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ABSTRACTS

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Abstract. Mechanical stresses, chemical/electrochemical reactions, and environmental aggressions often cause material degradation starting from the surface. Composite coatings are an excellent means of improving the surface properties of materials and increasing their lifespan. Due to its exceptional wear resistance, nickel-based composite coating has recently unlocked new possibilities. These coatings are created by incorporating solid particles (ceramics, carbides, solid lubricants) into a nickel matrix during the electrodeposition process.The tribological and wear properties of electrodeposited nickel-based composite coatings strongly depend on several factors, including the type, size, distribution, and concentration of reinforced particles, as well as electrodeposition parameters such as the type and magnitude of the applied current, bath composition, pH, temperature, type of agitation, the effect of magnetic fields, the presence of surfactants, and electrodeposition techniques.Weight loss, friction coefficient, hardness, and roughness are quantitative properties of electrodeposited nickel-based composite coatings that provide valuable insights for optimizing and selecting coatings. Researchers and engineers can tailor coatings for specific applications using these data and knowledge of electrodeposition parameters, thereby enhancing the performance and durability of the coatings.

Keywords: nickel-based electrodeposition, nanoparticles, composite, tribology, optimization method

A.2. ANALYSIS OF SOME MATERIALS FROM THE CLASS OF 3D PRINTED POLYMERIC MATERIALS USED AS BIOLOGICAL FILTER MEDIA

VASILE BAŞLIU, ALINA CEOROMILA, MIRELA CREȚU, MARIAN COADĂ, CIPRIAN CUZMIN, GINA IOAN, SILVIU BACALUM

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Abstract. Biological filter media play a significant role in recirculating systems by maintaining bearable levels of water toxicity and the sustainability of the aquatic environment composed of flora - plants and fauna - fish biomass.This paper aims to carry out an analysis of innovative 3D printed polymeric materials that will receive the role of biological filter media - 3D biofilter through their support characteristics, more precisely through the role of supporting active bacterial colonies.The analysis will focus on the study of the properties of 3D printed materials made of natural polymers - polylactic acid (PLA) and composite materials based on PLA and short carbon fiber inserts with 8% carbon (CF 8%).In this paper, we will analyze these materials for surface properties through contact angle, surface morphology through macro and microscopic imaging study through optical and electronic analysis using a scanning electron microscope (SEM) to observe the roughness of the materials, knowing that an essential factor in the development of bacterial colonies is given by the extent of the active surface present on the surface of the material.This research comes with a contribution to a more thorough knowledge of innovative 3D printed materials that can have a positive sustainable impact on the aquatic

environment. This work was funded by "Dunarea de Jos" University of Galati, Romania, grant research no. 7949 /31.03.2025.

Keywords: 3D biofilter, biological filter media, polylactic acid (PLA), PLA + 8% CF composite material

A.3. OPTIMIZATION OF PROCESS PARAMETERS FOR ELECTRICAL DISCHARGE MACHINING OF C120 MATERIAL

EUGEN HERGHELEGIU[1], OANA GEORGETA GHIORGHE[2], MARIA CRINA RADU[1], CAROL SCHNAKOVSZKY[1], PETRICA RADU[2], NICOLAE CATALIN TAMPU[1], BOGDAN ALEXANDRU CHIRITA[1], BOGDAN NITA[1]

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Abstract. The emergence of new hard and extra-hard materials has led to the development of new technologies capable of processing them, known as unconventional technologies. Electrical discharge machining (EDM) is a very common unconventional technology in the manufacturing industry, used to process special materials. The primary benefit is the ability to machine various complex shapes at a reduced cost. In this study the optimization of the electrical discharge machining parameters of C120 material was performed. The experimental setup was designed using the RSMD-OPTIMAL response surface method in Design Expert software, and the results were statistically processed with ANOVA analysis.

Keywords: EDM, C120 material, process parameters, optimization, ANOVA

A.4. OPTIMIZATION OF WC-CO EDM MACHINING PARAMETERS: EFFECT OF PARAMETERS ON PROCESS PERFORMANCE

ABDERRAHIM BELLOUFI, MOURAD ABDELKRIM, MOURAD MEZOUDJ, IMANE REZGUI, YASSINE ABDESSELAM

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Abstract. Electrical discharge machining (EDM) is an effective technique for machining hard and difficult-to-machine materials, such as WC-Co composites. However, optimizing machining parameters is essential to improve process performance and ensure an optimal compromise between material removal rate (MRR), surface quality, and electrode wear. In this study, an experimental approach is adopted to analyze the effect of key EDM machining parameters, including pulse current

Keywords: aluminum EDM, WC-Co, optimization, material removal rate, roughness, electrode wear, RSM

A.5. PREDICTIVE MODELING OF BURNISHING: OPTIMIZING PARAMETER INTERACTIONS FOR ENHANCED PERFORMANCE

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Abstract. This study aims to optimize burnishing parameters, including spindle speed, feed rate, depth of cut, and number of passes, to achieve the best combination to maximize hardness while minimizing surface roughness. An experimental approach is adopted, followed by optimization based on the Response Surface Method (RSM) to identify optimal process conditions. Tests are conducted using a structured experimental design to evaluate the impact of each parameter on the studied responses. Statistical analysis of the results highlights the interactions between the parameters and their effects on surface quality. The results show that increasing the depth of cut and the number of passes contributes to a significant improvement in hardness, while optimal rotational speed and feed rate minimize roughness. The prediction model developed using RSM identifies optimal burnishing configurations, ensuring an ideal compromise between surface finish and mechanical properties. This study provides recommendations for efficient burnishing optimization, with potential applications in sectors requiring high-quality surfaces, such as aerospace, automotive, and medical.

Keywords: burnishing, cutting parameters, optimization, hardness, roughness, RSM

A.6. GENERATIVE DESIGN AND NEW DESIGNERS' ROLE IN THE MANUFACTURING INDUSTRY - BIBLIOMETRIC STUDY

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Abstract. Generative Design, empowered by advancements in artificial intelligence (AI), is revolutionizing the manufacturing industry by enabling the creation of highly optimized and complex products. This approach leverages algorithms to process designer-set specifications, generating a multitude of design options that meet functional requirements. Unlike traditional design methods, which often rely on iterative refinement of an initial concept, generative design starts with defining objectives, constraints, materials, and manufacturing techniques to propose a diverse array of potential solutions. The role of designers is evolving from manually crafting component shapes to selecting the most suitable design generated by AI tools. This shift allows designers to focus on higher-level decision-making and creative problem-solving, enhancing the overall design process. By integrating generative design tools, designers can explore a broader solution space, leading to innovative applications and superior product performance. In the context of additive manufacturing, generative design fully exploits the potential of this technology, enabling the creation of intricate geometries that are difficult to achieve through conventional methods. This synergy between generative design and additive manufacturing is paving the way for groundbreaking advancements in product development. Overall, generative design is not only transforming the design process but also redefining the role of designers in the manufacturing industry, fostering a collaborative environment where human creativity and AI capabilities converge to produce exceptional outcomes.

Keywords: additive manufacturing, generative design, outcome selection, computer aided engineering

A.7. STUDY ON DETERMINING THE FUNCTIONAL CHARACTERISTICS OF THE MAIN PUMP FROM A HYDRAULIC DRIVE

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Abstract. Positive displacement pumps are used to convert mechanical energy into hydraulic energy, transporting liquid from one cavity to another by equalizing volumes. Positive displacement pumps can be of several types, such as axial piston pumps, diaphragm pumps, or gear pumps. The functional characteristics of a positive displacement pump include flow rate, pressure, pumping speed, efficiency, and durability. Connecting the pump, and here we refer to any type of volumetric pump, to the hydraulic network of the installation, requires the installation in parallel with the pump and as close as possible to it, of a safety valve for regulating the pressure and discharging the pump's excess flow to the tank. The pumps can be present in the hydrostatic system mounted in series or in parallel. The studies will consider the following parameters: theoretical flow rate, geometric capacity, hydraulic power produced, and mechanical power consumed. Pump testing is done with the aim of determining its functional parameters and how they vary under different working conditions. The pump unit to be tested must be previously run in, in accordance with the technical specifications. The installation or experimental stand must ensure the possibility of air evacuation from its circuits, as well as avoiding air absorption. Because of the particularity of the working environment, the hydraulic performance of the pump is generally tested with the normal temperature working fluids, and then the hydraulic performance of the prototype pump is obtained through the conversion formula. In general, careful observation of the installations and the preventive nature of operating activities can prevent the occurrence of major defects or even breakdowns. At the same time, hydraulic installations must be modified over time and brought into line with technological advances. The present work uses a typical scheme of an open circuit stand that allows functional testing of a positive displacement pump, recommended by specialized literature.

Keywords: pump, fluid, flow, hydrostatic, capacity, power

A.8. RESEARCHES CONCERNING THE GREEN MACHINING OF MAGNESIUM ALLOYS

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Abstract. As the demand for more sustainable processes continues to grow, the manufacturing industry is facing more and more transition challenges. Industries such as automotive, aeronautics and others consumer oriented must develop or adapt their products to be environmentally neutral, but also to respond to ever increasingly higher quality requirements. All of these can only be achieved by improved materials selection, optimized manufacturing processes and increased energy efficiency under economical balance. Magnesium alloys are regarded as a viable alternative to more traditional metal alloys as they offer an improved ratio of strength to weight and have very good machinability. There are, however, some downsides due to the reactivity that makes it prone to fire hazards. The current paper investigates the influence of machining parameters and cooling conditions on surface quality, cutting forces, and temperature during the process. A central composite response surface plan was used to find the correlation among the input factors represented by the cutting speed, the feed, the depth of cut, the feed direction, and the cooling environment and the machining outcomes mentioned earlier. It was found that the feed, feed direction and the cooling environment, together with their

interactions are the most influential on surface quality (surface roughness). The feed and the depth of cut are the most significant parameters that control the cutting forces, whereas the temperatures during machining are influenced by the feed and its direction, the depth of cut and, of course, by the cooling environment.

Keywords: magnesium alloy, machining parameters, cutting forces, surface quality, temperature

A.9. ADVANCED TECHNIQUES FOR ENHANCING DIMENSIONAL ACCURACY AND SURFACE QUALITY IN SPLINE MACHINING

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Abstract. This work presents theoretical and experimental contributions to optimizing the precision, surface quality, and structural performance of external splines manufactured by milling and grinding, including the development and validation of an innovative worm milling cutter design through finite element analysis and experimental studies. A novel worm milling cutter configuration is proposed and evaluated through finite element analysis, highlighting improvements in tool performance and manufacturing efficiency. Extensive experimental studies validate the theoretical models, examining surface roughness, tooth profile deviations, and process-induced noise. The findings contribute significant insights into optimizing manufacturing processes for high-precision spline components, offering pathways for enhanced productivity, cost reduction, and improved mechanical reliability.

Keywords: spline machining, surface quality, dimensional accuracy, finite element analysis

A.10. INFLUENCE OF RIVET LAYOUT AND VENTILATION ON AXIAL DEFORMATION IN FLOATING BRAKE DISCS

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Abstract. This paper presents the modeling and simulation process for a floating brake disc designed for a Formula Student race car. It explains the advantages of floating brake systems, such as improved heat dissipation, reduced axial deformation, and material cost optimization. Various disc configurations were analyzed, comparing the number of mounting rivets (3, 4, 5, 6) and different ventilation patterns. Static structural simulations were conducted using SolidWorks Simulation to study axial displacements under braking forces. Results indicate that increasing the number of rivets and optimizing ventilation slots significantly reduces deformation and vibration. The study highlights the strong correlation between pad size, rivet spacing, and braking performance, proposing optimized designs for better reliability and efficiency.

Keywords: floating brake disk, mounting rivets, structural simulation

A.11. RESIDUAL STRESSES GENERATED BY MILLING IN SURFACE LAYERS

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Abstract. All technological operations that are based on material deformations generate different types of residual stresses that can be useful or detrimental, critical or insignificant. In the case of milling operations, the level and type of residual stresses depend on the chemical composition and mechanical proprieties of the material, the working parameters and the working conditions. However, in this case the main effects of residual stresses distribution on the machined materials and parts were not extensively investigated. Flatness deviation is significantly influenced by the type and direction of residual stresses generated during milling, as these stresses can cause the workpiece to deform once the material is removed. The present paper analyses the experimental results concerning the residual stresses distribution generated by milling in surface layers as a function of materials proprieties and cutting speeds and the effect of such stresses distribution on the machined surface quality (surface flatness).

Keywords: milling, residual stress, machined surface

A.12. ANALYSIS OF MACHINING PARAMETER EFFECTS ON SURFACE QUALITY IN DRY MACHINING OF TI-6AL-4V ALLOY

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Abstract. This study investigates the effect of cutting parameters on surface roughness during the dry milling of Ti-6Al-4V titanium alloy using an 8 mm solid carbide end mill with four flutes. Machining tests were performed at cutting speeds of 10, 20, and 40 m/min and feed rates of 0.05, 0.1, and 0.2 mm/tooth. The results show that low cutting speeds combined with low feed rates yield superior surface quality, with roughness values as low as 0.1 µm. However, these conditions also lead to accelerated tool wear. Conversely, higher cutting speeds result in an increased roughness value to 0.32 µm, but significantly reduce tool wear. All operations were conducted under dry conditions. The findings highlight the trade-off between surface finish and tool life, providing useful insights for optimizing machining strategies for titanium alloys in dry environments.

Keywords: milling, residual stress, Ti Alloy

A.13. SHAPING TECHNICAL THINKING IN PRIMARY SCHOOL: A STUDY ON EARLY EDUCATIONAL INFLUENCE

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Abstract. Primary education plays a crucial role in establishing early educational foundations and guiding children towards technical fields. Through hands-on activities, educational games and the development of logical and creative thinking, students can cultivate a positive attitude towards science and technology. Introducing age-appropriate technical concepts helps to identify early interests and aptitudes, laying the foundation for a coherent educational path towards technical careers. Strengthening this foundation at an early age is essential for preparing future generations to face technological challenges. The aim of this paper was to analyze, by using both questionnaires and a classroom game, the way of thinking and early orientation of young students towards technical fields.

Keywords: technical orientation, children's career interests, technical thinking

A.14. CONSTRUCTIVE-FUNCTIONAL AND FEM ANALYSIS OF AN OIL UOP 12 C1 PUMP

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Abstract. In the context of a continuous evolution of the automotive industry, as well as the need to ensure the reliability of mechanical systems, oil pumps have an important role in maintaining the performance and durability of engines. The correct choice of materials and optimization of component design directly contribute to increasing efficiency and reducing maintenance costs. The paper presents the constructive-functional and FEM analysis of an oil UOP 12 C1 pump, aiming at three-dimensional modeling of the assembly in Autodesk Inventor program, as well as the finite element analysis of the created graphical model, determining the minimum and maximum values for the state of stresses and displacements. The stages of creating the 3D model, the commands used in the modeling process, as well as the simulation conditions applied in the FEM analysis are detailed. The paper also includes a comparative analysis of the states of stresses and displacements of the pump, depending on the material used - aluminum or steel. The obtained results highlight the advantages and limitations of each material in terms of mechanical strength and stress behavior, providing a basis for material selection according to the application requirements specific to the industrial environment.

Keywords: oil pump, autodesk inventor, FEM analysis, aluminium, steel

A.15. INFLUENCE OF PROCESS PARAMETERS ON THE PERFORMANCE OF DIE-SINKING EDM OF LOW STIFFNESS PARTS MADE BY GAMMA TITANIUM ALUMINIDE

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Abstract. Gamma titanium aluminides (γ-TiAl) are special materials used to manufacture critical components in the aerospace and automotive industries because of their superior properties: low density but high strength, structural and thermal stability, and very good resistance to creep and fatigue, corrosion, oxidation, and ignition. These properties, however, place them in the category of hard-to-cut materials using conventional technologies. Due to the tool-workpiece non-contact working principle, electrical discharge machining avoids issues that usually happen with traditional machining of these materials, especially significant tool wear and, consequently, poor surface quality. However, an unsuitable working regime may affect the geometrical integrity of low-stiffness parts because of excessive erosion. The aim of the current paper is to determine the influence of process parameters on the performance of die-sinking EDM of Ti-48Al-2Nb-2Cr alloy, quantified by material removal rate, tool wear rate, electrode wear ratio, surface roughness, and surface macrostructure.

Keywords: gamma titanium aluminides, EDM, thin-walled parts, machining regime

A.16. THE INFLUENCE OF WORKING REGIME ON THE PERFORMANCE OF MILLING PROCESS OF PARTS WITH LOW RIGIDITY

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Abstract. Choosing the right working regimes for machining parts with low rigidity often involves a trial-and-error approach, followed by the identification of an optimum function that provides the best solution for process sustainability: productivity, quality, and safety. The aim of the current study is to determine the influence of process parameters (cutting speed, radial depth, feed per tooth) on the machining performance of aluminium alloys in order to identify a working regime that allows the simultaneous fulfillment of high productivity and quality conditions while minimizing the environmental impact.

Keywords: low rigidity parts, milling, durable production, cutting forces, residual stresses, surface roughness

A.17. INFLUENCE OF CUTTING PARAMETERS ON SURFACE QUALITY OF AL6061 ALLOY UNDER DRY AND LN2 COOLING CONDITIONS

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Abstract. The aim of the present paper was to investigate the influence of cutting parameter under dry and LN2 (liquid nitrogen cooling) cooling condition on surface quality. Experiments were conducted on the AL6061 aluminum alloy and three cutting speeds and two cutting depths were tested in the presence and the absence of the cryogenic cooling. The increase of cutting speeds under the cryogenic cooling conditions led to a decrease of surface roughness from 0.28 µm (in dry condition) to 0.16µm (with LN2 cooling). Similar behavior was observed in the case of the increase of the cutting depth, thus for higher cutting depths the use of cryogenic cooling liquid generated lower surface roughness values that the dry milling. In conclusion the use of the cryogenic cooling technique is recommended for AL6061 milling as it generated better results that the dry machining and it is also considered an environmentally friendly technique.

Keywords: milling, AL6061 aluminum alloy, cryogenic cooling, liquid nitrogen, surface roughness

A.18. LASER SURFACE TEXTURING OF BIOPOLYMERS

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Abstract. Surface modification by forming, microgrooving, microdimpling, and microchanneling is known as surface texturing. In addition to other similar techniques on the substrate surface, laser micromachining is used to accomplish this. The surface properties of the biodegradable polymer (Arbofill Fichte and Arboblend V2 Nature) after four and six passes of laser texturing in hexagonal and square patterns are presented in this study. Regardless of the roughness that was achieved, the wettability test findings for Arbofill Fichte showed that this biodegradable polymer has a surface with a weak hydrophobic character (contact angle close to 90°). The Laser Surface Texturing (LST) surface modification altered the wear behavior of the underlying material. As a result, all samples' friction coefficient (COF) values increased. Regardless of the number of passes, the hexagonal geometry provides more stability and consistency than the square geometry. Square geometry may require additional process parameter modifications due to its greater susceptibility to fluctuations, especially along the Y-axis. Even at 4x, the hexagonal structure's tighter and more uniformly distributed layout inherently encourages more consistent compaction. However, due to the frequent overlaps in the laser trajectories, the benefits become more noticeable at 6x. By ensuring that every part of the material receives a comparatively constant energy dose, the overlap in the hexagonal shape minimizes localized disparities. Based on the acquired results, it is also possible to replace non-biodegradable polymers from other areas of activity because the possibility of use in the practice of textured surfaces is practical. The wettability test findings for Arboblend V2 Nature showed

that, irrespective of the texture type, the surface had a hydrophilic nature (contact angle less than 90°). The LST surface modification resulted in a change in the wear behavior of the underlying material. Only six passes with both textures saw an increase in COF values. Arboblend V2 Nature (hexagonal and square) exhibits a consistent X-axis expansion in the hexagonal geometry and a significant degree of variability in the square geometry on the topographical side, particularly at 6 passes, where the Y-axis (higher depths) is more compressed. According to the results, it is also possible to replace non-biodegradable polymers from other industries with this material since it may be used to create textured surfaces.

Keywords: laser, surface, texturing, biopolymer, pattern

A.19. AN OVERVIEW OF MATERIAL JOINING METHODS BY PLASTIC DEFORMATION

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Abstract. The technique of joining materials through forming technologies employs plastic deformation to establish robust junctions, even with dissimilar materials. This technique can be categorized into two primary types: mechanical interlocking and metallurgical bonding. Mechanical interlocking comprises techniques like clinching and self-pierce riveting, whereas metallurgical bonding includes friction stir welding and its derivatives. The paper offers a thorough examination of the most prevalent mechanical interlocking joining techniques. Each method in its category is examined individually, encompassing the processing principles, relevant materials, process variations, and the mechanical properties of the resultant joints, both static and dynamic. Furthermore, we emphasize diverse optimization strategies, encompassing experimental, numerical, and analytical methods, and assess the advantages and disadvantages of each technique for industrial applications.

Keywords: plastic deformation, materials joining, optimization strategies

A.20. THE EVIDENTIARY VALUE OF AUTOMOTIVE TECHNICAL EXPERTISE IN JUDICIAL PROCEEDINGS

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Abstract. In resolving a case involving a vehicle, most often an expert opinion is required to clarify technical aspects in relation to the regulations, legal provisions or any other acts that regulate the use, operation and maintenance of a vehicle. Thus, the large number of cases, the diversity and complexity of practical situations that come before the judicial bodies determine the need to draw up a specialized expertise. In this article, we will analyse the evidentiary value of automotive technical expertise in judicial proceedings, being an evidence that can be requested by the parties involved before addressing the judicial bodies, but also after this moment, before the judicial bodies but also ex officio by the authorities.

Keywords: technical expertise, vehicle, judicial evidence, extrajudicial evidence, road events

A.21. RESEARCH ON SINGLE POINT INCREMENTAL FORMING OF METAL SHEETS: A REVIEW

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Abstract. The switch to sustainable production has made the global market much more competitive. To keep up with market demands for increasingly customized products with shorter lead times and lower costs, manufacturing industries need to develop new processes and technologies. One of them is incremental sheet forming, a generic name for a group of forming processes that differ from conventional processes by eliminating the need for dedicated tooling. Single point incremental forming (SPIF) is the most studied process in this category due to its operational simplicity and, therefore, the flexibility of implementation and low costs. It allows for the manufacturing of components with different geometrical configurations using a single tool with a very simple geometry. The goal of this paper is to present the results of a study aimed at identifying the state of research in the field of SPIF in terms of technological variants, material formability, and quality of parts.

Keywords: SPIF, experimental setups, formability criteria, forming mechanisms, geometric accuracy, surface roughness, microstructure

A.22. STUDY ON THE INFLUENCE OF MACHINING PARAMETERS ON ELECTRODE WEAR AND QUALITY OF SURFACES MACHINED BY EDM

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Abstract. In this paper, the influence of electrical discharge machining (EDM) parameters—discharge current intensity, pulse on time, and pulse off time—on the surface characteristics of the machined parts and electrode wear is studied. Surface roughness and macrostructure were evaluated to assess the effect of various parameter combinations used in the research. The experimental results reveal that the use of higher current intensities increases the material removal rate but also leads to rougher surfaces and larger craters. Conversely, lower energy inputs produce better surface finishes but reduced machining efficiency. These findings highlight the critical balance between productivity and surface quality, providing solutions for the optimal selection of EDM process parameters.

Keywords: EDM, surface quality, macrostructure, peak current, pulse on time, pulse of time

A.23. OPTIMIZATION OF AWJ MACHINING PARAMETERS OF ARMOR STEELS

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Abstract. Abrasive water jet (AWJ) machining is a technique suitable for cutting hard-to-machine materials, such as alloys used in armor manufacturing, providing high accuracy and without thermally damaged surfaces. This research focuses on the optimization of the AWJ process using DOE++ software to improve important output parameters, such as the width of the cut at the jet inlet, the width of the cut at the jet outlet, the inclination of the machined surface, and surface roughness. The obtained experimental data were used to successfully identify the optimum process conditions. The results highlighted that parameter optimization improves the machining performance, making AWJ a reliable and adaptable method for materials used in armor manufacturing in defense and aerospace applications.

Keywords: abrasive water jet, optimization, surface quality

A.24. THE INFLUENCE OF ELECTRODE AND PROCESS PARAMETERS ON THE ELECTRICAL DISCHARGE MACHINING OF ALUMINUM ALLOYS WITH VEGETABLE DIELECTRICS

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Abstract. Green industry, sustainable production, and circular economy are concepts being increasingly developed in both industry and academia, or through collaboration between the two, to identify the best solutions in terms of societal and environmental utility and economic feasibility. Efforts are directed in particular towards the development of new technologies or the improvement of the existing ones to reduce waste, energy consumption, and pollution while reducing production costs and increasing occupational safety. The current paper presents the findings of a study concerning the influence of electrode material (99.9% electrolytic copper, 75% tungsten - 25% copper, and 60% brass) and working regimes on the performance of electrical discharge machining of aluminum alloys when using vegetable dielectrics (sunflower and rapeseed oils).

Keywords: EDM, sustainable production, vegetable dielectrics, electrode material, working regimes

A.25. OPTIMIZATION OF ABRASIVE WATER JET MACHINING PARAMETERS OF ALUMINUM ALLOYS

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Abstract. Abrasive water jet (AWJ) machining is an unconventional cutting process increasingly used for machining aluminum alloys due to its ability to produce precise cuts without thermal damage. This study investigates the influence of key process parameters—jet pressure, feed rate, distance between the machining head and the workpiece, and material thickness—on surface quality.
The optimization of these variables was carried out by using the response surface method and the analysis of variance (ANOVA) was used to statistically process the results. The findings of the study demonstrate that the optimization of process parameters significantly improves the cutting performance in terms of efficiency and accuracy of the machining, providing an optimal solution for AWJ of aluminum alloys.

Keywords: abrasive water jet, optimization, surface quality, ANOVA

A.26. OPTIMIZATION OF AWJ MACHINING PARAMETERS OF SJ 235 STRUCTURAL STEELS

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Abstract. This work studies the abrasive water jet (AWJ) machining of SJ 235 steel. This material is commonly used in structural and industrial applications. The research focuses on the evaluation of key quality characteristics, such as surface roughness and taper of the cut when machining with various process parameters, such as pressure, feed rate, distance between the focusing tube and the workpiece, and amount of abrasive material. Experimental tests revealed the influence of these parameters on the quality of the cut, emphasizing the need for precise control to obtain optimal results. The results show that adjusting these factors greatly enhances the machining performance, leading to the best outcomes for abrasive waterjet machining of SJ 235 structural steels.

Keywords: abrasive water jet, optimization, surface quality, SJ235 steel

A.27. STEELS RESEARCH ON THE INFLUENCE OF CUTTING REGIMES ON THE QUALITY OF PARTS MADE FROM TITANIUM ALLOYS

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Abstract. This paper presents the results of an experimental study on the influence of cutting regimes on the surface quality of titanium alloy parts, known for their superior mechanical properties and corrosion resistance. Cutting speed, feed rate, and depth of cut were analyzed, assessing their effects on surface roughness, burr formation, and surface integrity. Experiments performed on Ti6Al4V alloy using coated cutting tools revealed significant correlations between machining parameters and surface quality. The findings offer valuable guidelines for optimizing machining processes, with applications in high-precision industries such as aerospace and biomedical fields.

Keywords: titanium alloys, cutting regime, roughness, Ti6Al4V, surface integrity, optimization, machining

A.28. ASPECTS REGARDING THE GRINDING OF RUBBER MANTLE WITH CAMBER USED ON PAPER MACHINE ROLLERS IN THE PAPER AND CARDBOARD MANUFACTURING INDUSTRY

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Abstract. The paper presents some particularities of rubber processing by the grinding process on heavy grinding machines, used in paper production. The aspects studied and presented are related to obtaining the imposed camber, the roughness, under a certain cutting regime (dry or with coolant) using factorial experimental design.

Keywords: rubber mantle roller, rubber grinding, roller camber, porous grinding stone, coolant

B. OPTIMIZATION OF TECHNOLOGIES AND EQUIPMENT FROM PROCESS INDUSTRIES

B.1. STUDY OF A FLOW EXTRACTOR FOR MEDICINAL SUBSTANCES

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Abstract. This paper examines the extraction of medicinal substances from dried plant materials using a low-temperature flow extractor. The research encompasses both numerical studies conducted by ANSYS Fluent software and experimental tests performed on a specially designed test stand. The extraction process was modeled by simulating solvent flow through porous material, thereby determining velocity distribution and pressure varies during the procedure. In the experiments, key parameters such as pressure loss and liquid viscosity were correlated with operating temperatures below -30°C to minimize the dissolution of impurities. The results obtained contribute to the development of an optimized centrifugal extractor, enhancing the efficiency of the extraction process and the quality of medicinal substances. The study provides a robust foundation for further research on parameters affecting the concentration of substances in the final product.

Keywords: low temperature flow extractor, numerical research, fluid flow, medicinal herbs.

B.2. THE INFLUENCE OF THE ACTUATION SYSTEM ON THE MOTION OF THE MOVABLE JAW IN A DOUBLE-JOINTED CRUSHER

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Abstract. This study investigates the influence of the drive system on the motion of the movable jaw of a double-toggle crusher. The analysis presented in the study utilizes geometric and graphical analysis to understand the behavior of specific points within the drive system. From the geometric diagrams provided, spatial and vector relationships between the couplings of the mechanism used for driving (A, B, C, D, E, etc.) can be identified. These diagrams offer a detailed view of coordinates and vectors, highlighting the complex interactions between the various components. Graphs describing the variation of the linear velocity of couplings C and F over time are created by comparing different positioning variants of the drive system of the movable jaw. The periodic behavior observed in these graphs indicates the dynamic response of the system under varied conditions. The comparison of the two constructive variants reveals similar oscillatory patterns for coupling C and differing ones for coupling F, suggesting performance variations for different configurations. Overall, the study provides valuable insights

into the mechanical behavior of the movable jaw of the crusher, emphasizing the importance of the drive system in achieving optimal and efficient motion.

Keywords: drive system, movable jaw, linear velocity, oscillatory behavior.

B.3. MODERN MECHANICAL TRANSMISSION SYSTEMS IN CNC MACHINE TOOLS

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Abstract. This paper analyzes modern mechanical transmission systems used in computer numerically controlled (CNC) machine tools. A fundamental element linking the electronic "brain" (the CNC controller) to the physical movement of the machining axes is the mechanical transmission system. The quality, accuracy and reliability of these mechanical components are directly responsible for the final performance of the CNC machine, and hence the dimensional accuracy of the machined parts, the cutting speed and surface finish. Based on the most recent bibliographical references in the field, an analysis has been carried out which is finalized with the presentation of the novelties and trends of high-performance mechanical transmissions for CNC. A major objective of these developments is to shorten and simplify the mechanical kinematic chain by using: Linear Motors, Direct Drive (Rotary) Motors, Integration of high-resolution measurement systems, Advanced Thermal Management. Based on recent literature references, the paper addresses key issues such as motor, electronic circuits and safety in operation.

Keywords: mechanical transmission, kinematic chain, CNC.

B.4. TWO-COMPONENT INJECTION MOLDING USING BIODEGRADABLE MATERIALS - A REVIEW

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Abstract. The two-component injection molding technology for biodegradable materials represents an innovative approach to producing eco-friendly products with enhanced mechanical and functional performance. This study explores the two-component injection process, focusing on biodegradable materials such as polylactic acid (PLA) and polyhydroxyalkanoates (PHA), aiming to minimize environmental impact and promote product sustainability. Various material pairings were examined, including liquid silicone rubber (LSR) and glass fiber-reinforced polyamide (PA66GF30), chosen for their excellent processing behavior and strong interfacial adhesion. Rheological and thermal analyses revealed the pseudoplastic nature of the elastomers, which facilitates their flow during the injection process. Additionally, vulcanization experiments confirmed the rapid curing capability of LSR, ensuring stable bonding with the polyamide substrate. A critical component of the research involved employing finite element method (FEM) simulations to optimize key processing parameters, such as temperature, pressure, and injection speed. The experimental findings closely matched the simulation results, validating the effectiveness of the numerical model. Moreover, peel and tensile strength tests demonstrated excellent interfacial adhesion between the combined materials, a key factor for the long-term durability of the manufactured parts. Incorporating biodegradable materials into two-component injection molding offers promising applications across industries like automotive, sustainable packaging, and medical devices. Over time, adopting this technique could significantly reduce

dependence on conventional plastics and advance the sustainability of industrial manufacturing processes.

Keywords: two-component injection molding, biodegradable materials, polylactic acid (PLA), liquid silicone rubber (LSR), interfacial adhesion, numerical simulations.

B.5. EXTERNAL SURFACE BURNISHING AND ITS IMPACT ON METALWORKING - A REVIEW

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Abstract. This paper provides a detailed analysis of the work hardening of external surfaces and its impact on metal processing, an essential process for optimizing the mechanical properties of materials. Work hardening, as a phenomenon of surface layer strengthening through cold plastic deformation, plays a significant role in increasing wear, fatigue, and corrosion resistance of processed parts, making it applicable in various industries such as automotive, aerospace, and machinery manufacturing.The primary objective of this review is to investigate the fundamental mechanisms of work hardening, its effects on the properties of metallic surfaces, and the influence of various technological factors on the process. The correlation between work hardening and surface layer characteristics is analyzed, with a focus on microstructural changes, residual stress distribution, and the improvement of mechanical properties in processed parts. The methodology used includes a synthesis of specialized literature on work hardening theories, stress and deformation analysis models, and experimental techniques for characterizing the surface layer. The study also addresses the applicability of work hardening in various machining processes, comparing its efficiency with other finishing and mechanical treatment methods. The analyzed results indicate that work hardening significantly contributes to increasing surface hardness and reducing roughness, thus ensuring a considerable improvement in the mechanical performance of parts. Additionally, it has been observed that the presence of compressive residual stresses induced by work hardening enhances fatigue resistance and the durability of parts in operation. Compared to other finishing methods, work hardening presents notable advantages in terms of production costs and process sustainability.
The conclusions of this review emphasize the importance of optimizing the parameters of the work hardening process to achieve optimal characteristics of processed surfaces. Future research should focus on developing advanced predictive models and integrating modern technologies for real-time monitoring and control of work hardening.

Keywords: work hardening, cold plastic deformation, surface finishing, residual stresses, hardness, metal processing.

B.6. SURFACE INTEGRITY OF COPPER-COATED ADDITIVE MANUFACTURED SPECIMENS- A REVIEW

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Abstract. The paper investigates the behavior of PLA and HD PLA Green biopolymer samples coated with bronze composite powder, Metco 51F-NS (Bronze Alloy - Cu 9.5Al 1.2Fe – nominal composition). The samples were produced using 3D printing via the Fused Deposition Modeling (FDM) method, and the coating was applied using Atmospheric Plasma Spray (APS) deposition, which involves the deposition of micro powder onto the surface of the substrate. The study focuses on structural, morphological analysis, and Dynamic Mechanical Analysis (DMA) to evaluate the adhesion of the coating layer and improve the surface properties of the

biodegradable polymers. The novelty of this study lies in the coating of biodegradable biopolymer substrates with a bronze composite, offering an innovative approach to enhancing the mechanical and surface characteristics of these materials. 3D printing plays a crucial role in this process by allowing precise layer-by-layer deposition of the biopolymer, enabling the creation of complex geometries with tailored mechanical properties. FDM, as an additive manufacturing technique, offers advantages such as reduced material waste and the ability to customize the polymer's properties for specific applications. By combining the benefits of 3D printing with the durable properties of a bronze coating, this method presents new possibilities for designing biodegradable materials with enhanced strength and functionality.The Dynamic Mechanical Analysis (DMA) results demonstrate a significant improvement in the mechanical-dynamical properties of the coated samples, indicating that the treatment can enhance the performance of biodegradable polymers, making them suitable for use in demanding environments such as the automotive industry. This study suggests that these advanced, coated biopolymers could serve as viable alternatives to non-biodegradable materials, contributing to sustainability and reducing environmental impact in industrial applications.

Keywords: copper coating, biopolymers, microscopy, 3D printing, EDS, DMA.

B.7. IMPACT OF 3D PRINTING PARAMETERS ON THE MECHANICAL PROPERTIES OF REINFORCED PLA - A REVIEW

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Abstract. Due to the multiple advantages of 3D printing, it is used in various industrial fields, from robotics and the food industry to the automotive and aerospace industries. The results in this paper refer to parts obtained by 3D printing (both longitudinal and transverse) from PLA reinforced with wood fibers in 100%, 200%, and 300% proportions compared to parts obtained by pressing. The behavior of the reinforced PLA parts with wood fibers and a bio-additive was also studied. No significant differences were observed in tensile strength when printing in the transverse direction compared to the parts obtained by pressing, and in the case of longitudinal printing, the behavior was similar. However, a significant decrease in tensile strength was recorded for the parts printed transversely compared to the longitudinally printed ones. The variation in the width of the printed part influences the mechanical behavior, in the sense that for parts printed at 0º, a more ductile behavior was recorded as the width increased. The adhesion between wood fibers and the matrix can be improved by using a bioamide, and the addition of only 1.3% of the bio-additive led to an increase in tensile strength due to improved adhesion between the wood fibers. There was also a slight increase in the rigidity of the parts due to the increase in Young's modules. The impact resistance was much higher in the case of notchless samples because, as expected, they can absorb more energy compared to notched samples.3D printing, also known as additive manufacturing, allows the creation of complex, customized parts with varying geometries, using minimal material, making it sustainable technology. It enables rapid design adjustments and the improvement of part characteristics for specific applications. The FDM (Fused Deposition Modeling) technology used in this research plays a significant role, as it is capable of printing parts from biodegradable materials like PLA and enhancing them by adding natural fibers, such as wood fibers. Thus, 3D printing contributes to the development of innovative composite materials with a reduced environmental impact.

Keywords: 3D printing, PLA bio-composites, wood fiber, reinforced PLA.

B.8. STRUCTURAL DEGRADATION OF PORT CRANES UNDER ENVIRONMENTAL STRESS

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Abstract. Port cranes are constantly exposed to harsh external factors such as strong winds, high humidity, and salty environments, which accelerate corrosion and structural degradation. This study highlights the cumulative effects of these conditions on the materials and operation of port cranes, using relevant visual examples. The image presented illustrates a real case of severe corrosion, emphasizing the need for advanced protection and maintenance strategies. The study draws attention to the importance of regular assessments and the adaptation of construction solutions to extend the service life and operational safety of port cranes.

Keywords: structural degradation, port cranes, corrosion.

B.9. THE INFLUENCE OF VIBRATIONS CAUSED BY SURFACE IRREGULARITIES ON FORKLIFT FORKS

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Abstract. Forklifts operating in industrial or logistics environments often move over uneven and irregular driving surfaces. These surface imperfections generate significant vertical and horizontal vibrations that affect the lifting forks. The vibrations lead to additional dynamic stresses, accelerate material fatigue, and can cause deformations or the formation of cracks in the forks. As a result, the structural integrity of the components is compromised, endangering the safety of load handling operations. This study highlights the need for regular monitoring of the forks, preventive maintenance, and improvements to driving surface quality to mitigate the negative effects of vibrations.

Keywords: forklifts, vibrations, load handling operations.

B.10. SUSTAINABLE EXPLOITATION OF TECHNOLOGICAL EQUIPMENT IN FOOD SERVICE AND HOTEL INDUSTRY

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Abstract. The food service and hotel industry faces major challenges related to energy efficiency, operating costs and environmental impact. The concept of sustainability involves the responsible use of resources, with the aim of meeting current needs without compromising the ability of future generations to meet their own needs. A first step towards sustainability is the purchase of energy-efficient equipment. Modern equipment, equipped with advanced technologies, consumes less energy and water, which reduces both operating costs and greenhouse gas emissions. Regular and correct maintenance of equipment is another key element of sustainable operation. An often-neglected aspect is staff training. Employees who know how

to use equipment correctly can significantly contribute to reducing energy consumption and avoiding accelerated wear and tears. Reusing and recycling old or used equipment is also an essential component of sustainability. Last but not least, monitoring resource consumption and implementing clear environmental policies can guide the food service and hotel industry's activity towards a greener model. In conclusion, the sustainable exploitation of technological equipment in food service and hotel industry is an essential step for protecting the environment and making economic activity more efficient. Choosing the right equipment, rigorous maintenance, staff training and responsible recycling are the pillars of a modern and sustainable food service and hotel industry.

Keywords: food service, hotel industry, sustainability, technological equipment.

B.11. THE EVOLUTION OF AGRICULTURAL MACHINERY AND EQUIPMENT BASED ON THE SMART FARMING CONCEPT

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Abstract. From drones to satellite imagery and sensor technology, the agriculture industry is changing dramatically. Technological innovations are redefining the way agriculture is done. Its modernization and the use of digital technology have led to the creation of new concepts such as precision agriculture, digital agriculture and smart agriculture. These terms, although related, have subtle differences in their meaning. This paper attempts to clarify these concepts in order to understand what modern agriculture entails. It also mentions haw these technologies determine the adaptation of agricultural machinery and equipment to new conditions.

Keywords: agricultural machinery, agricultural equipment, smart.

B.12. CONSTRUCTIVE SOLUTIONS AND CALCULATION ELEMENTS FOR HIGH-PERFORMANCE SYSTEMS FOR SEPARATING LIQUID-SOLID HETEROGENEOUS MIXTURES FROM WASTEWATER THROUGH FILTRATION

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Abstract. The paper addresses a theoretical study regarding the constructive and calculation elements specific to high-performance systems for separating liquid-solid heterogeneous mixtures from wastewater through filtration. Moreover, the present theoretical research refers to the use of the most current calculation elements specific to both filtration in a stratified granular porous medium (hydraulic resistance of the filter layer; sizing of filtration installations in a granular porous medium; sizing of the wastewater supply installation of the filter; sizing of the filter washing installation), as well as filtration through screens and woven networks (the effect of inertial forces and Brownian diffusion; the mechanism of filtration through fabrics; calculation of the filtering surface area; calculation elements for fabric filters, including the calculation of hydraulic resistance, filtration speed, and filtration time; determination of the power required to operate the pressure generator). Undoubtedly, such elements are inconceivable in the design of the most advanced domestic and industrial wastewater treatment systems. Therefore, I considered it necessary to also address the constructive elements specific to high-performance systems for separating liquid-solid heterogeneous mixtures from wastewater, which, moreover, form the basis for the design of other more advanced, high-performance, and efficient systems

from a technical and economic point of view. Thus, the following constructive types were highlighted: sand granular layer filters, cylindrical/rotary cell filters with continuous operation (with 'Oliver' rotary drum; with 'Darrco' internal filtering surface; with discs), rotary vacuum filters, and press filters (with plates/chambers; with plates and frames; with conveyor belt).

Keywords: filtration, wastewater, hydraulic resistance, granular porous medium.

B.13. NEW APPROACHES REGARDING SPECIFIC CALCULATION ELEMENTS FOR THERMAL INSULATION SYSTEMS OF INDUSTRIAL TECHNOLOGICAL PIPES

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Abstract. This scientific paper highlights the most current theoretical aspects regarding the technical and constructive solutions for the installation of pipeline systems for the transport/distribution of the thermal agent, as well as the specific thermal calculation elements of pipeline systems and networks. The use of advanced techniques for placing pipes within systems, transport/distribution networks, and technological installations is noted for creating premises related to the foundations and specific methods of their thermal calculation, focused on determining parameters such as: heat losses in the network, temperature drop along the route, temperature on the outer surface of the thermal insulation, and optimal thickness of the thermal insulation. In conclusion, optimal technical insulation solutions are necessary to provide sustainable support for maintaining extremely low and long-term heat and mass losses in a building or an operational system of technological pipes. Through firm measures to save costs related to reducing losses, the objective increase in energy efficiency and the performance of technical pipeline systems that permanently require new and advanced thermal insulation solutions is ensured.

Keywords: thermal insulation, heat losses, energy efficiency, pipeline systems.

B.14. SOME CONSIDERATIONS REGARDING THE RELIABILITY AND DURABILITY OF SEALING GASKETS SPECIFIC TO CONTACT SEALS

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Abstract. The paper provides a theoretical approach regarding the reliability and durability of sealing gaskets specific to contact seals. The importance of these devices for preventing fluid leaks from certain equipment characterizes the vitality of their satisfactory operation in various process industries (chemical, petrochemical and refining, food, pharmaceutical, etc.), thus ensuring the sealing between components such as flanges, valves, or pipes. Considering the sealing achieved by compressing the gasket which compensates for surface imperfections and prevents substance losses, safety, performance, and efficiency of the sealing systems are implicitly ensured. Through the technical elements characteristic of ensuring efficient and satisfactory operation of contact sealing systems through gaskets, the paper highlights the necessary conditions for achieving their reliability and performance: sealing, durability, elasticity, thermal conductivity, and ease of disassembly. Moreover, the reliability of contact sealing systems through gaskets is crucial for preventing leaks, reducing downtime, extending the equipment's lifespan, and reducing maintenance costs. To ensure reliability, the correct

choice of sealing gasket, material compatibility, proper installation, monitoring of operating conditions, and implementation of a preventive maintenance program are recommended. Gaskets must maintain sealing throughout the system's lifespan, thus protecting the equipment and the environment.

Keywords: reliability, durability, sealing gaskets, contact seals.

B.15. ESEARCH ON DETERMINING THE LONGITUDINAL ELASTICITY MODULUS OF SEALING GASKETS MADE OF COMPOSITE MATERIALS

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Abstract. The purpose of this paper is to determine the longitudinal elasticity modulus of sealing gaskets made of composite materials. The materials used for obtaining these gaskets were rubber, polypropylene, silicone rubber, and an adhesive. Considering that the gaskets must operate under different conditions, factors such as temperature, chemical resistance, the pressure to which they will be subjected, ensuring a precise seal, having appropriate mechanical properties, and deforming elasto-plastically when tightened to fill the microasperities of the sealing surfaces must be taken into account. Finally, the specific deformation was represented as a function of the tightening pressure of the sealing gasket.

Keywords: elasticity modulus, composite materials, sealing gaskets, mechanical properties.

B.16. HIGH-PERFORMANCE COATINGS OBTAINED BY COMBINED THERMAL SPRAYING METHODS – FOR INDUSTRIAL USE

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Abstract. This work presents the development of high-performance metallic coatings using a combined thermal spraying method, based on a hybrid device (CTSD) that integrates wire arc spraying with flame spraying. A 60T (Fe-Cr) wire was deposited on low-carbon steel (C15) substrates with a 75B (Ni-based) bond coat. Process optimization was carried out using the Taguchi method, varying four control parameters (wire feed speed, current intensity, compressed air flow, and methane flow) to evaluate their effects on porosity, adhesion, microhardness, and layer thickness. Experimental results were correlated with wear tests and structural characterization (XRD, optical microscopy, and SEM-EDX). The analysis revealed that current intensity and methane flow significantly influence hardness and adhesion. Optimized parameters allow the formation of dense, hard, and wear-resistant coatings. However, the parameters that yield maximum performance also reduce deposition efficiency, indicating a trade-off between coating quality and process cost.

Keywords: metallic coatings, flame spraying, XRD, optical microscopy, SEM-EDX.

B.17. EFFECTS OF CORROSIVE CHEMICAL SOLUTIONS ON PITTING CORROSION OF AL ALLOY

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Abstract. Aluminum alloys require protective treatments to improve their resistance to corrosion and thereby extend their operational lifespan. Among the various protection techniques, anodizing stands out due to its straightforward procedure, cost-effectiveness, and high level of protection. Currently, sulfuric acid anodizing (SAA) is the most commonly employed method for aluminum alloys. This technique is favored for its ease of application and its ability to produce a relatively thick protective layer. However, one drawback is that it may increase the susceptibility of the material to corrosion fatigue. The aim of this study is to conduct a comparative analysis of various corrosive media-specifically solutions of NaCl, HCl, H_2SO_4, and NaOH-and their effects on the initiation and propagation of pitting corrosion in aluminum alloys. Additionally, the study investigates the influence of microstructure on corrosion susceptibility in different aluminum alloys (e.g., 2024, 6061, 7075), as well as the application of electrochemical testing methods, such as potentiodynamic polarization and electrochemical impedance spectroscopy (EIS), to evaluate corrosion behavior. Aluminum alloy samples naturally form a passive oxide film (Al_2O_3) on their surface when exposed to air or water. This thin, protective layer serves as a barrier against general corrosion. However, in the presence of aggressive anions—particularly chloride ions (Cl^-) from solutions such as NaCl—this passive film can locally break down, especially at sites with defects or inclusions in the alloy. Once the passive layer is compromised, pitting corrosion begins. The process involves several stages: pit initiation, pit propagation, and autocatalytic growth. As the pit develops, the local environment becomes increasingly aggressive due to the accumulation of Cl^- and H^+ ions, which further destabilize the passive film and deepen the pit. Over time, pits may grow and merge, leading to structural damage and a significant loss of mechanical integrity, particularly in load-bearing components.

Keywords: chemical solutions, aluminum alloy.

B.18. APPLICATION OF SEPARATION PROCESSES IN WASTEWATER TREATMENT

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Abstract. The increasing demand for sustainable water management has intensified the focus on efficient wastewater treatment technologies. Among these, separation processes play a critical role in removing contaminants and improving the quality of treated effluent. Sedimentation represents one of the most fundamental and widely applied separation processes in wastewater treatment, serving as a critical step in the removal of suspended solids and the reduction of pollutant load. This study investigates the role and efficiency of sedimentation in both primary and secondary treatment stages of municipal wastewater. The analysis covers key operational parameters such as particle settling velocity, hydraulic retention time, and sludge blanket formation, which influence the performance of sedimentation tanks. Laboratory experiments and field data are used to evaluate sedimentation under different loading conditions, clarifying the impact of flow rate, temperature, and flocculant addition on the process. The findings

demonstrate that optimized sedimentation significantly improves the clarity of effluent, reduces downstream treatment demands, and enhances overall system sustainability.

Keywords: separation processes, wastewater treatment, sedimentation.

B.19. CLASSIC AND NOVEL DOMESTIC HOT WATER SYSTEMS - A COMPREHENSIVE REVIEW

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Abstract. Domestic hot water (DHW) supply systems constitute a critical element of the sanitary-technical infrastructure within residential, industrial, and institutional facilities. These installations are designed to ensure the continuous and reliable delivery of heated water for applications including personal hygiene, sanitation, and domestic utility functions, thereby supporting occupant health and comfort. DHW systems may be configured to utilize various energy sources—such as natural gas, electricity, biomass, or renewable energy technologies including solar thermal collectors and heat pump systems—depending on design requirements, energy efficiency considerations, and local resource availability.The configurations analyzed in the work vary depending on the hot water needs, building type and local climatic or economic conditions: fossil fuel-based systems (natural gas, wood, coal, pellets), electrical systems (boilers, instantaneous), renewable energy systems (solar thermal, heat pumps), respectively hybrid systems (gas + solar panels, wood + electric boiler, heat pumps + electric resistance). Hybrid systems using renewable energy sources are becoming increasingly relevant in sustainable energy architecture. These include solar-assisted heat pumps (SAHP), geothermal heat pumps (GSHP) and water source heat pumps (WSHP), each of which has its own mechanisms for converting low-quality energy into usable thermal energy. The comparative analyses conducted indicate that a properly engineered and high-efficiency domestic hot water system significantly enhances occupant comfort while simultaneously minimizing energy consumption and environmental impact. This is particularly critical in the context of the prevailing shift toward nearly Zero Energy Buildings (nZEB). Consequently, the appropriate selection, accurate sizing, and systematic maintenance of these systems are fundamental to achieving long-term sustainability goals and complying with contemporary energy performance standards.

Keywords: domestic hot water, renewable energy, heat pumps, hybrid systems.

B.20. AGRIVOLTAICS – PERFORMANCE ENHANCING CARACTERISTICS – A REVIEW WITH EMPHASIS ON INCLINATION ANGLE

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Abstract. Agrivoltaic systems (AVSs) present a promising strategy for sustainable land use by integrating agricultural production and solar energy generation on the same plot of land. This dual-use approach enhances land-use efficiency and contributes to both food security and the transition to renewable energy. A comprehensive AVS design approach is also proposed, considering agronomic factors, structural safety, and system economics to ensure practical and site-specific implementation. Notably, the inclination angle of PV modules significantly influences both energy yield and crop growth by altering shading patterns and the distribution of

solar radiation reaching the crops. Optimizing this angle requires careful consideration of seasonal sun paths, local climate conditions, and crop-specific light requirements. Design trade-offs among shading, power generation, structural load, and installation cost are assessed, with findings showing that steeper angles may enhance energy output but intensify shading, thereby reducing photosynthetically active radiation and potentially impacting crop productivity. Conversely, flatter configurations may favor plant growth but limit power generation. These insights support the development of standardised AVS models and inform policy frameworks to balance food production, energy generation, and economic feasibility, while also encouraging stakeholder adoption through evidence-based design criteria.

Keywords: agrivoltaic system, sustainability, panel array.

B.21. MAINTENANCE MANAGEMENT PRACTICES FOR A BEER BOTTLING LINE

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Abstract. Maintenance is essential to ensure continuity of productivity to produce high quality products and to maintain the of the company competitiveness. For a better understanding of the problems, in the first part of the paper, theoretical considerations on maintenance activity are presented. Also, the components of the studied bottling line and their functionality are presented. It is well known that the maintainability of a product can be determined by watching the product behavior at customer and the organization of "technical databases". The establishing of such a database was the basis for maintenance activities study for a bottling line Maintenance team created a database on maintenance which helped them to identify the causes of defects. Knowing the causes of defects, it was possible realization of a action plan with organizational measures (preventive maintenance) for involved departments, in view of performing under optimal conditions of maintenance activities. This paper presents the stages of identify the causes of defects, the measures included in maintenance plan management and the results of applying this plan.

Keywords: reliability, maintainability, defects, register of damages.

B.22. COMPUTER-AIDED TOOLS FOR COLUMN APPARATUS DESIGN

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Abstract. The design, construction, assembly, and operation of this type of equipment present significant challenges, both due to the complexity of the tasks involved and the typically large overall dimensions. Consequently, the development of columns with reduced wall thickness in their components can result in lower manufacturing costs and, implicitly, reduced capital investment, provided that operational safety requirements are strictly observed. Under these conditions, the use of specialized computational software proves to be highly beneficial, as it decreases the workload, shortens project timelines, and ultimately reduces overall production costs.

Keywords: design, specialized software, coumn apparatus

B.23. ENERGY RECUPERATION FROM WHEELED VEHICLE MOTION

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Abstract. Improving vehicle driving system efficiency is one of the more significant issues and has a substantial impact on fuel consumption. The low efficiency of drivetrains creates the need to develop hybrid systems that can deliver considerable benefits. However, these systems are complex. This paper presents various simple methods aimed at recovering energy from vehicle motion (vibrations) or their drivetrains. Methods for harvesting energy from vehicle suspension systems are proposed, along with an estimation of the amount of mechanical energy that can be converted into electrical energy and a suggested approach for its storage and utilization. Additionally, suspension deflection diagrams for vehicles will be presented, covering different categories of paved and unpaved roads. The analysis will also explore the possibility of recovering energy from waste heat generated by drivetrain components and internal combustion engines located near cooling systems. The results of simulation studies demonstrated the significant effectiveness of such solutions.

Keywords: energy recuperation, off-road, high mobility wheeled vehicle, vibrations.

B.24. DESIGN OF A PROTOTYPE SYSTEM FOR MONITORING OF LOADS ACTING ON THE FRAME OF A HIGH-MOBILITY OFF-ROAD VEHICLE

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Abstract. Off-road trucks, due to the nature of the ground, are subjected to significant loads of a highly variable nature during operation. These loads carried by the frame have a significant impact on the durability and reliability of the vehicle. It is therefore desirable to monitor these loads, especially if their values approach the yield strength of the frame material. The article describes a system developed to measure the loads acting on the stringers of a high-mobility off-road vehicle and record them. The system consists of stringer-mounted strain transducers (described in another article) and a central unit consisting of a PLC-class controller and measurement amplifiers. The transducers are connected by signal cables to the amplifiers, and the controller is powered by on-board power (24V). The system is designed to monitor signals in multiples of vehicle axles, up to a maximum of 10 (for 5 axles). The system has the ability to set tripping thresholds, above (or below) which the signal value is stored in the controller's memory and on the SD card. The article describes the hardware and software layer of the data recording system. The program was written in the CODESYSYS environment. The system was tested on a real object under laboratory conditions. The tests consisted of forcing the vehicle frame to deflect by lifting the wheels of the vehicle. Tests confirmed the achievement of the intended functionality. The article describes the test procedure and the results of preliminary tests, and presents possibilities for further expansion of the system with other sensors that monitor the condition of the vehicle.

Keywords: high mobility vehicle, off-road, monitoring, measurement

B.25. DESIGN AND LABORATORY TESTS OF A TRANSDUCER FOR CONTINUOUS MEASUREMENT OF A HIGH MOBILITY WHEELED VEHICLE FRAME DEFORMATION

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Abstract. High-mobility wheeled vehicles are designed for operation on public paved roads and off-road. Very often at the design stage of a universal chassis, the cargo is not precisely defined and only general assumptions are made about its weight and dimensions. In some specific cases, the cargo can cause loads on the vehicle of near maximum values. The risk of exceeding the maximum values and causing damage to the vehicle then arises. To avoid such load cases, it is necessary to continuously monitor the strain on key structural components of the vehicle (e.g. the load-bearing structure) and store the loading history. For such unusual applications, specially designed monitoring systems are being developed that analyze the condition of a vehicle by processing measurement signals from a network of sensors. An example of such a sensor (transducer) for continuous measurement of vehicle frame deformation is presented in the paper. By determining analytically the ranges of allowable deformation and taking into account the results from FEM analysis of the stress distribution, suitable measurement locations were selected for which a transducer for measurement of deformation was designed. The problem was how to design such transducer that could be subjected to large deformation (total elongation of more than 5000 μm, torsion angle of up to 7°), and its shape and dimensions had to be matched to the already existing vehicle structure. The transducer was subjected to laboratory tests, which confirmed the accomplishment of the expected goals. The measurement signal from the transducer was transmitted and analyzed in a PLC, as described in detail in the paper "Design of a prototype system for monitoring of loads acting on the frame of a high-mobility off-road vehicle".

Keywords: load monitoring system, off-road, high mobility wheeled vehicle, load transducer

B.26. MINIATURISATION OF ELECTRICAL SYSTEMS OF MULTIDIMENSIONAL STRAIN GAUGE TRANSDUCERS

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Abstract. Mobile machines and high mobility vehicles are often operated at the strength limit of e.g. drive system, working equipment or load-bearing structure. This creates a need to monitor permanently some of important operating parameters so that it is possible to e.g.: assess the effort of the load-bearing structure, rationalise service intervals and protect the vehicle or its parts from destruction. Multidimensional transducers are best suited for this role, which allow avoiding problems with complex cabling (power supply and signal acquisition. In addition, they require less interference in the vehicle structure. This article presents a concept for solving problems resulting from the combination of miniaturisation and the need of compensation both the influence of operating parameters (e.g. temperature) and some load components. One of the methods of compensation resistance-strain gauge systems is the use of extensive precision resistor systems (use in resistance-strain gauges circuit) what require space, which is particularly

difficult with the desired miniaturisation. This paper presents a method for scaling a multidimensional load transducer that allows obtaining a characteristic that takes into account the interactions with the least possible amount of work.

Keywords: high mobility vehicle, measurement, strain gauge transducers

B.27. GARDEN TILLERS PRESENTATION OF A TECHNICAL SOLUTION TO INCREASE THE WORKING CAPACITY OF MOTORCULTIVATORS EQUIPPED FOR MOWING OPERATIONS ON SLOPES

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Abstract. Garden tillers are designed and manufactured starting from the idea of satisfying the largest possible number of beneficiaries and ensuring the widest possible range of tasks. One of the tasks is the mowing operation. This operation is carried out both on flat and sloping lands. According to official data, the arable area of Romania is 12.714 million hectares. Of the total agricultural area of Romania, 20%, respectively 2.5 million hectares, is represented by sloping lands, of which 1.542 million hectares are in the form of fines. One of the challenges raised within the technological process of obtaining the fines necessary for livestock farming is the mowing operation on sloping lands. The accessibility of these lands by agricultural machinery is reduced primarily for tractors and for some motor cultivators due to the risk of their overturning and lateral skidding. Through this material we aimed to present a technical solution that can increase the traction force of motor cultivators equipped for mowing operations carried out on sloping surfaces (hilly and mountain areas), which involves optimizing the design and operation of the motor cultivator to cope with more difficult terrain conditions. This aims to increase the accessibility of these lands by motor cultivators equipped for mowing operations, with the final result of increasing the agricultural area of Romania that can be worked mechanized. The technological process of obtaining fodder also includes the mowing operation, an operation that is one of the largest energy and time consumers of the entire process. Currently, this operation is performed mechanized with the help of mowing equipment or manually. However, the mechanized mowing operation has certain limitations due primarily to the size of the working surface and the location of the working surface, respectively in areas where the land is on a slope with an inclination value that does not allow access to working equipment, there being a danger of overturning or skidding. For these lands, the manual mowing operation is applied, which requires a high consumption of labor and time. Considering these, we present a technical solution to improve the technical characteristics of motor-cultivators so that the mowing operation can be carried out on sloping land that has not been accessible until now, as well as to ensure the increase in the area of land that can be worked mechanically, thus ensuring increased productivity of the mowing operation, fuel savings, and reduced environmental pollution.

Keywords: garden tillers, traction, skidding, tires

B.28. PLASMA JET THERMAL DEPOSITIONS ON AGRICULTURAL EQUIPMENT

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Abstract. The present study focuses on thermal plasma jet deposition using the APS (Atmospheric plasma spray) technique on disc harrows, equipment intended for soil processing. These components are subjected to extreme working conditions during soil processing and their main required properties are wear and corrosion resistance, performances that the discs must

have in order to have the longest possible service life. Since these components are highly stressed in operation, thermal deposition is an effective method both for improving the wear and corrosion resistance properties on the manufacture of new components, and for reconditioning works on worn elements in order to be able to restore them to good functioning.The raw materials used, which are found in the form of metal and ceramic powders, are designed to create a hard surface layer, with reduced porosity and very good adhesion and stability of the deposition on the base material. During the research, thermal depositions were performed using 3 types of coatings, both metallic and ceramic with established powders (W2C/WC12Co (Metco71NS); Cr2O3 4SiO2 3TiO (Metco136F); Co25.5Cr10.5Ni7.5W0.5C (Metco45C-NS)) on the surfaces of the discs that come into direct contact with the soil. To evaluate the properties of the superficial deposits, microstructural analyzes were performed by optical microscopy, electron microscopy (SEM) and X-ray diffraction (XRD), and to evaluate the mechanical properties, tribological tests of microscratching, determination of the coefficient of friction and indentation were performed.The agricultural sector pays increased attention to the development and integration of modern technologies, so as to contribute to the improvement of the mechanical and chemical properties of the materials of the harrow discs.

Keywords: atmospheric plasma spray, agriculture, disc harrows, wear resistance, microstructural properties, corrosion

B.29. BIHARMONIC MAPS AND THEIR POTENTIAL IN ENGINEERING OPTIMIZATION PROBLEM

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Abstract. Biharmonic maps represent a natural generalization of harmonic maps, and they are defined as the critical points of the bienergy functional. This presentation first reviews recent analytical and numerical advances that of guaranteed existence, regularity and efficient discretization. Then, we prove how biharmonic regularization guides engineering optimisation, yielding lighter shell structures, reduced-drag hulls and smoother actuator trajectories, and outline avenues for integration with data-driven design.

Keywords: bihamornic maps, engineering optimisation

B.30. DATA-DRIVEN OPTIMISATION OF FFF PROCESS PARAMETERS FOR ENHANCED MECHANICAL PERFORMANCE

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Abstract. This interdisciplinary study combines additive manufacturing, materials science, and engineering to optimise mechanical strength in the fused filament fabrication (FFF) process. Despite FFF's popularity for prototyping and production, achieving high mechanical performance remains challenging. The research analyses the impact of six key processing parameters on part strength, using neural network models to capture complex, non-linear relationships. These models enable precise predictions and guide process adjustments to improve output quality. The findings demonstrate the effectiveness of machine learning in enhancing FFF component performance and present a practical framework for integrating data-driven optimisation into additive manufacturing workflows.

Keywords: fused filament fabrication, tensile strength, optimisation, neural networks

B.31. THE STUDY OF SHOES SOLES BEHAVIOR UNDER STRESS CONDITIONS

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Abstract. The paper presents the results of physical-mechanical tests performed on shoe soles made of polymeric composite materials, before and after they were subjected to stress factors, like artificial ageing, high number of flexions and immersion in organic solvents. All the experiments were made according to actual standards. Under certain conditions, the materials from which these soles are made can suffer damages that could endanger the shoe wearer. For this reason, the purpose of this article is to highlight the differences between certain types of shoe soles, depending on the materials they are made of.

Keywords: physical-mechanical tests, polymeric composite materials, stress conditions

B.32. SOME ASPECTS REGARDING THE PERFORMANCE OF PNEUMATIC PRESSURE TESTS OF PRESSURE EQUIPMENT

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Abstract. The conformity of pressure equipment with the essential safety requirements imposed by the applicable European Directives must be assessed according to the prescriptions of the competent authorities. Pressure equipment must be tested and inspected during manufacture and after manufacture in accordance with applicable design standards. Checks on the mechanical characteristics of the construction material, the thickness and homogeneity of the material, the inspection of surfaces, and the verification of compliance with design standards are completed with a pressure test. The paper outlines the minimum requirements for the quality management procedure and system that must be followed by organizations responsible for manufacturing, modification, manufacturing supervision, use, conformity assessment/reassessment, periodic inspections, intermediate inspections and exceptional checks.

Keywords: pressure equipment, assessment, quality management system

B.33. OBTAINING COMPOSITE MATERIALS REINFORCED WITH CARBON FIBERS WITH ENHANCED PHYSICAL-MECHANICAL AND TRIBOLOGICAL PROPERTIES

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Abstract. Metal matrix composites belong to the category of "new materials"; they form a specific field of research and industrial applications. Acquired because of use in unconventional technologies, applied especially in aeronautics. It is generally accepted that a composite material consists of a matrix and reinforcing material. The role of the matrix is to take over and transmit stresses and to create a new strength structure together with the reinforcing materials. The matrices that offer spectacular development prospects are the metallic ones. According to current technologies, a composite is a combination of characteristics different from those of each component. Therefore, a strict and precise definition of composite materials is needed to

determine the difference between current composites and other heterogeneous mixtures of materials. Thus, in this paper, I set out to highlight the peculiarities of the technology of obtaining by sintering a type of composite materials with the metal matrix. From this category, I decided to refer to those with the copper matrix (Cu 88.5 %) and additions of Sn (8.4%) and graphite (2%), armed with chopped carbon fibers. For this newly obtained product, we used the symbolization of CuFC. I will also refer to the characterization of these products in terms of mechanical and physical properties obtained after sintering. With the objective of obtaining finished products with high compactness, we chose the process that consists of both a double pressing and a double sintering. As for the first stage (pressing), it is carried out with average values (300 MPa) and sintering at a temperature of 8200C (30 minutes handle), while the second pressing is carried out at high pressures (400÷450 MPa), it is subsequently accompanied, in normal regime, by the final sintering. Hardness is the most important mechanical property of metal composite materials made by sintering. This is determined by the Brinell method and is nothing more than a measure (function) of the bonding forces between particles, density and the strength of the material in the test area.

Keywords: composite materials, carbon fiber, matrix, friction

B.34. STUDY ON THE USE OF THERMAL TUBES TO IMPROVE THE THERMAL EFFICIENCY OF BUILDINGS

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Abstract. Currently, the functioning of the world economy relies mostly on energy from non-renewable resources (coal, oil, natural gas). Renewable energy comes from natural resources that are constantly replenished in relatively short time frames. Renewable sources are used to generate electricity and heat, but also for the production of transport fuels. Solar radiation can be used to directly produce electricity using photovoltaic panels or indirectly using generated heat (heat → water vapor → turbine→ generator; Stirling engines, etc.). Solar radiation is also used on a relatively large scale to produce domestic or even industrial hot water. The paper presents a global system based on solar energy recovery consisting of an environmentally friendly concrete wall equipped with thermal tubes and proposed to improve the energy performance of buildings.

Keywords: renewable energy, heat and mass transfer, thermal tubes

B.35. STUDY OF HOT AIR HEATING INSTALLATIONS

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Abstract. The technique of warming developed gradually over time, parallel to the other branches of technology, as civilization progressed and production developed continuously. Heating systems have evolved over time from free fire to modern district heating systems. Hot air heating systems use air as a heat carrier. Unlike hot and hot water or steam heating systems, in which thermal energy is transmitted to consumers by means of heat exchangers (heating bodies, equipment, thermic appliances, etc.), in hot air systems the heat agent is used directly by the consumer without an intermediate heat exchanger. The paper presents the main criteria regarding the use of hot air heating, the energy sources necessary for air heating (own-fire aggregates, aerotherms, multifunctional devices), the methods and solutions of destratification that lead to worsening of indoor microclimate conditions, as well as the design stages of a hot air plant.

Keywords: heat and mass transfer, hot air, heating systems

C. OPTIMIZATION IN ENVIRONMENTAL ENGINEERING AND ENVIRONMENTAL PROTECTION

C.1. MONITORING THE PHYSICAL-CHEMICAL CHARACTERISTICS OF SOILS AROUND AN OIL REFINERY

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Abstract. Soil is an open and dynamic system that constantly exchanges matter and energy with the environment. Under these conditions, soil, as an essential component of the environment, is characterized by a high degree of exposure to aggression factors resulting from human and anthropogenic activities [1]. Oil contamination causes serious geoenvironmental concerns and negatively affects the soil environment, such as the destruction of soil structure and biodegradability, due to the release of toxic by-products. Therefore, the aim of this study was to investigate how refinery location influences the physical and chemical properties of the soil [2,3], comparing and analyzing samples taken in the autumn and winter seasons. In our concrete research, soil samples were taken from 5 locations, approximately 50 meters apart, all close to the Oil Terminal Sud oil refinery. The selected soil quality indicators were evaluated on samples collected at a depth of 0.15–0.20 m, and the sampling date was, corresponding to the autumn of 2024, and the winter of 2024/2025 [1]. The physicochemical parameters evaluated were: pH, conductivity and cationic composition of the soil solution (Mg^{2+}, Ca^{2+}), the presence of nitrogen in the form of nitrites, determination of extractable iron and humus content.The results obtained show that the physicochemical properties of the soil were affected due to oil contamination.Therefore, the soils in the area of the oil refinery were characterized as alkaline, slightly salinized and with a low, relatively medium content of exchangeable cations (Ca^{2+} and Mg^{2+}). Nitrites, which can have as sources besides oil pollution and chemical fertilization or atmospheric pollution, presented values ranging between 1.4945 and 5.9092 mg nitrite/kg soil, for the 5 soil types, the values corresponding to the autumn season. Regarding the winter season, nitrite values ranged between 7.0356 and 9.1557 mg nitrite/kg soil. The humus content showed a very low supply state of the polluted soils around the refinery, with values for the autumn season ranging between 2.7140 and 5.6545 %. In the case of the winter season, the values ranged between 0.8017 and 4.4569 %.In the analyzed soils, nitrites are present in both autumn and winter soils, with higher values in winter, while humus content was significantly higher in autumn., Due to the variability that may occur between different sampling dates within a year, it is recommended to sample during the same period each year, for a coherent interpretation of changes in soil quality indicators [1].

Keywords: soil quality, soil properties, oil refining, soil monitoring

C.2 THE USE OF BIODEGRADABLE MATERIALS FOR MITIGATING ACOUSTIC POLLUTION

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Abstract: Noise pollution is a growing problem in the modern world, affecting health, productivity and quality of life. A sustainable and innovative solution for noise reduction is the use of biodegradable materials for sound insulation. Recent research shows that three types of environmentally friendly materials have a high performance in this respect: densified coconut wood, aerogels and composites from agricultural waste. Densified coconut wood, obtained through chemical and thermal treatments, has excellent sound insulation properties, reducing noise by up to 57.6 dB. In addition to its acoustic efficiency, it is a durable and hard-wearing material and an environmentally friendly alternative to traditional building materials. Aerogels, thanks to their porous structure and very low density, are among the best materials for sound absorption and sound insulation. They are used in both architecture and industry and have the advantage of low thermal conductivity, making them ideal for multi-functional and energy-efficient insulation. Another promising solution is composites made from agricultural waste, such as orange peels, combined with biodegradable resins. These materials offer similar acoustic performance to commercial solutions but are more affordable, easier to produce, and help reduce organic waste. The use of these biodegradable materials in construction and interior design can significantly reduce noise pollution while providing environmentally sustainable solutions. Their widespread development and adoption can bring us closer to a greener future, where acoustic comfort is ensured without affecting the natural balance of ecosystems.

Keywords: sound insulation, biodegradable materials, noise pollution, densified wood, aerogels, eco-friendly composites, sound absorption.

C.3. TOWARDS INDUSTRIAL APPLICATION: SELECTIVE RECOVERY OF ZN(II), CD(II), AND NI(II) BY D2EHPA IN A SEMI-PILOT LIQUID-LIQUID EXTRACTION SYSTEM

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Abstract. Heavy metal pollution from industrial effluents requires scalable and efficient remediation technologies. This study demonstrates the selective recovery of Zn(II), Cd(II), and Ni(II) using D2EHPA (di-(2-ethylhexyl) phosphoric acid) in diesel within a semi-pilot-scale liquid-liquid extraction system, bridging the gap between laboratory research and industrial implementation. Key operational parameters - extraction time, pH, metal concentration, phase ratio (VA/VO), and stirring speed - were optimized to enhance separation efficiency.Results revealed distinct extraction kinetics: Zn(II) was rapidly extracted (62.94% yield in 5 minutes), Cd(II) and Ni(II) required extended contact times, reaching yields of 36.9% (15 minutes) and 21.36% (30 minutes), respectively.The study further evaluated re-extraction conditions to regenerate the organic phase and recover metals, highlighting the process's technical feasibility for industrial wastewater treatment (e.g., mining effluents, battery recycling). By combining high Zn(II) selectivity with scalable semi-pilot operation, this work provides a critical step toward sustainable metal recovery and circular economy strategies.

Keywords: liquid-liquid extraction, D2EHPA, semi-pilot scale, selective metal recovery.

C.4 INNOVATIVE WATER PURIFICATION: REMOVING MALACHITE GREEN WITH DENDRIMER CLAY

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Abstract. The widespread use of toxic synthetic dyes like malachite green (MG) in industrial processes poses significant environmental and health risks, necessitating efficient removal methods. This study investigates the adsorption performance of montmorillonite K10 (Mt-K10) intercalated with hyperbranched polyester dendrimers (Boltorn™ H20, H30, H40) for MG decolorization from aqueous solutions. The effects of key parameters: pH, contact time, initial dye concentration, and adsorbent mass, were systematically evaluated. Results revealed that Mt-K10 modified with Boltorn™ H20 exhibited the highest adsorption capacity, achieving 95.36% removal efficiency under optimal conditions (pH 10.89, 15 mg adsorbent mass, and low MG concentration). Kinetic studies fitted the pseudo-second-order model, indicating chemisorption as the dominant mechanism, while equilibrium data aligned best with the Langmuir isotherm, suggesting monolayer adsorption. The modified clay's enhanced performance was attributed to increased hydrophobicity, interlayer spacing, and active sites from dendrimer functionalization. This work demonstrates the potential of dendrimer-clay hybrids as cost-effective, high-efficiency adsorbents for treating dye-contaminated wastewater, offering insights into scalable environmental remediation strategies.

Keywords: water, trace elements, PCA, geostatistics, contamination, Lake Togo, Aného.

C.5. MULTI-OBJECTIVE OPTIMIZATION OF A TEXTILE WASTEWATER TREATMENT IN A SPINNING DISC SYSTEM

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Abstract. This study explores a multi-objective optimization approach to improve the performance of a spinning disc system used for removing suspended solids and color from textile wastewater. The analysis builds on empirical regression models that describe removal efficiencies based on key operational parameters: liquid flowrate (14–26 L/h), disc rotational speed (150–450 rpm), and operation time (10–20 min). These models, proposed in a previous study, were expanded with a newly introduced equation to estimate power consumption, assuming a direct relationship between rotational speed, liquid flowrate, and energy usage. To optimize the system, a Pareto-based strategy was applied using the Non-dominated Sorting Genetic Algorithm II (NSGA-II) in MATLAB software. The goal was to maximize suspended solids and color removal efficiencies while minimizing energy consumption. NSGA-II is particularly effective for handling multiple conflicting objectives, allowing for an unbiased optimization process without the need for predefined weight assignments. Given the system's nonlinear interactions, conventional optimization techniques often struggle to find optimal solutions, whereas NSGA-II efficiently resolves these complexities. The resulting Pareto front clearly illustrates the tradeoff between treatment efficiency and energy demand. The optimization results were visualized using a 3D surface plot, highlighting Pareto-optimal points. The plot demonstrates how increasing operational parameters enhances removal efficiency but also leads to higher energy consumption. The Pareto front provides a range of optimal operating conditions, enabling system operators make decisions based on their specific priorities—whether prioritizing maximum treatment performance or energy conservation. This approach serves as a practical decision-making tool for designing and operating efficient, energy-conscious spinning disc systems in wastewater treatment applications.

Keywords: multi-objective optimization, wastewater, spinning disc technology, power consumption.

C.6. COVER CROPS A SUSTAINABLE STRATEGY IN VITICULTURE

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Abstract. This study investigates and evaluates the benefits of cover crops use in grapevine plantations and their impact on vegetative development. The use of cover crops can become a viable choice for conserving water resources, augment soil organic carbon ratios and regenerate soil microbiota, ensuring agricultural sustainability. 2024 climate data revealed non-specific values for general and vine-specific climatic parameters. Due to the extreme drought, the experimental variants of cover crops recorded limited vegetative growth and, consequently, had minimal effects on soil parameters and vine plantation development. The objective of 2025 is re-establish of experimental variants in the context of new climate conditions.

Keywords: sustainable viticulture, climate change, cover crops.

C.7. CIRCULAR STRATEGIES AND INNOVATIVE TECHNOLOGIES FOR FOOD WASTE MANAGEMENT: A REVIEW OF SUSTAINABLE SOLUTIONS FOR NUTRIENT RECOVERY

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Abstract. The aim of this paper is to explore and analyze recent circular strategies and innovative technologies for food waste management, with a focus on nutrient recovery and reducing environmental impacts. In a global context with significant food waste, the paper identifies sustainable solutions that can transform waste into valuable resources, promoting a more efficient and resilient food system. Key circular strategies that are discussed include chemical nutrient recycling, upcycling, biotechnology and fermentation recycling. These processes will help to recover essential nutrients such as phosphorus, nitrogen and potassium from food waste. The paper highlights how these strategies are contributing to waste and pollution reduction as well as providing economic and environmental benefits. The paper also examines recent innovative technologies that support these strategies, such as advanced phosphorus extraction techniques, genetically modified micro-organisms for accelerated decomposition of food waste, bio-engineered plants for nutrient recycling and the use of digital technologies to optimize recycling processes. These technologies are assessed in terms of their efficiency, long-term sustainability and their potential to improve circular food systems. In conclusion, the paper analyzes the challenges related to the implementation of these solutions, such as economic barriers, regulations and the necessary infrastructure. The contents of this paper underline the significant

potential of circular strategies and innovative technologies to transform food waste into a valuable resource, contributing to a more sustainable and environmentally balanced food system. Moreover, the paper makes an important contribution to scientific progress by improving the understanding of the implementation of circular solutions, providing a theoretical and practical basis for future research and policies aimed at reducing food waste and optimizing resource use.

Keywords: circular strategies, food waste management, innovative technologies, nutrient recovery.

C.8. THE ECONOMIC IMPACT OF ARTIFICIAL INTELLIGENCE IN ENVIRONMENTAL ENGINEERING AND PROTECTION

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Abstract. The Economic Impact of Artificial Intelligence used in Environmental Engineering and Protection. This paper explores the economic impact of AI-driven technologies in the fields of environmental engineering and protection, highlighting their potential to optimize resourcemanagement, reduce operational costs, and create innovative solutions to pressing environmental challenges. AI applications, such as predictive analytics, machine learning, and automated systems, facilitate efficient waste management, and pollution control, reducing both environmental and financial costs. Furthermore, AI-driven climate modeling and biodiversity monitoring enhance decision-making, enabling proactive and cost-effective environmental strategies. However, the adoption of AI technologies involves substantial initial investments and raises ethical concerns regarding data privacy and workforce displacement. Balancing these factors is critical to maximizing AI's economic benefits while ensuring sustainable development. This study underscores the need for collaborative efforts among governments, industries, and academia to harness AI's potential for environmental protection while addressing economic and societal challenges.

Keywords: environmental, AI, waste-management.

C.9. BIODIVERSITY CONSERVATION IN PROTECTED AREAS IN THE CONTEXT OF ECOTOURISM: A REVIEW OF POLICY STRATEGIES AND MANAGEMENT APPROACHES

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Abstract. Protected areas are essential for conserving the Earth's biological diversity, providing a home for plant and animal species, maintaining ecological balance, and offering protection for endangered species. They also benefit humanity, such as clean air, water, climate regulation, sustainable livelihoods, recreation, and education, promoting a greater appreciation for nature. Among all forms of tourism, ecotourism supports the conservation of protected areas by attracting visitors interested in nature and outdoor activities. This article aims to review the

literature on the connection between ecotourism and biodiversity conservation, focusing on policies and management approaches implemented in protected areas around the world. Assessing a series of case studies, the paper examines the effectiveness of ecotourism as a tool for sustainable development, evaluating both its potential benefits and challenges. The income generated by this form of tourism in a destination is reinvested in park management, habitat restoration projects, education and information for communities and visitors; however, it can lead to unnecessary resource use and habitat degradation. Ecotourism encourages sustainable tourism practices, promoting sustainable resource management while stimulating the local economy. This review highlights the main policies and management practices that have successfully integrated ecotourism with biodiversity conservation objectives. It emphasizes the importance of adaptive management strategies, meaningful stakeholder involvement, and supportive policy frameworks to ensure the sustainability of ecotourism in protected areas. By providing in-depth insights and related overviews of sources and related content, this review article has various implications for stakeholders, local communities, and visitors. Ecotourism offers tremendous potential for biodiversity conservation, but its future success depends on careful planning, sustainable practices, and long-term monitoring.

Keywords: adaptive management, biodiversity conservation, community involvement, ecosystem preservation, sustainable tourism.

C.10. SPECIATION, MOBILITY, BIOAVAILABILITY AND ECOLOGICAL RISK OF TRACE ELEMENTS IN THE AGRICULTURAL SOILS AROUND THE PHOSPHORITE PLANT IN KPÉMÉ (SOUTH TOGO)

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Abstract. The pH of the soils is slightly acidic for agricultural. The average conductivity and salinity values are respectively 125.24±49.01 µS/cm and 0 g/l. The organic matter contents are relatively low (3.19±1.75%). The studied agricultural soils are mainly composed of fine to coarse sand (83.83±5.98%) and have an average cation exchange capacity (CEC) of 16.32±7.39 meq/100g. The majority of trace elements are widely represented in the 5 different geochemical fractions. However, the showed affinities for one or the other of the different geochemical fractions. The highest value of the exchangeable fraction is 92.71% for Li obtained at site S4. That of the acid-soluble fraction is 95.98% for Rb at site S4. The highest proportion of the reducible fraction is 69.18% observed at site S7 for Se. The oxidizable fraction records the highest proportion (78.21%) at site S1 for Sr and the residual fraction shows the highest proportion (99.37%) at site S1 for Pb. The non-residual fractions were found to be significant (50.89-99.80%) for the majority of trace elements revealing a fairly significant mobility and bioavailability for these trace elements. These are Ti, Cu, Ag, Cd for site S1, Cs, As, V for site S4, Ga, Hg, Li, Rb, Co, Sr, Cr, U, Pb for site S7 and Se, Zn, Ni, Ba for site S11. Low to catastrophic levels of ecological or environmental risks were recorded for 85% of the trace elements with average RACs ranging from 2.19% for Zn to 93.42% for Ga. Therefore, special attention must be paid to this ecosystem for its sustainable management.

Keywords: Soils, Trace elements, Speciation, Risk, Phosphorite, Kpémé, Togo.

C.11. THE ISO 59000 FAMILY OF STANDARDS - A GLOBAL FRAMEWORK FOR THE TRANSITION TO A CIRCULAR ECONOMY

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Abstract. Circular economy is of vital importance for the present and for the future of humanity and our existence on Earth. The limit of natural resources has provoked scientists to look for ways to use renewable resources and to reuse, recycle, repair and reduce the use of existing raw materials. Circular economy is not only a buzzword, but also the focal point of the efforts of many international organisations such as the United Nations and ISO. The UN Sustainable Development Goals serve as the basis of global actions that align various initiatives for the benefit of all. Since 2024, ISO has published the first of a series of international standards related to circular economy. The purpose of this paper is to present an overview of the ISO 59000 series of standards. In addition, several case studies demonstrate how the principles and guidance of these standards can be adopted for implementation in various organizations.

Keywords: ISO Standards, ISO 59000 series, Circular economy, Sustainable Development Goals (SDGs), Analysis of cases studies.

C.12. APPLICATION OF MICROBIOLOGICAL PREPARATIONS TO REDUCE ENVIRONMENTAL IMPACTS

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Abstract. Product of microbial origin can be the basis for organic farming and plant resistance to unfavorable environmental factors inducing, as well as for the crop yield increasing. The results of the present study revealed the entomopathogenic isolates found in the larvae Cydia pomonella, local production of biopesticides, which will reduce the final cost of the product and will more accessible to farmer. The insect entomopathogenic pesticide is only one method to construct and restore the stable ecosystem, other methods can also be applied as the effective methods as long as they are useful to the control of target pest insects and do not cause destruction of the environment. Surveys conducted after treatment with Bacillus thuringiensis var. kurstaki against (Cydia pomonella L) revealed a rather high biological efficiency. Damage to fruit in the crown of a tree ranged from 21.3% in the control to 4.3% in the variant with a dose of 10.0 l/ha, and in the variant with entomopathogenic suspensions at a dose of 10.0 l/ha, it had a decrease in damage 79.8%. The success of entomopathogenic-based control programs depends upon collaborative efforts among government and research institutions, growers' associations, and private companies, which realize the importance of using strategies that protect human health and the environment at large. Initiatives to develop new regulations that promote the use of this type of ecological alternatives tailored to different local conditions and farming systems are underway.

Keywords: bacillus thuringiensis subsp, kurstaki, biological products, microbiological preparations.

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harnessing methodologies and technologies" funded by the National Agency for Research and Development and by the Ministry of Education and Research.

C.13. INFLUENCE OF CROP ROTATION AND SOIL FERTILIZATION SYSTEMS ON PRIMARY MACRONUTRIENTS IN AN EXPERIMENTAL FIELD

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Abstract. The objective of this study was to observe the influence of crop rotation and soil fertilization systems on primary macronutrients (nitrogen, phosphorus and potassium) in an experimental field. The experimental variants chosen from the experimental field for crop rotation were as follows: wheat monoculture, 2-year rotation - wheat-corn, 3-year rotation - wheat-wheat-corn-pea-corn, 4-year rotation - wheat-sunflower-corn-corn-pea. The fertilization applied was nitrogen fertilization -90kg N/ha, phosphorus-75 kg P/ha, nitrogen and phosphorus-N90P75 kg/ha, manure, unfertilized. High values of potassium concentration (values recorded were above the values determined in the soil control samples) were recorded for fertigated with manure. The increased potassium content indicates a high accumulation of the primary macronutrient. Soil phosphorus/nitrogen supply was very good for the experimental variants fertilized with the macronutrient phosphorus/nitrogen, which is beneficial for plant health, as phosphorus/nitrogen plays a role in plant metabolism.

Keywords: crop rotation, fertilization systems, primary macronutrients.

C.14. AIR POLLUTION IN 2 CITIES ALONG THE DANUBE: COMPARATIVE STUDY

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Abstract. This research examines air pollution in two neighboring Romanian port cities, Galati and Braila, focusing on their atmospheric quality monitoring between summer 2023 and spring 2024. The study analyzes major atmospheric pollutants including particulate matter (PM2.5 and PM10) and several oxides using both satellite data and local monitoring stations. Despite their geographical proximity and shared characteristics as Danube ports, these cities show distinct pollution patterns. Galati generally exhibited higher pollution levels, particularly in particulate matter, likely due to extensive road rehabilitation works and industrial activities from its steel plant and shipyard. The research methodology involved collecting data three times daily for one week during each season (July 2023, October 2023, January 2024, and April 2024). Satellite measurements often showed lower concentrations than local monitoring stations, especially for PM2.5 in Galati, while Braila's local monitoring was limited by non-functional sensors. The study reveals that urban ecosystems significantly alter air quality compared to surrounding rural areas, with building density, street layout, and industrial activities playing crucial roles in pollutant dispersion.

Keywords: atmospheric monitoring, urban pollution, satellite vs. ground monitoring, physical-geographical conditions.

C.15. SOME ENVIRONMENTAL STRESS ON PLANTS

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Abstract. This research examines some environmental stress on the growth and development of plants. For this purpose, plant material was taken from various tree species in several areas of the city of Galati. The plant samples were collected starting in the spring phenophase, when they are fully developed and healthy, and in autumn. At the time of sampling, the following indicators were measured: soil moisture, soil pH and soil temperature. At the same time, measurements of PM 2.5 and PM 10, CO2, volatile organic compounds (TVOC), air temperature and humidity - were carried out three times a day: morning, noon and evening. The influence of environmental factors on the water content of the plant and the amount of chlorophylls was studied. The content of some metals was determined using the XRF technique and malondialdehyde (MDA) was measured as an indicator for estimating the effects of oxidative stress on lipids in leaf tissues analyzed. The study found that the sources of oxidative stress in plants were water deficit, extreme temperatures and exposure to various urban anthropogenic pollutants. Higher concentrations of air quality indicators caused a decrease in the water index and relative water content, a decrease in chlorophyll concentrations and at the same time an increase in the concentration of malondialdehyde.

Keywords: environmental stress, plant, malondialdehyde, pigment content| water content.

C.16. ADAPTIVE FILTER OPTIMIZATION FOR GROUND OZONE CONCENTRATION FOR DIURNAL VARIATION' INVESTIGATION IN THE SOUTH EASTERN PART OF ROMANIA

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Abstract. Building adaptive filters to study the dynamics of processes that include the presence of disturbances is not new. In the case of pollutant gas concentrations, this process of implementing methods from automation and studying systems is currently a necessity.In the present work, using data taken from the national air-monitoring network, we addressed the problem of building such adaptive filters of the low-pass filter and recursive filters (RLS) type.The method studied by our team is based on a proprietary algorithm, using the MAPLE programming environment. The RLS and low-pass filter model is considered into account. In this way, using Fourier analysis, the dynamic equations that describe the diurnal variation of ozone at the Earth's surface can be quantitatively determined. The validation was made on the Southeastern part of Romania data streams.

Keywords: adaptive filter, MAPLE programming, ozone concentration.

C.17. INVESTIGATION ON THE INFLUENCE OF ENVIRONMENTAL FACTORS ON CATALASE ACTIVITY IN VARIOUS SOILS

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Abstract. Considering that it is very important to understand the roles of soil enzymes, and especially catalase (CAT), to maintain soil quality in optimal conditions and in the management of an ecosystem, catalase activity determination in soil can be an important clue to the pollutant impact on soil ecosystems. Catalase (EC 1.11.1.6) is an enzyme that belongs to the class of oxidoreductases and is found in the soil, being able to play the role of biochemical indicator. It biocatalyzes the decomposition of hydrogen peroxide, thus resulting in water and oxygen. Various environmental factors can influenced catalase activity. In general, physicochemical factors greatly influence the way in which the enzyme acts on the substrate. Based on this aspect, it can be easily shown if major disturbances occur at the soil level through the response of this enzyme to the action of environmental factors. In this context, in the present work, soil catalase was used as a biochemical indicator of its quality by correlating enzymatic activity with soil biology. However, as shown in this study, catalase activity can be influenced by several environmental factors, both physical and biochemical. Moreover, their impact on enzymatic activity is different. In addition to important factors, such as pH, soil organic matter has been shown to be one of the factors that can greatly influence catalase activity. Our results indicate that this enzyme is a good biochemical indicator of soil quality. The different quality of the soils affected the activity patterns of the enzymes studied. In addition, according to the results obtained, all the analyzed soil samples show catalase activity that depends on the depth from which the samples were collected.

Keywords: soil, bioindicator, CAT, enzymatic activity, pollutant.

C.18. METHODS FOR OPTIMIZING HOUSEHOLD WASTE COLLECTION FROM ECOLOGICAL ISLANDS WITHIN THE MUNICIPALITY OF GALATI

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Abstract. Currently, the problems related to waste collection are extremely complex and topical. Romania must solve the requirements imposed by the EU.Waste Management activity (WM) is an urban action becoming more and more important in the municipal economy. In many cities, this activity is linked to significant revenues from selective waste collection services. The current economic situation requires increasing efficiency and profitability in order to succeed in cutting operational costs, and an important part of revenue comes from this selective waste collection activity.In these conditions, a number of 275 ecological collection islands have been built in the municipality of Galati. In these conditions, a problem is related to the possibility of dynamically optimizing the daily visit maps of these islands. In this regard, our team has generalized a proprietary software application for the dynamic generation of maps that includes the collection points to be visited. The application is based on the use of Dijkstra-type algorithms and, considering the street map and traffic restrictions of the municipality of Galati, an optimization of the operating costs of the network of ecological collection islands can be achieved.

Keywords: waste management activity, dynamic maps, Dijkstra-type algorithms.

C.19. ENVIRONMENTAL STUDY ON TUNNEL EXCAVATION USING A ROADHEADER MACHINE – CASE STUDY: RASS EL MA – AZZABA RAILWAY TUNNEL, ALGERIA

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Abstract. Tunnel excavation using a roadheader machine offers advantages in urban or geologically complex environments due to its flexibility and precision. However, this method involves significant environmental impacts such as the generation of vibrations, dust production, noise, as well as the disruption of groundwater and the stability of surrounding ground. To better understand these effects, a study was conducted using the Phase2 software, a finite element numerical modeling tool dedicated to the analysis of underground excavation stability. The modeling made it possible to simulate excavation conditions under various geotechnical scenarios: soil type (clay, shale, limestone), depth, machine advance rate, and support system configuration. The results show that rock mass deformations are strongly influenced by the mechanical properties of the terrain and by the support method used. Furthermore, the modeling helped identify stress concentration zones, thereby reducing the risks of collapse and impacts on surface structures. Regarding environmental aspects, the study assessed vibration transmission and pressure wave propagation in the soil. The results were used to recommend optimal advance rates and mitigation measures such as dust suppression by watering, acoustic barriers, and reinforcement of the tunnel face through bolting or shotcrete. The use of Phase2 thus enabled an integrated approach, combining the technical performance of excavation with the minimization of environmental impacts. This approach contributes to a more sustainable and safer development of underground projects.

Keywords: roadheader, Phase2, underground structures excavation, environmental.

C.20. PRELIMINARY MODELING AND OPTIMIZATION STUDY OF A TEXTILE DYE CONTAINING EFFLUENT ADSORPTION STEP ONTO AN ALGAL BIOCHAR-BASED ADSORBENT

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Abstract. This research work presents the preliminary adsorption results in a modeling and optimization study for removal of residual reactive Remazol Rosso RB dye from textile effluents, or simulated dye-containing effluents (around 50 mg/L of residual dye, pH 3-4) onto 'non-conventional' and 'low cost' adsorptive material, i.e. processed dried freshwater algal (Spirogyra) biomass (by pyrolysis at 300 C degrees). There were considered as principal influencing variables the algal biochar-based adsorbent concentration (1.70-18.30 g/L), the operating temperature (6.50-33.50 C degrees) and biosorption contact time (1.50-14.50 h). The modeling study is based on an empirical model of three independent variables (i.e. a central active compositional rotatable experimental 2^3 design) in which the dye removal efficiency (%) related to Remazol Rosso RB dye was considered as optimization criterion, or dependent function, followed by a classic/conventional mathematical optimization study for the finding of optimum values. The optimum reactive dye removal was of 88.78 %, good enough for the specific optimum operating conditions of 18.85 g/L of algal biochar-based adsorbent, around 20 C degrees and 8 h of adsorption contact period. The proposed mathematical model is

corresponding for static working regime having an average deviation of -3.065% (in the agreed deviation limit of ±10%) and can be applied for the tested reactive dye removal from textile effluents/residual solutions, especially for recycling and/or other reuse facilities. The use of algal biochar-based adsorbent was found beneficial as an alternative adsorbent for textile dye removal from aqueous systems.

Keywords: adsorption, operating independent variables, optimization criterion| Remazol Rosso RB dye removal, residual Spirogyra green algae.

C.21. IDENTIFICATION OF THE RESIDUAL WASTE COMPOSITION IN BACĂU COUNTY FOR THE YEAR 2023

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Abstract. This study presents an analysis of the composition of municipal residual waste generated by the population of Bacău County, with particular emphasis on identifying the proportion of recyclable and non-recyclable waste, together with detailed categories of recyclable materials. Determining the composition of residual municipal waste is essential for optimizing waste management processes and developing efficient recycling and disposal strategies. This work helps to identify the types of materials predominantly generated by the population, contributing to the reduction of non-recyclable waste and increasing the reuse of resources. It also helps local authorities to improve selective collection infrastructure and promote sustainable practices to protect the environment and reduce the impact on urban ecosystems. The compositional determinations, carried out in two stages of the year 2023, revealed that of the total amount of municipal waste analyzed, non-recyclable waste accounts for 77.93%, while recyclable waste accounts for 22.07%, highlighting a significant need to optimize sorting and recycling processes. Within recyclable waste, the plastics category had the highest share (56.33%), followed by glass (14.56%), cardboard (12.63%), paper (9.59%) and metals (6.83%). These data suggest that materials with high recycling potential are often under-utilized. Additional analyses, such as the quantity variation charts for biodegradable materials, textiles, wood and other household waste, highlight significant differences in waste composition between different urban areas. The study provides a solid basis for the development of waste management strategies, emphasizing the importance of community awareness and the implementation of efficient technological solutions. The resulting conclusions highlight the need for a more sustainable approach to reduce the amount of non-recyclable waste and improve recycling rates in the analyzed area.

Keywords: residual waste composition, recyclabe and non-recyclable waste, waste management.

C.22. PRELIMINARY MODELING AND OPTIMIZATION STUDY OF THE COAGULATION-FLOCCULATION TREATMENT STEP APPLIED FOR TEXTILE EFFLUENTS USING COMMERCIAL HYBRID COMPOSITE MATERIALS

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Abstract. This research work presents the preliminary coagulation-flocculation treatment results performed according to an experimental planning design used for modeling and after optimization of turbidity and color removal efficiencies referring to textile effluents containing the residual reactive Remazol Rosso RB dye (around 50 mg/L of residual dye, pH 8.78) working with two commercial materials, VTA BIOSOLIT 6124 and CETTA CLEAR, as hybrid composite eco-coagulants/flocculants. There were considered as principal independent influencing variables of the coagulation-flocculation process in all performed laboratory scale setup experiments (Jar tests, stirring at 100 rpm and min 30 min of sedimentation) the VTA BIOSOLIT 6124 hybrid coagulant concentration (20-60 mg/L), the CETTA CLEAR eco-flocculant concentration (2-20 mg/L) and stirring time (5-30 min). Modeling was based on the central active compositional rotatable 2^3 design in which the turbidity and color removal efficiencies (%) were considered as optimization criteria, or dependent functions. The optimum values of independent and dependent process variables were found by application of the classical/conventional mathematical optimization methodology. The optimum removals were of 92.78 % for turbidity and 52.83% for color, good enough for the specific operating conditions of 39.80 mg/L of VTA BIOSOLIT 6124 hybrid coagulant, 5 mg/L of CETTA CLEAR eco-flocculant and at least 22 min of stirring time period. The proposed mathematical model was found corresponding due to its average deviation of -4.233% (in the agreed deviation limit of ±10%), possible to be applied for the tested textile effluents, especially for recycling and/or other reuse facilities. These research findings permit to continue our works concerning the application of hybrid materials as coagulation-flocculation agents in different wastewater treatments.

Keywords: coagulation-flocculation treatment step, hybrid composite materials, reactive Remazol Rosso RB dye, textile effluent.

C.23. THE INFLUENCE OF THE PARENTAL FACTOR ON THE VALUABLE TRANSGRESSIONS MANIFESTATION IN SEGREGATING TOMATO POPULATIONS

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Abstract. As a result of the evaluation of productivity indices (number of fruits per plant, mass of one fruit and mass of fruits per plant) in the reciprocal combination F2 Desteptarea x Flacara/Flacara x Desteptarea, a fairly high variability of the evaluated characters was found. The analysis of the transgressive potential of the productivity indices demonstrated that in the direct crossing of the parents Desteptarea x Flacara, the degree of transgressions constituted 23.4%, 139.6%, 155.0%, respectively, for the number of fruits per plant, fruit mass, fruit mass per plant. In the indirect crossing (Flacara x Desteptarea), the degree of transgressions constituted 56.4%, 64.9%, 222.6%, respectively, for the number of fruits per plant, fruit mass, fruit mass per plant. In the indirect cross (Flacara x Desteptarea), the degree of transgressions constituted 56.4%, 64.9%, 222.6%, respectively, for the number of fruits per plant, mass of fruit, mass of fruits per plant. The frequency of transgressive forms for the analyzed characters varied within

the limits of 3.03 ... 22.2% for direct crossing and 6.1 ... 12.1% – indirect crossing, which indicates the differentiated and specific contribution of minor genes with complementary action, but also of the parental entity to the formation of characters of genetic-improving interest. A number of 22 genotypes selected from the reciprocal combination F2 Desteptarea x Flacara / Flacara x Desteptarea were evaluated at three levels of temperature – optimal: 25oC and stressful (42 and 11oC), based on the growth characters (radicle, stem and whole plantlet length) in comparison with the parental varieties. In the most cases, stressful temperatures produced significant inhibition of growth organs. Complex resistance was exhibited by the variety Flacara and genotypes 4, 8, 9, 10 selected from the F2 Desteptarea x Flacara combination, which offers opportunities for their use in breeding programs as reliable sources of resistance.

Keywords: tomato, productivity, temperature, resistance, genotype, growth characters.

Acknowledgments. The research was carried out within the framework of project "Identifying and capitalizing on the valuable parents of agricultural crops in the creation of a native genetic base of socio-economic interest", financed by the National Agency for Research and Development of the Republic of Moldova (2024-2025).

C.24. METHODS TO REDUCE ACRYLAMIDE LEVELS IN BAKERY PRODUCTS

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Abstract. This study presents the main methods for reducing acrylamide levels in bakery products, implemented by economic operators in the field. These methods must be adapted depending on the nature of the operators' activity in the field and must be applied starting with the cereal cultivation stage and continuing throughout the technological process until the development of baking instructions for products intended to be finished at home or in public catering units. Thus, it was found that in the agricultural sector a balanced level of sulfur and nitrogen in the soil must be ensured, respectively to prevent the occurrence of fungal infections in cereals. At the technological level, the effect of applying the following measures to reduce AA was monitored: use of asparaginase, use of calcium salts, use of antioxidants, addition of dry sourdough to obtain bakery products. It has been shown that the addition of calcium salts to sourdough gives variable results in reducing the level of AA, but has negative effects on the aroma and texture of the finished product. Adding low doses of dry sourdough to wheat flour is a good option for reducing AA, including improving the physical and sensory properties of bread, but at higher doses, AA levels increase. The addition of antioxidants, namely rosemary extract, in small quantities to wheat flour, together with the use of asparaginase can be used as successful methods to reduce the acrylamide content in bakery products and to improve the rheological properties of the dough and the quality of the bread. In these tests, bread samples with improved quality characteristics in terms of technological, sensory and acrylamide content were obtained.

Keywords: acrylamide, reduction methods, bakery products.

C.25. TOWARDS A SUSTAINABLE FUTURE: CHALLENGES, STRATEGIES AND GLOBAL PERSPECTIVES

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Abstract. Sustainable development has established itself in recent decades as the defining paradigm of the contemporary era, articulating in an integrative conceptual framework the interdependencies of the economic, social and ecological dimensions of human progress. By

means of a critical, systematic and exhaustive analysis of the recent scientific literature, this article aims to underpin a comprehensive and integrative approach to the concept of sustainable development, examining both its theoretical evolution and the ways in which it has been translated into practice in public policies and sectoral interventions.The theoretical approach starts from the conceptual delimitations enshrined in the Brundtland Report and expands on the emerging contributions in the specialized literature in order to identify the major challenges associated with the transition towards a sustainable development model. The analysis highlights the inherent structural tensions between the imperatives of economic growth, the need to conserve natural capital and ensure intergenerational equity, which are essential aspects in reconceptualizing development processes in the current global context.In parallel, the paper investigates the policy instruments and governance mechanisms needed to operationalize the principles of sustainability in a context of systemic uncertainty, structural complexity and accelerating social, economic and environmental change. In line with the recent directions of specialized research, the fundamental role of innovation, education and democratic participation as vectors of transformation towards a sustainable, resilient and equitable future is argued.

Keywords: sustainable development, sustainability, governance, innovation, innovation, sustainable transition.

C.26. EVALUATION OF THE ANTIBACTERIAL EFFECT OF SOME SUBSTANCE USED IN AVICULTURE SECTOR

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Abstract. Wastewater from the agricultural sector contains microbiological pollutants that favor the proliferation of potentially pathogenic microorganisms in the environment. According to national legislation, the treatment of this wastewater before discharge into the network is stipulated as a mandatory requirement.The objective of this study is to evaluate the efficacy of two substances, one with bactericidal effect (AvianProtect-TEN, Romvac Company S.A.) and one with bacteriostatic effect (Clorrom, SC G&M 2000 SRL), on isolated bacterial strains from poultry wastewater.Isolation of bacteria was performed from wastewater samples that were subjected to physico-chemical pretreatment processes, including rotary filter, flocculation system and DAF.The characterization of bacterial strains was carried out based on both their cultural and microscopic characteristics. Different concentrations of substances, ranging between 1-7 mg/mL, were tested. The results of the study were evaluated using the Biosan DEN-1 densitometer. This evaluation showed a favorable effect at a concentration of 4 mg/L of substance.

Keywords: poultry wastewater, bacteria, Clorrom, avianprotect-ten.

C.27. STUDY ON ECO-LABELS FOR TOURISM SERVICES

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Abstract. Products and services have environmental impacts throughout their life cycle. In the context of the current challenges to which society has to respond and provide sustainable solutions (global warming, increasing CO_2 emissions, waste accumulation, diminishing water resources, etc.), eco-labels are a solution to make the economy circular, a lever to limit pollution and contribute to achieving climate neutrality objectives by 2050.One of the sectors of activity that is a source of pollution, with an impact on natural resources, beaches and protected areas, is tourism and tourist services. In this context a new concept has emerged - sustainable tourism. Sustainable tourism is becoming increasingly linked to eco-labels, which are awarded to encourage sustainable practices in environmental and social responsibility activities. The environmental impact of a product or service, starting with its production, cannot be seen by consumers. Eco-labels are the only way consumers can learn about the harmful consequences of developing a product or service. This paper aims to describe the main criteria for obtaining the eco-label for tourism services, as well as the types of labels used in Romania by tourism operators. Eco-labels are useful for accommodation establishments, helping to develop their image, increase their competitive strength, promote innovation and the quality of the services they offer, and positively inform tourists about the establishment. By informing tourists, these certifications help to educate the public and encourage environmentally responsible behavior. The paper aims to describe the main criteria for obtaining the eco-label for tourism services, as well as the types of labels used in Romania by tourism operators.

Keywords: tourism, environment, eco-labels, life cycle, sustainability.

C.28. PERFORMANCE OF THE ROADHEADER MACHINE IN UNDERGROUNDS STRUCTURES AND IT'S INFLUENCE ON THE STABILITY OF A ROCK MASS MODELED USING PHASE 02 SOFTWARE, CASE OF STUDY: RAILWAY RASSE-EL-MA, AZZABA, ALGERIA

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Abstract. This comprehensive study examines the intricate relationship between roadheader excavation performance and rock mass stability in the challenging geological conditions of the Rasse El-Ma railway tunnel in Azzaba, Algeria. Through an integrated approach combining field monitoring, laboratory testing, and advanced finite element analysis using Phase2 software (01), we have quantified the significant variations in roadheader efficiency across different lithological units, with limestone sections achieving 3.2 m/day advance rates compared to just 1.5 m/day in marl formations (02), while specific energy consumption increased by 34% in the weaker marl strata. Our numerical modeling revealed criticalinsights into stress redistribution patterns and deformation mechanisms, particularly in the highly weathered zones (degrees IV-V) (05) that were implicated in the 2021 tunnel collapse, where the Phase2 simulations demonstrated remarkable accuracy in predicting both the extent of plastic zones (reaching 2.4 times the tunnel diameter) and the asymmetric deformation patterns that matched field observations. The research provides practical recommendations for optimizing both excavation parameters and support systems in similar geologically complex tunneling projects, demonstrating how a combination of systematic rock bolting and fiber-reinforced shotcrete can reduce deformations by up to 60% in the most challenging ground conditions (03).

Keywords: roadheader, Phase, Underground Structures, Tunnel, the finite element method.

C.29. PRACTICAL APPROACHES FOR MUNICIPAL SLUDGE DEWATERING USING LABORATORY TECHNIQUES

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Abstract. In the multifaceted field of water and wastewater management, sludge treatment presents significant challenges that demand thorough attention to its characterization, utilization, and disposal. Effective management requires the allocation of appropriate resources, given the fluctuating quantities and complex composition of sludge. Implementing suitable methodologies at each stage is essential with preliminary assessments designed to optimize treatment efficiency and reduce operational costs. These initial evaluations frequently involve laboratory-based activities such as simulations, small-scale tests, prototype development, and product combinations. The primary goal of our study was to perform laboratory experiments to assess the performance of selected organic flocculants in the dewatering of municipal sludge. The methodology involved applying various dosages of flocculants, analyzing the flocculation process, and facilitating the separation of solid and liquid phases. Through detailed experimentation and analysis, the study aimed to enhance the sludge dewatering process, thereby supporting more efficient and sustainable practices in wastewater management.

Keywords: organic flocculants, sludge, dewatering.

C.30. EARLY WARNING SYSTEMS AND THE RAPID SHIFT FROM ATMOSPHERIC INSTABILITY TO ARCTIC SURGE: AN APPLIED ANALYSIS OF THE APRIL 2025 COLD WAVE

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Abstract. In early April 2025, Romania experienced an abrupt and intense cold wave, characterized by a rapid transition from convective atmospheric instability to Arctic air advection. On April 5th, warm and moist air masses generated heavy rainfall, thunderstorms, and localized windstorms, especially in northeastern regions. Within less than 24 hours, a surge of Arctic air descended from the North Pole, crossed the Arctic Ocean and Scandinavia, and subsequently stagnated over Romania, until April 11th.Despite the presence of snow and strong winds, the synoptic configuration did not match the classical blizzard scenario typically observed in the region, which usually involves a warm Mediterranean cyclone

coupled with an Eastern European or Scandinavian High ridge. Instead, this event resulted from a fast reconfiguration of large-scale atmospheric circulation, a feature more common during transitional seasons. This paper analyzes the physical mechanisms behind this unusual cold outbreak, emphasizing the challenges it posed for short and medium-term forecasting and the and the effectiveness of early warning systems. The impact on infrastructure and agriculture was notable, with reports of wind damage and partial losses of vegetation due to negative night-time temperatures. This case highlights the critical importance of timely dissemination of weather information and real-time decision-making in reducing potential damage during rapidly evolving atmospheric events.

Keywords: atmospheric instability, Arctic air outbreak, cold wave, early warning systems, socio-economic impact.

C.31. IMPLEMENTATION OF CIRCULAR ECONOMY PRINCIPLES IN THE FIELD OF BUILDING CONSTRUCTION. COMPARATIVE STUDY ROMANIA - NORWAY

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Abstract. The circular economy is a sustainable development model that aims to reduce waste, reuse materials and increase resource efficiency. The construction sector is one of the largest consumers of resources and generators of waste, which requires the adoption of sustainable solutions to minimize environmental impact. The circular economy in construction is based on reducing resource consumption, reusing materials, recycling and designing for durability and. By maximizing resource use and minimizing waste, this model promotes sustainability. It encourages the reuse of components from old buildings and the recycling of materials for new construction, creating a closed system where resources are used continuously, reducing environmental impact. This study compares the implementation of circular economy principles in the construction sector in Romania and Norway, highlighting the differences in policies, techniques used and environmental impact. The main goal is to analyze the strategies adopted by the two countries and to identify good practices that can be applied in the Romanian context for an efficient transition to the circular economy.

Keywords: circular economy, sustainability, renewable and non-renewable resources.

C.32. THE IMPACT OF THE NATIONAL "GREEN WEEK" PROGRAM ON EDUCATION FOR A SUSTAINABLE ENVIRONMENT

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Abstract. The national program "Green Week" is an educational initiative with the aim of promoting sustainable development and environmental awareness among students in pre-university education.Its impact on education can be analyzed from the perspective of stimulating students' interest in environmental issues, through interdisciplinary learning, shaping responsible attitudes and behavior, developing civic spirit and teamwork, innovation and creativity in educationGreen Week provides opportunities to apply knowledge from different subjects - physics, biology, chemistry, geography, civics and technology education - in real-life contexts through alternative teaching methods - outside the classroom - which

makes education more attractive. It promotes an education centered on competences, not just on the accumulation of theoretical information. The national program is focused on the development of modern education, centered on competences and values. This is an important step towards a more sustainable, educated and environmentally responsible society.

Keywords: innovation, environment, sustainable, civic.

C.33. STUDIES ON THE POSSIBILITY OF USING HYPERSPECTRAL CAMERAS ON DRONES FOR ENVIRONMENTAL MONITORING

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Abstract. Recent advances in drone technology have favored the integration of hyperspectral imaging systems on Unmanned Aerial Vehicles (UAV) platforms, leading to a profound transformation of aerial data acquisition and analysis methods and greatly expanding their applications in research and industry. Hyperspectral cameras, capable of recording hundreds of narrow spectral bands, provide detailed information on the chemical composition and condition of objects or surfaces under investigation. By mounting these sensors on drones, hyperspectral images with high spatial and spectral resolution can be captured flexibly, efficiently and at low cost. This technology is successfully used in precision agriculture for crop growth monitoring, disease or water stress detection, in forestry for species inventory and deforestation detection, in geology for mineral mapping, in water resources and environmental management for pollutant identification and water quality assessment, and in the fields of security and archaeology. At the same time, drones equipped with hyperspectral cameras are becoming key components of modern environmental monitoring systems, enabling a continuous and accurate assessment of ecological parameters over large areas. The continuous development of algorithms for processing and classifying hyperspectral data contributes to increasing the accuracy and automation of analyses, strengthening the role of UAVs equipped with hyperspectral sensors as indispensable tools in applied research and practical operations.

Keywords: drone, hyperspectral camera, environmental monitoring, hyperspectral imaging.

C.34. RESEARCH ON REDUCING WASTEWATER POLLUTION IN RURAL TREATMENT PLANTS THROUGH SUSTAINABLE CHEMICAL SOLUTIONS

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Abstract. Efficient wastewater management in rural areas is a major challenge, given the technological, economic and logistical constraints of small-capacity wastewater treatment plants. Ammonium (NH_4^+), one of the main indicators of nitrogen pollution, is present in significant concentrations in domestic wastewater and requires specific treatments to be effectively eliminated, especially in the absence of advanced biological processes.Although nitrification and denitrification processes are frequently applied in biological treatment, chemical treatments can be a viable alternative for rural plants with unstable operating regimes.In this context, the present study analyzes the efficiency of chemical treatment with ferric chloride ($FeCl_3$ 40%) and polyaluminum chloride (PAC 5A) in reducing ammonium concentration, while evaluating the impact of these reagents on other quality parameters of treated water.Thus, chemical treatment with $FeCl_3$ 40% and PAC 5A may represent a viable alternative in optimizing the treatment process for small-capacity rural stations, in complementing or substituting classical biological

treatments, which are more expensive and more sensitive to load variations.The research is part of the circular economy perspective, aiming at recovering resources from wastewater, reducing reagent consumption and integrating sustainable solutions for rural communities with limited infrastructure.

Keywords: wastewater treatment plant, ammonium, chemical treatment, circular economy, wastewater, biological treatment.

C.35. CLAAIR® PHOTOCATALYTIC ASPHALT INNOVATION IN REDUCING THE ECOLOGICAL IMPACT OF ROAD INFRASTRUCTURE

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Abstract. Amid the intensifying effects of climate change and the urgent need to reduce the ecological footprint, sustainable technologies in the field of road infrastructure are becoming essential. This study explores the ClAir® ecological asphalt, developed by STRABAG, an innovative solution with low environmental impact. ClAir® Asphalt technology, is an innovation based on a bituminous mixture modified with titanium dioxide (TiO_2) with photocatalytic properties, actively contributing to the reduction of pollutant emissions (NO_x, CO_2, VOC) and the improvement of air quality. It also favors the reuse of recycled materials, supporting the principles of the circular economy. The analysis covers the entire technological cycle – from production to application – identifying sources of ecological impact, assessing risks and formulating proposals for process optimization. The study uses a mixed methodology, which includes desk research, direct observation, expert interviews and environmental impact assessment methods. The results highlight not only a significant reduction in emissions and improvement in air quality, but also the active integration of circular economy principles through the use of recycled materials and resource optimization throughout the life cycle of photocatalytic asphalt. At the same time, potential environmental risks are assessed and strategies are formulated to improve the environmental impact of this technological solution. Its ability to reduce air pollutant emissions and to actively contribute to improving urban air quality makes it a model of good practice in the field of green construction. The integration of titanium dioxide into the asphalt composition not only improves environmental performance, but also supports the reuse of recycled materials, thus promoting the circular economy.

Keywords: ecological asphalt, ClAir®, STRABAG, titanium dioxide, gas emissions, circular economy, environmental impact.

C.36. DIVERSITY AND SOCIO-ECONOMIC IMPORTANCE OF EDIBLE INSECTS IN TOGO

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Abstract. Entomophagy has experienced a resurgence of interest in recent years, supported by scientific research highlighting the numerous benefits of insect consumption. This practice is

gaining a more modern and globalized dimension in response to global challenges related to food security and the sustainability of agricultural systems. This article catalogs the various species of insects consumed in Togo and demonstrates the importance of their harvesting, processing, and commercialization in reducing poverty and hunger, particularly in rural and even urban areas. To achieve this, an ethnomethodological survey was conducted among ethnic groups across various regions of Togo to gather information on the diversity of edible insect species and their socio-economic significance. This information was supplemented with the identification of insect samples collected from the surveyed localities. The results reveal that 51 insect species are consumed in Togo at different stages of their development. These species belong to 39 genera, 15 families, and 7 orders. Coleoptera and Orthoptera are the most commonly consumed. Insect collection is typically carried out by both women and men of all ages. The collection techniques and tools used depend on the behavioral ecology of the insects. The most commonly employed processing methods are roasting and grilling. There are virtually no large-scale conservation methods for these edible insects. Only seven species are commercially traded, specifically Brachytrupes membranaceus (Drury, 1773) (Orthoptera: Gryllidae), Cirina forda (Westwood, 1849) (Lepidoptera: Saturniidae), Rhynchophorus phoenicis (Fabricius, 1801) (Coleoptera: Curculionidae), Oryctes monoceros (Olivier, 1789) (Coleoptera: Scarabaeidae), Macrotermes bellicosus (Smeathman, 1781), Macrotermes falciger (Gerstacker, 1891), and Macrotermes subhyalinus (Rambur, 1842) (Isoptera: Termitidae). These edible insects help offset household food shortages, especially during lean seasons, and constitute a significant source of income. Given the wide diversity of edible insects identified across Togo and their socio-economic importance, they can significantly contribute to improving food security and living conditions for the Togolese population. Therefore, the promotion of income-generating activities based on edible insects should be considered within the framework of poverty reduction strategies, both in rural and urban settings.

Keywords: Edible insects, diversity, socio-economic importance, ethnic group, Togo.

C.37. ANALYSIS OF 2024 HEAT WAVES IN THE EASTERN PART OF ROMANIA

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Abstract. In this study the heat waves of 2024 summer were analyzed, by integrating daily meteorological data from stations in Moldova, data from geographic information systems, forecast maps and satellite imagery. Heat waves are extreme phenomena with an impact on population and environment. In 2024, 22nd of July was declared the warmest day on record, according to data from the Copernicus Climate Change Service. The global daily mean temperature reached a new record high (17.16°C) in the ERA5 dataset. This beats the previous records of 17.09°C, (21st of July, 2024) and 17.08°C, (6th of July, 2023). The frequency of heat waves and the duration of the wave in July made the summer of 2024 exceptional in Moldova, as the absolute maximum temperature was exceeded at several meteorological stations, there were 13 consecutive hot days at the Focșani Meteorological Station (daily maximum temperatures ≥35°C), the average temperature (24.0°C) was 4.6°C above the climatological norm specific to the 1971-2000 reference period. The summer of 2024 was a summer with positive temperature anomalies, and the episodes of heatwave and severe thermal discomfort were also accompanied by periods of atmospheric instability that manifested through torrential showers, frequent electrical discharges, intensification of winds and hail. At the same time, in the summer of 2024, there were negative precipitation anomalies.

Keywords: heat wave, thermal discomfort, extreme phenomena, new records.

C.38. STUDIES AND RESEARCH ON THE IMPACT OF CLIMATIC FACTORS ON THE QUALITY OF WHEAT IN LONG-TERM STORAGE: ANALYSIS AND PERSPECTIVES

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Abstract. The aim of this study is to demonstrate that long-term storage of wheat is a critical step in maintaining agricultural product quality and food safety. Climatic factors, in particular temperature, humidity and extreme weather variations, directly influence the physical, biochemical and nutritional properties of the stored product, in this case wheat. Studies in the literature highlight the fact that high temperatures (>25°C) and high relative humidity (>65%) in the storehouse promote accelerated degradation of the grain, leading to the growth of moulds and thus to loss of baking value. Application of modern technologies of controlled aeration, digital monitoring and adaptation of storage infrastructure are recommended to limit these negative effects. Future research perspectives aim to integrate climate predictive modeling and smart sensing for sustainable management of agricultural stocks. This study highlights the need to continuously update conservation strategies in the context of accelerated climate change.

Keywords: wheat storage, climatic factors, grain quality.

C.39. IDENTIFICATION OF THE COMPOSITION OF GROUNDWATER IN THE AREA OF A CLOSED MUNICIPAL WASTE LANDFILL SITE TWO DECADES AFTER ITS CLOSURE TAKING INTO ACCOUNT SELECTED PHYSICO-CHEMICAL AND MICROPLASTICS INDICATORS – A CASE STUDY

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Abstract. In the area of an inactive municipal waste landfill site in southwestern Poland, a study of the quality of groundwater and leachate water was carried out in 2023, the aim of which was to identify their composition, taking into account 11 physico-chemical and 13 microplastic indicators. The obtained test results confirmed the impact of the closed waste landfill on the aquatic environment. On their basis, it was found that after two decades, the inactive landfill has a deteriorated environmental quality due to the significant content of total organic carbon - 24.8 mg/L, and especially in the second half of the year cadmium - 0.211 mg/L, PET polymer with a significant increase in atmospheric precipitation and the amount of leachate. The demonstrated dominance of pollutants below the closed waste landfill site, taking into account seasonality, confirms the penetration of pollutants from the waste deposit of organic and inorganic substances, as well as microplastics, which contributes to the deterioration of the quality of groundwater in its surroundings.

Keywords: leachate, water, municipal waste, inorganic contamination, microplastics.

C.40. IMPLEMENTATION OF A LOW-COST AIR QUALITY MONITORING SYSTEM USING NEURAL NETWORK FORECASTING MODEL

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Abstract. This study presents the development of a low-cost air quality monitoring system designed to assess the Air Quality Index (AQI) in Port Harcourt, Nigeria, using a neural network-based prediction model. The system integrates affordable environmental sensors to gather real-time data on pollutants such as PM2.5, PM10, NO2, SO2, and CO2, as well as environmental parameters including temperature and humidity. These sensors interface with Arduino-based microcontrollers, and data is logged using SD card modules for further processing. The predictive aspect of the system is powered by a Long Short-Term Memory (LSTM) neural network model trained on historical air quality and meteorological data to improve forecast accuracy. The model's performance, evaluated using Mean Squared Error (MSE), achieved a low training loss of 0.0189 and a validation loss of 0.00067394, indicating high precision in AQI predictions. The results show that the LSTM model significantly outperforms traditional prediction models and earlier neural network-based approaches, particularly in the accuracy of PM2.5 and PM10 forecasts. The low-cost sensors used in the system demonstrated strong agreement with reference-grade air monitoring equipment, especially in tracking particulate matter levels. PM2.5 and PM10 predictions closely followed World Health Organization (WHO) standards, aligning with recommended mean limits for air quality safety. Additionally, the affordability of the system is notable; the prototype costs only 9% of a lower-end commercial device and 0.45% of a higher-end system, enhancing accessibility for broader deployment. This makes the solution highly scalable and practical for both urban and rural environments. Overall, the project contributes a robust, cost-effective, and accurate air quality monitoring solution that leverages AI for real-time prediction, offering significant implications for environmental monitoring, public health protection, and data-driven policy making.

Keywords: air quality index (AQI), neural network, prediction model, long short-term memory (LSTM), mean squared error (MSE), root mean square error (RMSE).

C.41. ASSESSING GEOLOGICAL VS. PURPOSE-BUILT STORAGE SOLUTIONS FOR SAFE RADIOACTIVE WASTE MANAGEMENT

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Abstract. This paper compares two methods for radioactive waste management: geological disposal and purpose-built storage. Geological disposal relies on natural geological formations for long-term isolation but faces challenges such as irretrievability and geological stability. In contrast, purpose-built storage offers flexibility, enhanced monitoring, and the ability to adapt to different waste types, though it requires continuous maintenance and presents higher operational risks. A comprehensive risk analysis and modeling help determine the optimal solution, balancing environmental safety and practical feasibility. The study highlights the importance of technological advancements and continuous monitoring to ensure safe management for future generations.

Keywords: radioactive waste management, purpose-built storage, nuclear waste safety, environmental impact, risk analysis.

C.42. THE ROLE OF ECO-LABELING IN THE CIRCULAR ECONOMY

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Abstract. The challenges facing society today relate in particular to reducing the impact of activities, products and services on the environment. An answer needs to be found on how we can implement sustainable production and consumption patterns.One of the ways that we can integrate principles that help protect the environment and help create a circular, sustainable and resilient economy is through the use of the Ecolabel. Eco-labels promote the transition to a circular economy, helping producers who choose to design sustainable products by promoting innovation, saving resources.The European Ecolabel is a component of the Action Plan for a Circular Economy. The Action Plan sets out guidelines on eco-design as well as measures on criteria for specific product groups. The Ecolabel supports products and services that have a lower environmental impact, contribute to sustainable development throughout their life cycle in terms of energy efficiency, durability, reliability, and maintainability. The paper attempts to highlight the ways in which eco-labels can help strengthen the principles of the circular economy.

Keywords: circular economy, eco-labeling, sustainable, durability, eco-design.

C.43. VR TRAINING FOR ENVIRONMENTAL ENGINEERING: UV WATER DISINFECTION

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Abstract. This paper presents the development and implementation of a virtual reality lesson on UV disinfection at 254 nm of water using Unreal Engine 5. The lesson includes three sections: theory, practice and simulation. Students first learn the principles of purification by UV-C disinfection, then assemble the main components of the UV stand and finally operate the system in a realistic simulation. A virtual robot assistant provides step-by-step AI voice instructions and captions, while feedback mechanisms track progress and task completion. The VR lesson aims to improve students' understanding of system components and operation, enhance problem-solving skills, and create an engaging and immersive learning experience. At the same time, this work provides real feedback on the understanding and implementation of the principles (fluid dynamics and mechanics) behind the design of the UV disinfection plant.

Keywords: virtual reality, engineering, UV water disinfection, training, education.

C.44. ENERGY EFFICIENCY & SUSTAINABLE UTILIZATION OF RESOURCES IN GREEN TRANSITION

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Abstract. We must not forget the climate crisis. It is difficult enough to solve one crisis – managing several crises at the same time is a huge challenge. In a world that is increasingly characterized by crises and unrest, the important work against climate change and the destruction of nature can quickly be forgotten. The green transition refers to the global shift toward sustainable economic systems that minimize environmental impact and prioritize long-term ecological balance. Two foundational pillars of this transition are energy efficiency and the sustainable utilization of resources. Energy efficiency means using less energy to perform the same task or produce the same outcome. It reduces energy waste and lowers greenhouse gas (GHG) emissions. Improving energy efficiency can cut global GHG emissions by over 40% by 2040, according to the International Energy Agency (IEA). It also lowers energy bills, reduces energy imports, and boosts energy security. Key Strategies: Building retrofits, Smart grids and metering, Efficient appliances and lighting, Industrial optimization. Sustainable utilization of resources involves using natural resources—like water, minerals, biomass, and fossil fuels—in a way that meets present needs without compromising the ability of future generations to meet theirs. Key Approaches: Circular economy practices, Renewable energy adoption, Sustainable agriculture and forestry, Eco-design and green materials. Benefits: reducing environmental degradation and biodiversity loss, enhances economic resilience by reducing reliance on finite resources, supports social well-being through cleaner environments and resource equity. Energy efficiency and sustainable resource use are synergistic: Efficient systems require fewer raw materials and generate less waste. Sustainable materials can reduce the energy demand of manufacturing and end-of-life disposal. Together, they contribute to carbon neutrality, economic competitiveness, and environmental justice.

Keywords: energy efficiency, sustainability, sustainable utilization of resources, green transition.

C.45. ENERGY PERFORMANCE ANALYSIS OF A PASSIVE SOLAR CHIMNEY VENTILATION SYSTEM IN EASTERN ALGERIA

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Abstract. This study evaluates the energy performance of a passive ventilation system using asolar chimney, with a specific focus on residential applications in the eastern region ofAlgeria. The analysis examines the impact of geometric parameters—particularly chimneyheight, width, and inlet size—as well as local climatic conditions, using Bordj Bou Arréridj asthe reference site. Key performance indicators such as hourly air change rate (ACH), outlet air velocity, and mass flow rate were calculated. Temperature distributions across the glazing surface, airflow behavior inside the chimney, and heat transfer along the inner wall were also investigated. Results indicate that chimney width plays a dominant role in enhancing ventilation performance compared to inlet size. The outcomes are consistent with existing literature, reinforcing the potential of solar chimneys as an effective solution for sustainable passive ventilation in hot climates.

Keywords: solar chimney, energy performances, passive ventilation, theorical study.

C.46. THEORETICAL AND PHYSICAL STUDIES OF A RECTANGULAR COIL ROTATING IN A VARIABLE MAGNETIC FIELD IN SPACE

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Abstract. This article is dedicated to the theoretical and physical studies of an analysis of the behavior of a rectangular coil rotating in a spatially variable magnetic field. The authors use several fundamental laws of electromagnetism, namely Ampère's theorem, Biot-Savart's theorem and the Faraday-Lenz law to model the induced magnetic field and the generated electromotive force. The objective is to provide a new approach to the mathematical formulation of the impact of rotation on the induced voltage, in order to better understand the phenomena at work in electrical machines. We also examine the variations of the magnetic field at different points of the coil and its influence on the flow of the induced current. The results obtained demonstrate that the current intensity is directly related to the characteristics of the applied magnetic field and the geometric parameters of the coil. Analysis of the resulting curves allows observing the dependence of the magnetic field on spatial coordinates and rotational speed, thus highlighting important implications for the design of electromechanical devices exploiting electromagnetic induction.

Keywords: rectangular coil, magnetic field, rotation, induced voltage, induced current

C.47. QUALITY ASSESSMENT OF TREATED WASTEWATER IN A LOCALITY OF PRAHOVA COUNTY

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Abstract. The objective of this study is to evaluate the environmental impact caused by the Sinaia Wastewater Treatment Plant, located in the southern area of Sinaia City. The wastewater treatment technology is presented, and the quality of the treated effluent is analyzed by measuring key indicators: pH, total suspended solids (TSS), chemical oxygen demand (COD), biochemical oxygen demand over 5 days (BOD), detergents, and extractable substances. The findings indicate that the treatment plant's effluent meets the requirements set by current regulations and does not pose a pollution risk.

Keywords: environmental impact, wastewater, regulations.

C.48. RESEARCH ON THE SOUND-ABSORBING CHARACTERISTICS OF LIGNOCELLULOSIC LAYERED BIO-COMPOSITE STRUCTURES

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Abstract. This study investigates the utilization of lignocellulosic waste in the production of biocomposite materials, emphasizing sustainability and highlighting key findings: the ecological and biodegradable concept has a major global impact by reducing energy consumption and pollution; biocomposite materials have transformed various industries due to their low costs and abundant natural resources; they can replace traditional structures in automotive, marine, railway and aerospace sectors, offering lightweight properties and adaptability; biocomposites represent innovative materials with superior mechanical properties, dimensional stability and economic benefits. Experimental research demonstrated that panels made from lignocellulosic chips exhibit good sound absorption, though acoustic insulation performance is influenced by factors including source-receiver distance, their relative positioning, barrier angle, measurement environment (open field vs built areas), and meteorological conditions (temperature between 0-40°C, no precipitation, wind speed below 5 m/s). For accurate measurements, it is essential to maintain a fixed loudspeaker-microphone assembly aligned with the rotation plane to avoid parasitic reflections.

Keywords: lignocellulosic waste, bio-composite structures.

C.49. ESTIMATING GROUNDWATER LEVEL IN ROMAN CITY AND NORTHERN COUNTIES USING GEOSTATISTICAL METHODS: ORDINARY KRIGING AND SEMIVARIOGRAMS

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Abstract. Managing groundwater resources is a growing challenge for all humanity, which needs a good characterization of these resources. An important factor is the spatial characterization through hydrological parameters specific to the study area. The main purpose of this research was to use spatial interpolation techniques to model the piezometric groundwater surface of Roman city and the nearby northern counties, using GIS methods. The study used ordinary kriging in ArcGIS 10.8 software to estimate the piezometric surface, based on 95 observation points and included semivariogram modeling to capture the spatial distribution of data. The methodology involved analyzing spatial variability with geostatistical methods, calibrating the model, adjusting the semivariogram, and checking predictions by comparing with observed data. By applying these geostatistical methods, this research aims to assess the effectiveness of kriging in modeling hydrogeological data, showing the role of semivariograms in identifying spatial structures to estimate the groundwater hydrostatic level.

Keywords: groundwater, Kriging ordinary, semivariogram

D. MECHATRONICS & ROBOTICS

D.1. BEHAVIORAL SIMULATIONS WITH DIGITAL TWINS AND POSITIONAL LOCATION ERRORS

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Abstract. Simulations with Digital Twins for Mechatronics systems are of high interests now days. By design a simulation is intended to represent a specific solution, which usually is considered without any errors which might be affecting it. However, while in real physical world processes are affected by errors, a behavioral simulation would naturally need to incorporate these errors. This white paper intends to address a particular case, when in such simulations a certain positional error affects the actuator(s) final reach position. A hands on example with a step-by-step methodology of implementing a digital twin behavioral simulation with deterministic errors, integrated using Siemens NX, is explored in this article. Conclusions will show why this approach is important as well as possible utilization.

Keywords: digital twins, mechatronics, behavioural simulation.

D.2. DEVELOPMENT OF A VERSATILE EDUCATIONAL ROBOT WITH MECANUM LOCOMOTION, ANDROID CONTROL, AND SCRATCH-BUILT LIDAR

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Abstract. This paper presents the development of a mobile robot equipped with omnidirectional mecanum wheels. The robot can be controlled via an Android application, enabling direct operation when within the user's line of sight, as well as remote teleoperation based on LiDAR data displayed on the device. It also supports autonomous navigation along user-defined paths drawn directly on the touchscreen interface. The project investigates the feasibility of accessible, low-cost solutions using common hardware components, and features a custom-built LiDAR sensor designed from scratch for obstacle detection and workspace mapping. Its modular architecture offers strong potential for educational, research, and low-cost prototyping applications, as well as future extensions to more advanced robotic systems.

Keywords: LiDAR, mecanum, mobile robot, autonomous navigation.

D.3. INTEGRATING THE NAO ROBOT INTO INTELLIGENT INDUSTRIAL INFRASTRUCTURE _X000B_FOR REAL-TIME OPERATIONAL ASSISTANCE

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Abstract. The study aims to adapt and integrate the NAO Robot into intelligent industrial processes to assist with real-time voice commands. The NAO Robot is a programmable humanoid robot equipped with multispectral sensors, video cameras, microphones, and precision actuators. It is capable of interacting naturally with users through voice, gestures, and

autonomous movements, making it ideal for applications in assistance, education, research, and human–industrial process interfacing in intelligent environments.The process proceeds as follows: the human operator issues voice commands to the NAO system via a natural communication interface (a microphone integrated into the robot's structure). The NAO Robot, equipped with advanced voice processing and semantic interpretation modules, analyzes the recognized commands and determines the appropriate action [3, 4]. In cases of misunderstanding or uncertainty, the NAO Robot can validate or request additional confirmation from the human operator. Depending on the command context, the NAO Robot transmits digital instructions to the execution devices either via the wired Ethernet LAN or the wireless Wi-Fi network. The Industrial Ethernet Controller and the Industrial Wi-Fi Controller receive the digital commands and relay them to the technological equipment or automated production lines (industrial robots, transportation systems, assembly lines, etc.).The system executes the commands either automatically or semi-automatically, and the NAO Robot can provide vocal feedback to the operator regarding the status of the command (accepted, executed, failed). In the event of error detection or unforeseen conditions, the system requests reconfirmation or adjusts the command, ensuring the safety and efficiency of the industrial processes.The developed system offers the following features: Real-time voice recognition; Omnichannel communication via Ethernet LAN and industrial Wi-Fi; Intelligent interface functionality of the NAO Robot between the operator and the industrial infrastructure; Automatic command processing and direct control of industrial processes..

Keywords: NAO robot, industry 4.0, voice recognition, real-time control systems.

D.4. PHOTOLUMINESCENCE AND OPTICAL PROPERTIES OF POLYCRYSTALLINE ZINC OXIDE THIN FILMS

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Abstract. Zinc oxide (ZnO) thin films were prepared by thermal oxidation in open atmosphere of vacuum evaporated zinc metallic films. The investigations of film structure, performed by X-ray diffraction technique, showed that ZnO films are polycrystalline and have a würtzite (hexagonal) structure with film crystallites preferentially oriented with (002) planes parallel to the substrate surface. Some values of structural parameters (lattice constants of würtzite cell, crystallite size, Zn-O bond length) of the ZnO films were determined. The transmision and absorption spectra were studied for incident photon energies ranged between 1.50 eV and 4.50 eV. The optical energy bandgap, calculated from the absorption spectrum, ranges from 3.36 eV to 3.45 eV. Photoluminescence (PL) spectra at temperatures 293 K and 78 K have been analysed. The PL is dominated by the emission at 3.338 eV. Temperature dependence on the intensity of the main peaks has been discussed.

Keywords: thin films, zinc oxide, structural characteristics, optical absorption, photoluminescence spectra

D.5. DEVELOPMENT OF A COST-EFFICIENT AUTONOMOUS ELECTRIC VEHICLE FOR URBAN ENVIRONMENTS USING SENSOR FUSION AND EDGE AI

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Abstract. This study aims to design and implement an affordable and scalable autonomous electric vehicle that enhances navigation and safety in urban areas, particularly at low speeds, leveraging sensor fusion and edge AI technologies. The vehicle employs a suite of perception

sensors, such as RGB cameras, stereo vision, and a cost-effective 3D LiDAR. Sensor data is fused using deep learning techniques combined with probabilistic algorithms. A modular software stack, built on ROS 2 and Autoware, facilitates realtime functionalities like obstacle detection, pedestrian recognition, lane detection, and GPS-IMUlocalization. Mechatronic systems ensure precise control of vehicle operations, while computational tasks are handled onboard via an NVIDIA Jetson platform, utilizing edgecomputing without reliance on cloud infrastructure. Preliminary analysis highlights the potential of the proposed system to provide effective solutions for autonomous navigation in urban environments. These calculations validate the functionality of the sensor data fusion system and demonstrate the efficiency of edge computing for local data processing. Additionally, initial results suggest that integrating mechatronics with advanced AI algorithms could ensure precise and robust vehicle coordination. The study underscores the potential of autonomous electric vehicles as practical solutions forurban transportation. Future work will focus on improving AI performance through enhancedsemantic segmentation techniques and expanding datasets, further optimizing vehicle efficiency and safety. Future research will focus on enhancing traffic safety by integrating additional sensors into the system. These supplementary sensors, such as advanced thermal imaging cameras, ultrasonic detectors, and higher-resolution LiDAR, aim to improve obstacle detection, pedestrianrecognition, and overall situational awareness in dense urban scenarios. By refining the sensorarchitecture and further optimizing the data fusion processes, the safety and reliability of autonomous vehicles can be significantly increased, paving the way for secure and efficient urban transportation solutions. It represents a foundational step toward the development of cost-efficientautonomous vehicles for urban environments.

Keywords: autonomous, AI, cost-efficient.

D.6. THEORETICAL AND EXPERIMENTAL RESEARCH ON MINIMIZING DEFECTS IN WELDED JOINTS

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Abstract. Considering that in recent years I have studied several processes such as deformation, hardness, weldability, hardness standards, wear, I will try to highlight some aspects about the wear and hardness process. Frictional wear can occur when mechanical interaction occurs under the action of an external load and relative motions of bodies occur. The destruction process also involves superficial structural changes, deformations, detachments of material. Wear is analyzed according to the applied loads, speed and environment. At some point, due to repeated stress, the crack network is large enough that the weakened area between the surface and the crack network detaches. The rupture is brittle leaving behind a micro-crater with rough edges. The characteristics of the millet (temperature, composition, pressure) can significantly influence the evolution of the destruction in the surface layer. Depending on the predominant composition of a destruction process, four fundamental types are considered: adhesion, abrasion, fatigue and corrosion. The hardness of a material is assessed by the value of conventional characteristics, obtained from tests that affect the surface of the part very little. Thus, it can be considered that the determination of hardness is carried out by non-destructive methods, based on the use of a penetrator, which makes an imprint on the surface of the material through its action. Depending on the geometry of the indenter and the shape of the indentation, three test methods are commonly used, namely Brinell, Vickers, Rockwell. In conclusion, there are several methods for identifying defects in welded joints.

Keywords: process, wear, cracks, hardness, methods.

D.7. GRIPPER OPTIMIZATION VIA OPTICAL SENSORS AND MACHINE LEARNING

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Abstract. This paper investigates an innovative method for optimizing robotic gripper using a screw-nut actuated mechanism integrated with multi-joint robotic arms. The fundamental premise is to enhance the ability of robots to manipulate a wider range of objects with increased precision and safety. The study explores the use of optical sensors to capture detailed information about the workspace and object characteristics. This data is then processed by machine learning algorithms to determine, in real-time, the optimal gripping force required for effective manipulation, preventing slippage or object damage. Preliminary results demonstrate the capacity of the machine learning model to accurately predict the necessary force based on visual data, leading to more adaptable and reliable gripping. Furthermore, the research examines the advantages of utilizing additive manufacturing for creating customized gripper mechanism components, enabling design optimization for reduced weight and enhanced functionality. Future directions include expanding the training dataset for the machine learning algorithms, integrating haptic feedback for finer grasp control, and robust testing of the system in complex industrial scenarios.

Keywords: adaptive gripers, optical sensors, machine learning, multi-joint robotic arm, additive manufacturing.

D.8. MECHANICAL OPTIMIZATION OF REPRAP HELIOS ARM

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Abstract. This study presents an in-depth analysis of the mechanical structure enhancement of a RepRap Helios multi-joint arm, initially designed with SCARA functionality. The paper identifies the limitations of the original structure and proposes modifications aimed at optimizing the system's performance. A primary objective is the relocation of motors to achieve a more compact design, thereby reducing robot's inertia and overall dimensions. A crucial aspect of the research is increasing the arm's stiffness, which is essential for ensuring movement precision and repeatability. In this regard, various structural reinforcement methods and component geometry modifications are explored. To assess the effectiveness of these changes on stiffness, advanced engineering FEM techniques are employed. The results demonstrate significant improvements in the modified arm's stiffness, contributing to more stable and accurate operation. The paper also provides a detailed comparison between the initial and improved structures, highlighting the advantages of the new design in terms of compactness, stiffness, and applicability in a wide range of mechatronic applications. The conclusions emphasize the importance of mechanical structure optimization to enhance the overall performance of RepRap multi-joint robotic arms.

Keywords: multi-joint arm, RepRap Helios, stiffness, compaction, mechatronics.

D.9. 2R1T ROBOTS FOR METAL MACHINING QUALITY ASSESSMENT

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Abstract. This paper explores the use of multi-joint robots, with an initial 2R1T structure, in the quality assessment of metal machining processes. The study presents how the final configuration of the robotic system is adapted to align with flexible manufacturing cells used in industrial settings. A key aspect of the research is the improvement of the multi-joint arm's stiffness, crucial to ensure precise and reliable measurements of the machined surface quality. The article details the integration of 2R1T robots into quality assessment processes, covering surface roughness analysis, superficial hardness evaluation, and other relevant techniques. It analyses the advantages of using multi-joint robots compared to traditional methods, emphasizing flexibility, automation, and ability to perform complex evaluations on varied geometries. The study addresses the challenges related to sensor calibration, robot positioning accuracy, and adaptation to different industrial environments. Furthermore, the paper presents case studies or experiments that demonstrate the effectiveness of the proposed approach, highlighting improvements in inspection time, measurement reproducibility, and the accuracy of the obtained data. The conclusions underscore the potential of multi-joint robots to optimize quality control processes in the metal processing industry.

Keywords: 2R1T robots, quality assessment, machining, roughness, flexible cells.

D.10. 1T2R ROBOTIC ARM VIBRATION AND FATIGUE: STRUCTURAL OPTIMIZATION

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Abstract. The present study examines the vibration and fatigue assessment of key components in 1T2R multi-joint arms used in flexible cells within the machining industry. The study investigates how design principles from civil engineering and architecture can be adapted to enhance the performance of these robotic systems. A significant emphasis is placed on increasing the stiffness of the multi-joint arm, a crucial factor for reducing vibrations and extending the lifespan of components. The paper analyses the sources of vibration during operations, including robot movement inertia, and interaction with the workpiece. Various methods for vibration measurement and analysis, such as the use of accelerometers and experimental modal analysis, are evaluated to quantify the dynamic response of the robotic arm. In addition, the study explores design techniques inspired by civil engineering, such as the use of advanced composite materials, topological optimization of structures, and the implementation of vibration damping elements, to improve stiffness and reduce component fatigue. The study also presents simulation models and experiments that demonstrate the effectiveness of the proposed approaches in reducing vibrations and improving the durability of multi-joint arms. The implications of these findings for the design and operation of flexible manufacturing cells are discussed, aiming to enhance machining accuracy, reduce tool wear, and improve overall system reliability.

Keywords: 1T2R robotic arm, vibrations, fatigue, stiffness, flexible cells.

D.11. MECHANICAL APPLICATIONS IN MECHATRONICS: A SYNERGISTIC APPROACH TO MODERN ENGINEERING

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Abstract. The latest research conducted in China has revealed the potential of information transmission through 10G technology. While 5G is focused on mobile internet speeds, 10G is a term that primarily refers to high-speed internet over broadband networks, particularly for cable internet providers using DOCSIS (Data Over Cable Service Interface Specification) 4.0 technology. The main features of 10G internet communications are: speeds 10,000 times bigger than typical broadband speeds available today; symmetrical upload and download speeds; reduced lag and improved real-time communication; support for more devices; congestion-free experience and so on. The purpose of this paper is to highlight the integration of mechanical applications into mechatronics, using 10G technology. Thus, major implications are foreseen in the following applications: Robotics and Automation; CNC Machines and 3D Printers; Automated Guided Vehicles (AGVs); Medical Devices; Smart Consumer Devices; HVAC Systems and Smart Thermostats.

Keywords: DOCSIS, virtual reality (VR), augmented reality (AR), robotic actuators, end effectors.

D.12. DESIGN AND IMPLEMENTATION OF A HAND GESTURE CONTROLLED HYDRAULIC ACTUATION SYSTEM USING CLOUD REAL-TIME DATABASE FOR REMOTE OPERATION

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Abstract. The purpose of this work is to explain the design and implementation of a remote-controlled hydraulic system for remote control actuation. The system uses a master – slave pair computers system, that communicate thru Google's Cloud Firebase. Each of the master-slave computers runs specific Python code. The system translates human hand gestures, sends the data to the cloud real-time database that is read at the other end and encoded, with the purpose of communicating with an Arduino Mega 2560 that controls a series of hydraulic distributors, thus moving the piston rod. The system is capable of both manual actuation through the use of a joystick and visual monitoring through the use of a camera, it is well-suited for use in robotic, agricultural, or industrial applications that require remote or automated automation.

Keywords: remote-controlled hydraulic system, master-slave computer system, cloud communication.

D.13. TRAJECTORY MAPPING AND KINEMATIC MODELING OF A BI-AXIAL DUAL-HYDRAULIC GRIPPING SYSTEM

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Abstract. This study presents a kinematic analysis of a gripping mechanism, powered by a hydraulic bi-axial two-piston system, utilizing video-based trajectory tracking and homogeneous transformation matrix formulation. Using a combination of computer vision techniques and

mathematical modelling, there were extracted and analysed the time-dependent spatial and rotational behaviour of both gripping jaws. The derived transformation matrices serve as a foundational framework to understand motion characteristics, coordination, and phase relationships between the pistons. The results indicate that transformation matrices are crucial in modelling real-world mechanical movements and lead to better understanding further analysis in synchronization and control of multi-actuator systems.

Keywords: piston kinematics, homogeneous transformation matrix, computer vision in mechanics, motion tracking, dual-piston system, trajectory analysis.

D.14. APPLICATION OF CAVE SYSTEMS FOR ROBOTIC MOTION ASSESSMENT IN IMMERSIVE VIRTUAL ENVIRONMENTS

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Abstract. This paper explores the application of Computer Aided Virtual Environment (CAVE) systems in the assessment and optimization of robotic motion within fully immersive 3D environments. By integrating motion capture data, spatial positioning systems, and kinematic analysis algorithms, the study evaluates how a virtual environment manages compared to traditional 2D and 3D simulation platforms. Emphasis is placed on the precision of trajectory calibration and real-time interaction. The results indicate that immersive environments can significantly reduce development time and help to understand on how to improve the accuracy of robotic motion planning, particularly in applications requiring high spatial awareness.

Keywords: CAVE systems, robotic motion analysis, virtual reality in robotics, immersive environments, human–robot interaction.

D.15. IMAGE-BASED CLASSIFICATION OF STRESS-STRAIN SAMPLES FOR ADAPTIVE CONTROL OF HYDRAULIC SYSTEMS

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Abstract. An image classification approach using stress-strain data was developed to enable autonomous control of hydraulic systems. A high-volume dataset composed of images derived from mechanical testing, were processed using convolutional neural networks (CNNs) to extract features indicative of material behavior, including stress, strain, and surface conditions. The predicted labels are employed to dynamically adjust pressure and actuator response in a closed-loop hydraulic control system. Experimental validation indicates a strong correlation between visual patterns and control parameters, offering a solution for predictive control in industrial settings.

Keywords: stress-strain imaging, hydraulic system control, convolutional neural networks, intelligent actuation, mechanical behavior prediction.

D.16. HEATMAP VISUALIZATION FROM SCRATCH DETECTION MODELS FOR FAILURE PREVENTION IN INDUSTRIAL EQUIPMENT

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Abstract. Early detection of surface damage, such as scratches or deformations, plays a critical role in maintaining the operational reliability of industrial equipment. This research paper proposes the use of heatmap visualizations generated by deep learning models trained for scratch detection on metallic surfaces. The heatmaps highlight high-risk areas and serve as an input for automated decision-making systems aimed at process optimization and preventive maintenance. The approach is validated through case studies where heatmap intensity correlates with zones with defects.

Keywords: scratch detection, heatmap visualization, deep learning diagnostics, predictive maintenance, surface damage analysis.

D.17. KINEMATIC MODELING OF A FOUR-PISTON ACTUATION SYSTEM WITH DUAL TRANSLATION AND INDUCED ROTATION

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Abstract. This paper introduces a symbolic kinematic model for a mechatronic system consisting of four hydraulic pistons, where two pistons generate translation motion, and two induce rotational movement through mechanical interaction. The system architecture enables compact multi-functional actuation suitable for constrained industrial environments. Analytical expressions are derived to describe the motion dependencies between pistons, accounting for nonlinear couplings and spatial constraints. Simulation results illustrate the dynamic behavior of the system under varying input conditions, helping at designing and optimizing hybrid actuation mechanisms.
Keywords: multi-axis actuation, kinematic modeling, hydraulic pistons, rotational-translational systems, mechatronic design optimization.

D.18. CONTROL METHODOLOGY IN DIRECT DINEMATICS FOR THE MOVEMENT OF THE SAWYER ROBOTIC ARM BY MEANS OF G-CODE INSTRUCTIONS

ANDREI-COSTIN TRASCULESCU, HORATIU ROIBU, STEFAN-IRINEL CISMARU, IONUT-CRISTIAN RESCEANU, FLORINA-LUMINITA PETCU, NICU-GEORGE BIZDOACA

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Abstract. The continuous evolution of mechatronics and robotics underlines an increasing emphasis on high precision, predictability and robustness in robotic handling tasks. A central aspect of this evolution is the development of robotic systems capable of executing very finely, efficiently and reliably controlled incremental movements. Traditional robot control methods often rely on inverse kinematics (IK), calculating the angles of the joints from the Cartesian positions of the end element. However, IK-based approaches are associated with significant computational complexities, including ambiguity of solutions, singularities in the joint space, but also numerical instability, especially in scenarios requiring incremental and predictable

positioning. In order to address these limitations, this application in the present research proposes and thoroughly explores an alternative to the robotic control paradigm based on direct kinematics (Forward Kinematics - FK).

Keywords: forward kinematics, robotic handling, high precision.

D.19. CHALLENGES AND IMPLICATIONS OF INTEGRATING POST-QUANTUM CRYPTOGRAPHY INTO VEHICULAR SYSTEMS: IMPACT ON MICROCONTROLLER PERFORMANCE AND COSTS

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Abstract. In the context of the rapid evolution of vehicular communication technologies and the increasing cybersecurity threats, automotive security is becoming a strategic priority. The progress of quantum technologies necessitates the adoption of advanced cryptographic solutions in the automotive industry, where communication security and data integrity are essential. This paper explores the implementation of post-quantum cryptography in vehicular systems, focusing on the implications regarding microcontroller performance and associated costs. It analyzes how new algorithms influence resource consumption, processing times, and code size, highlighting the need for optimizing existing hardware. The study emphasizes the importance of balancing the desired level of protection with the practical constraints of the automotive industry. Furthermore, it reveals the necessity of rethinking hardware and software design to ensure the resilience of automotive systems against quantum threats, without compromising performance or economic feasibility.

Keywords: post quantum cryptography, vehicular systems, cybersecurity.

D.20. INTEGRATION OF MECHATRONIC SYSTEMS IN VIRTUAL AND AUGMENTED REALITY APPLICATIONS

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Abstract. The incorporation of mechatronic systems in a Virtual Reality (VR) and Augmented Reality (AR) environment is a major development in increasing interactivity, realism and precision in simulating applications [1]. Through integrating sensors, actuators, embedded control, and intelligent feedback loops, mechatronic systems support real-time physical manipulation of virtual objects, thus serving as a means to connect the digital and the physical world [2]. This is crucial In fields such as advanced manufacturing, medical simulation, and remote robotic control, where tactile feedback and spatial awareness are vital [3]. This paper aims to provide a structured review of the role and integration of mechatronic equipment in the modernization and enhancement of VR and AR systems.

Keywords: virtual reality, augmented reality, mechatronics.

D.21. DEEP LEARNING-BASED IMAGE ANALYSIS FOR DETECTION AND CLASSIFICATION OF CORROSION PATTERNS IN ALUMINUM SAMPLES

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Abstract. This paper proposes a computer vision framework based on convolutional neural networks (CNNs) to analyse corrosion evolution in aluminium alloys exposed to saline, Ambiental and microbiological environments. The dataset includes a time-lapse imagery of samples under the conditions described. Preprocessing steps involve noise reduction, edge enhancement, and segmentation of surface features. CNN is trained to classify corrosion types, such as uniform corrosion, pitting, and microbial biofilm formation. Performance metrics including accuracy, F1 score, and confusion matrices are presented. The results indicated the feasibility of AI-driven corrosion diagnostics, supporting predictive maintenance applications in industrial and marine settings.

Keywords: computer vision, convolutional neural networks (CNNs), corrosion analysis, aluminium alloys.

D.22. DESIGN AND IMPLEMENTATION OF AN AUTOMATED PLATFORM FOR LONG-TERM CORROSION MONITORING IN ALUMINUM ALLOYS

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Abstract. This study presents the design, development, and testing of a platform capable of monitoring aluminium alloy corrosion under saline and microbiological environments. The platform integrates structural aluminium profiles and a high-resolution camera-lighting system with time-lapse capabilities. The system is controlled via a Python-based interface, automating image capture at predefined intervals. This approach enables precise, consistent, and non-invasive monitoring of corrosion processes over time, reducing manual intervention and increasing reproducibility in experimental setups. The platform supports modular expansion, including more environments, paving the way for adaptive control and AI-assisted corrosion analysis.

Keywords: adaptive control, AI assisted analysis, predictive maintenance, corrosion diagnostics, platform design.

E. ECONOMIC ENGINEERING

E.1. HUMAN RESOURCES AND PERFORMANCE MANAGEMENT IN ROMANIAN SMES

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Abstract. Although recognise the importance of the human factor in achieving performance at the level of an organisation (especially in times of crisis) few managers in large organisations, the fewer of those of small and medium enterprises (SMEs) who do not have a specialised department in human resources issues are willing to pay due attention to the implementation and use of a performance management system. In general, in the literature, it is considered that proper performance management is usually based on two main components: the exploitation and preservation of talent, respectively the performance feedback mechanism. This paper aimed to carry out research to highlight the importance of SMEs and their performance in the Romanian economy and to increase the knowledge in their management, especially human resources management.

Keywords: Human resources; performance; SMEs.

E.2. DIGITIZATION AND THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE IT FIELD IN CLUJ-NAPOCA

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Abstract. Currently, on the labor market in Cluj-Napoca, one of the predominant sectors is that of information technology (IT), which, according to the company, brings together several benefits and advantages offered by companies. The paper aims to address both the source of origin of this sector, namely technologization, and the major threat it faces, which is represented by the evolution of artificial intelligence, which could in the future replace the human factor. This study starts from the hypothesis that although the current world has experienced an unprecedented evolution of technology, which has revolutionized both the labor market and social life, people in Cluj-Napoca, who work in the IT field, believe that the implementation of artificial intelligence has a significant impact and could represent a threat to the labor market, having the potential to replace the human factor in a company. The research method was the survey and the instrument was the questionnaire. The target group was formed by randomly selected individuals who work in the IT field within various companies in Cluj-Napoca, the respondents deliberately choosing to answer this questionnaire. The analysis of the responses received to the applied questionnaire confirms the research hypothesis and also highlights the optimistic perspective of the subjects regarding the evolution and future of this technology.

Keywords:information technology; artificial intelligence; threat; questionnaire.

E.3. STUDY ON THE ANALYSIS OF THE PRODUCTIVITY AND ENERGY CONSUMPTION OF A HOT-ROLLED PIPE PRODUCTION SECTION IN A MULTINATIONAL COMPANY

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Abstract. Within the metallurgical industry, the great diversity of the types of sizes produced leads to the need to have a robust, transparent and reality-based production cost calculation system. To achieve this, it is necessary for the cost analyst to understand the production process in detail, so that he can then be able to make the connections between the technological parameters used in the production process and the impact they have on the production cost. The above applies to aspects related to the productivity of the machine, as well as the consumption of tools, electricity, gas, steam, compressed air, labor or the use of third-party companies, so that the particularities of a new product are also reflected in the production cost that it will have. The paper aims to detail the impact of the increase in energy prices on the cost of production, depending on the processes that the product has, and depending on the energy consumption of each process, as well as the presentation/detailing of methods for tracking and reducing production costs. The research methodology involves breaking down the cost into its component elements, studying cause and effect relationships.

Keywords: performance; cost; production; energy; reduction.

E.4. THE ECONOMIC IMPACT OF ARTIFICIAL INTELLIGENCE INTEGRATION IN ROMANIA'S MECHANICAL INDUSTRY: PRODUCTIVITY GAINS, JOB DISPLACEMENT, AND WORKFORCE RESKILLING

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Abstract. This study examines the economic implications of artificial intelligence (AI) adoption in Romania's mechanical and industrial sectors, focusing on automation, productivity, and labor market transformation. Recent data indicates that generative AI technologies will be affecting over 4.2 million people within the next decade. While AI integration could contribute an estimated €14–16 billion to national GDP, its rapid expansion poses major shifts in employment, especially in sectors dependent on repetitive, rule-based tasks such as manufacturing, logistics, and customer service. AI-related job postings have grown 3.5 times faster than others, and salaries in AI roles can be up to 25% higher than the national average. Companies such as Dacia–Renault and Ford Romania are already implementing predictive maintenance, robotic vision systems, and AI-driven production scheduling, demonstrating increased operational efficiency with reduced reliance on manual labor. Despite its economic potential, AI adoption raises significant concerns: workforce displacement, skill mismatches, and unequal access to retraining. It is concluded that a cost-benefit framework for assessing AI integration and presents policy recommendations aimed at economic resilience must be created. These include targeted upskilling programs, national investment in digital education, and public-private partnerships to mitigate labor disruption while enhancing Romania's industrial competitiveness.

Keywords: Artificial Intelligence; Labor Market Transformation; Automation; Job Displacement; Workforce Reskilling; Industrial Digitization; AI Economics.

E.5. THE INFLUENCE OF ICT ADOPTION ON THE FIRMS' PERFORMANCE: EVIDENCE FROM ROMANIA

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Abstract. In the contemporary business landscape, the implementation of Information and Communication Technologies (ICT) represents one of the most significant transformations that a firm can undertake to enhance its overall performance, profitability, and competitiveness. For small and medium sized enterprises (SMEs), this transition is particularly critical, as the integration of ICT tools cand serves as a source of comparative advantage. The aim of our study is to analyze the evolution of ICT implementation in Romania, in comparison with the European Union and to study the impact of this implementation on the economic and financial performance of small and medium sized enterprises. The results of this analysis point to the positive impact of the implementation of different information and communication technologies. They lead to increased overall performance, increased profitability and increased competitiveness for firms. Also, ICT adoption made it possible for companies, especially for small and medium sized enterprises, to explore new market opportunities and to develop the e-commerce component of their activity. This beneficial role of ICT implementation was even more highlighted by the covid pandemic, which forced some companies to extend their activity on the e-commerce business area in order to compensate for some of the negative effects that the pandemic brought to their financial results. The most used ICT tools used by the Romanian firms include Enterprise Resource Planning Systems, Business Process Management tools, Digital Financial Management tools and E-commerce and Online Selling platforms. Our analysis highlights the fact that ICT adoption can have a transformative influence on the overall performance of small and medium sized enterprises, especially if it is accompanied by proactive management techniques. Moreover, the implementation of educational programs about the benefits of digitalization and ICT adoption by firms can be of interest for policymakers in their attempt to develop strategies that could increase the economic development.

Keywords: ICT adoption; firm performance; small and medium sized enterprises; e-commerce.

E.6. USING THE NET CORRECTED ASSET (NCA) METHOD IN SUSTAINABILITY AND GROWTH POTENTIAL PREDICTION FOR COMPANIES

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Abstract. The main objective of the paper is to highlight the importance and accuracy of the corrected net asset (NCA) method in providing an accurate and up-to-date evaluation of a firm, considering market dynamics and the importance of fixed assets in ensuring long-term competitiveness. The NCA method involves adjusting assets and liabilities to their current market value, which allows a clear and real picture of the company's economic value to be obtained. The theoretical considerations were verified through a case study based on the analysis of the company Rikko Steel S.R.L. from Bacau. The results of the research underline the relevance of the NCA method as a robust assessment tool, capable of providing a true picture of a company's financial situation and supporting strategic management decisions. By using the NCA method, the differences between the inventory value and the entry value of the equity items on the balance sheet are eliminated. This means that the values of assets that are recorded on the

balance sheet can be adjusted to their current market value if they have undergone price changes over time (e.g. land, buildings, equipment or inventory). The interpretation of the results obtained after the evaluation of a company using the A.N.C. method considers significant net worth, risk assessment, sustainability and growth potential for the analyzed company.

Keywords: Balance sheet; profit and loss account; assets; liabilities; income and expenses of the company; profitability and ability to generate cash flow.

E.7. THE EFFECT OF CONSUMPTION AND INVESTMENT ON ECONOMIC GROWTH IN ROMANIA

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Abstract. This paper aims to analyze how investment and consumption determine economic growth in Romania. Within the national economy, investments constitute the fundamental element that initiates and develops any economic activity. The positive effects of investments for the national economy are not limited only to economic growth but also to job creation and to generate various economic, technical, and structural impacts. Investments are considered a primary driver of economic growth, especially those made by the business sector. Consumption's impact on economic growth is not explicitly addressed in the provided context, but investment is clearly highlighted as a key factor. In Romania, the relationship between consumption and investment in the economy is a crucial one, as both play key roles in driving economic growth.

Keywords: economic growth; investment; consumption.

E.8. TRENDS IN THE MARKETING RESEARCH MARKET IN THE DIGITAL ERA

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Abstract.. This article aims to highlight the main recent trends emerging in the marketing research market as a result of the widespread adoption of new technologies. The expansion of online research, the integration of virtual and augmented reality, as well as the use of artificial intelligence in data collection and analysis processes, bring a series of significant advantages: a substantial reduction in required resources, access to a variety of information that was previously difficult to obtain, and the ability to gather real-time feedback from target audiences while generating complex analyses in a very short time frame.In this context, the marketing research market has experienced accelerated growth in recent years. The present paper seeks to highlight both the evolution of the market volume and the main structural changes that have redefined the way marketing research is conducted in the digital era.

Keywords: marketing research market; digital era; trends.

E.9. ENERGY TRANSITION INVESTMENTS AND INDUSTRIAL COMPETITIVENESS IN CENTRAL AND EASTERN EUROPE: IMPLICATIONS FOR ECONOMIC ENGINEERING

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Abstract. The accelerating energy transition across Central and Eastern Europe (CEE) presents both opportunities and challenges for industrial competitiveness. This paper investigates the relationship between investments in renewable energy infrastructure, improvements in grid efficiency, and the economic performance of manufacturing sectors in the region. Using a panel econometric approach, we analyze the impact of renewable energy expansion, energy cost dynamics, and digitalization trends on industrial productivity and trade openness. Our findings highlight that targeted investments in energy transition not only enhance environmental sustainability but also contribute to strengthening the region's industrial base, provided they are coupled with strategic technological upgrades and supportive policy frameworks. However, disparities in investment capacity, labor costs, and innovation ecosystems across CEE countries reveal critical challenges that must be addressed through coherent economic engineering solutions. The study offers practical recommendations for policymakers, industry leaders, and engineers, emphasizing the need for integrated strategies that align green transition goals with competitiveness objectives. By combining digital transformation with sustainable reindustrialization, CEE economies can better position themselves in the evolving global landscape, ensuring long-term resilience and growth.

Keywords: Energy Transition; Industrial Competitiveness; Renewable Investments; Economic Engineering; Central and Eastern Europe; Sustainable Reindustrialization; Digital Transformation.

E.10. BRIDGING BUSINESS ADMINISTRATION AND IP LAW IN DIGITAL TRANSFORMATION: A COMPARATIVE EU STUDY ON INNOVATION AND SUSTAINABILITY

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Abstract. Digital transformation is reshaping business across Europe, raising critical intersections between business administration and intellectual property (IP) law. This article investigates how these domains converge to influence innovation outcomes and sustainability in EU countries, with a particular focus on Romania. We employ a mixed-methods approach that integrates quantitative analysis of innovation indicators (R&D investment, patent filings, etc.) with qualitative case studies of leading Romanian tech firms (such as UiPath and Bitdefender). The comparative analysis highlights stark disparities in innovation performance across the EU – Romania lags in R&D spending and patent activity relative to Western Europe – and examines how governance and social factors mediate these outcomes. Our findings show that robust IP law frameworks and proactive IP management are vital for fostering innovation but must be coupled with sound business strategy and governance. Companies that effectively bridge business and IP considerations tend to drive sustainable innovation, balancing competitive advantage with social responsibility. Romanian case studies illustrate both the challenges (e.g. low patenting rates, weaker R&D infrastructure) and opportunities (entrepreneurial talent, global market reach) in aligning digital transformation with IP strategy. The study also underscores the social and governance dimensions of sustainability: transparent IP governance, ethical technology

deployment, and inclusive innovation practices emerge as key drivers for long-term success. In conclusion, we provide insights into policy and management practices that can enhance innovation ecosystems – recommending stronger IP support mechanisms, cross-sector collaboration, and embedding environmental, social, and governance (ESG) principles in digital transformation initiatives. This research contributes to a deeper understanding of the nexus between business administration and IP law in the digital era and offers guidance for EU and Romanian stakeholders to promote innovation that is not only competitive but also socially and environmentally sustainable.

Keywords: Digital Transformation; Intellectual Property Law; Innovation; Sustainability; Business Administration; Romania; European Union; Governance; Social Responsibility.

E.11. ETHICS AND CORPORATE SOCIAL RESPONSIBILITY IN EUROPEAN SUSTAINABLE BUSINESSES

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Abstract. European companies are facing increasing pressure to integrate ethical practices and corporate social responsibility (CSR) into their sustainability strategies. This article examines the specific challenges and solutions across different economic sectors, highlighting how cultural factors, regulations, and market demands influence corporate approaches. Furthermore, the article provides a rationale for why sustainability is no longer optional but a prerequisite for business survival in Europe.The study adopts an interdisciplinary perspective, combining insights from economics, business ethics, environmental law, and sustainable management.

Keywords: ethical business models; companies; sustainability; challenges; innovation and competitiveness.

E.12. THE IMPACT OF STOCK EXCHANGE DEVELOPMENT ON ECONOMIC GROWTH IN ROMANIA

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Abstract. This paper aims to present the role and importance of the Romanian stock exchange in the country's economic growth.In Romania, the development of the capital market plays an important role in promoting economic growth through various levers, such as: facilitating companies' access to financing, attracting domestic and foreign investors, reducing the cost of capital, etc.The study reveals a positive correlation between stock market development and economic growth in Romania.

Keywords: stock exchange; capital market; economic growth.

E.13. AI-DRIVEN ECONOMIC INSIGHTS INTO ENERGY RESOURCE CONSUMPTION: A REVIEW STUDY

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Abstract. This review explores the role of Artificial Intelligence (AI) in the economic and financial analysis of energy resource consumption. As industries face increasing pressure to optimize energy usage and reduce operational costs, AI-based tools offer advanced methods for forecasting demand, identifying inefficiencies, and supporting strategic decision-making[1]. Techniques such as machine learning, predictive analytics, and intelligent control systems enable more accurate assessments of energy impact on financial performance[2, 3]. The integration of AI in this context not only improves resource efficiency but also enhances economic sustainability. This paper aims to provide a structured overview of current AI applications in analysing the financial implications of energy consumption and their potential for driving informed, data-based energy management strategies.

Keywords: artificial intelligence; energy resource; consumption.

E.14. LIFESPAN EVALUATION UNDER CYCLIC LOADING: AN ECONOMIC PERSPECTIVE

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Abstract. This study delves into analytical and computational approaches for assessing fatigue behavior, enabling accurate predictions of component durability. Lifespan evaluation under cyclic loading plays a pivotal role in engineering design, with direct implications for structural integrity and economic efficiency. The integration of lifespan evaluation into engineering practices reduces unexpected failures, optimizes resource allocation, and minimizes maintenance costs, thus yielding substantial economic benefits. By aligning technical advancements with economic objectives, the research underscores the value of incorporating lifespan analysis into the design and lifecycle management of load-bearing components. This perspective highlights the critical balance between technical rigor and cost-effectiveness in ensuring sustainable engineering solutions.

Keywords: Lifespan; Fatigue; Cost-effectiveness.

E.15. RESILIENCE THROUGH ENGINEERING AND MANAGEMENT: SUSTAINABLE INNOVATION FOR A CHANGING WORLD

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Abstract. In an increasingly complex global context, marked by accelerated climate change, energy crises, economic instability and resource pressures, engineering and management are gaining a strategic role in shaping a sustainable future. This article explores how modern engineering approaches, combined with innovative and adaptable management practices, can generate viable solutions to the most pressing global problems. It analyzes emerging trends in

the development of green infrastructure, the integration of digital technologies in industrial processes and the streamlining of supply chains in the spirit of the circular economy. Through concrete examples from industries such as energy, construction and manufacturing, the article highlights the impact of data-based management decisions, multidisciplinary collaboration and innovation orientation. At the same time, it emphasizes the importance of responsible leadership, capable of integrating sustainability into organizational strategies and responding quickly to the uncertainties of the global environment. Thus, an integrated vision is proposed in which engineering and management are not just operational tools, but engines of systemic change and essential pillars for ensuring social, economic and ecological resilience on a global scale.

Keywords: sustainable engineering; global crises; green infrastructure; energy transition; green technologies; urban resilience; decarbonization; smart solutions; climate adaptation.

E.16. LOGISTICS IN OIL WELL DRILLING

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Abstract. In the specialized literature, it is known that logistics is associated with a competitive advantage for modern companies. Due to the special competitiveness, the current geopolitical and economic context, both in the upstream and downstream markets, companies resort to logistics activities to increase market performance. The field of logistics has recorded truly spectacular chances, some of a practical nature, others of a conceptual nature, these materializing in the reorientation of the focus on physical distribution, to the analysis of the entire logistics system of information analysis, transportation, inventory, storage, handling, packaging, delivery and after-sales support. After analyzing the logistics system of two companies producing well drilling equipment, the paper presents an integrated logistics management model with a focus on after-sales support, which is required both by market competition and customer requirements.

Keywords: logistics; competitive advantage; upstream and downstream markets; well drilling; management model.

E.17. THE EFFICIENCY OF MANAGEMENT IN EU-FUNDED PROJECTS: CHALLENGES AND LESSONS IN THE CONTEXT OF FUND ABSORPTION IN ROMANIA

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Abstract. Accessing and implementing projects financed through European Union funds represents a strategic pillar for supporting sustainable economic development and reducing regional disparities. In this context, project management efficiency becomes a key factor in maximizing the impact of European funding. This paper investigates the recurring challenges encountered in the management of EU-funded projects in Romania, focusing on strategic planning, resource allocation and management, monitoring and evaluation, as well as ensuring the sustainability of outcomes post-implementation. The analysis is based on a combination of relevant case studies and data collected through questionnaires administered to project managers from various regions and sectors. Key dysfunctions identified include excessive bureaucracy, the lack of specific competencies within implementation teams, delays in approval processes, and difficulties related to co-financing and eligibility criteria. The study also highlights the importance of adaptive leadership and the use of modern project management tools to prevent deviations and ensure the achievement of targeted objectives. The paper proposes a set of best practices and recommendations aimed at enhancing the professionalization of management

teams, digitalizing administrative processes, increasing transparency, and improving the institutional framework. These measures can significantly contribute to enhancing the absorption of European funds and strengthening the implementation capacity of projects in Romania, thereby supporting sustainable regional development and fostering economic convergence at the European level.

Keywords: EU projects; efficiency; funding absorption; challenges; good practices.

E.18. THE ADAPTABILITY OF ROMANIAN SMES TO ECONOMIC VOLATILITY: MANAGERIAL APPROACHES AND SUSTAINABLE PERSPECTIVES

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Abstract. In the current economic environment - characterized by heightened uncertainty, accelerated digitalization, and inflationary pressures - small and medium-sized enterprises (SMEs) in Romania face a constant need to adapt their managerial strategies to maintain viability and competitiveness. This paper investigates how SMEs respond to these challenges through the development of organizational flexibility, innovation in internal processes, and the integration of digital technologies into economic decision-making. The analysis encompasses both reactive and proactive adaptations, emphasizing managerial capacity to anticipate market shifts and build agile structures. By employing a mixed-method approach - qualitative (semi-structured interviews) and quantitative (standardized questionnaires) - on a sample of SMEs operating across diverse sectors (industry, services, commerce), the study identifies best practices as well as common barriers to adaptation. A positive correlation is observed between the level of digitalization and the speed of strategic response, alongside a pressing need for continuous managerial training to effectively manage change. The findings highlight the importance of institutional support, innovation-oriented public policies, and educational initiatives aimed at entrepreneurs. These factors can play a critical role in strengthening economic resilience and supporting the transition toward sustainable development models. Thus, the paper contributes to a deeper understanding of the mechanisms through which SMEs can navigate economic volatility, offering a reflective framework for the formulation of medium- and long-term strategic measures.

Keywords: Economic volatility; SME; viability; competitiveness|; sustainable perspectives.

F. CHEMICAL & FOOD ENGINEERING

F.1. EFFECTS OF FERTILIZERS/BIOSTIMULANTS DERIVED FROM MARINE RESIDUES ON PLANT GROWTH AND DEVELOPMENT

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Abstract: Several fertilizers/biostimulants were prepared from rockweed (*Ascophyllum nodosum*) and fish (cod, common ling, cusk, haddock, saithe) residues. These residual materials were processed by appropriate methods, obtaining the following products: dried and ground fish residues, pellets and compost based on fish and rockweed residues, and a biostimulant based on rockweed residues. These fertilizers/biostimulants had similar or positive effects compared to commercial products on the growth and development of lettuce and strawberry. Processing seaweed and fish residual materials to produce fertilizers and biostimulants is a promising strategy for improving plant growth and development, while reducing marine residues, which are currently underutilized.
Acknowledgements: This conference presentation is part of the project MARIGREEN which has received funding from the European Union's Horizon 2020 research and innovation program under agreement 817992 and Executive Agency for Higher Education, Research, Development, and Innovation Funding (UEFISCDI).

Keywords: algae residue, biostimulant, fertilizer, fish residue, lettuce, strawberry

F.2. EFFECTS OF BIOCHAR DERIVED FROM VINE RESIDUES ON PLANT GROWTH

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Abstract: The influence of biochar (BC) derived from vine residues on the growth of bell pepper and tomato plants was evaluated for three soil types, *i.e.*, Fluvisol (pH=7.99±0.01), Chernozem (pH=6.26±0.02), and Luvisol (pH=5.40±0.02). BC (pH=9.89±0.01) obtained by slow pyrolysis of vine pruning residues had a beneficial effect on plants grown in the strongly acidic soil Luvisol. This positive effect is due to changes in soil properties, *e.g.*, electrical conductivity, pH, bulk density, soluble nutrient concentrations. The use of strongly alkaline BC as an amendment

for strongly acidic soils is a promising strategy for improving plant growth, while reducing biomass residues.

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Keywords: bell pepper, biochar, pyrolysis, soil amendment, tomato, vine pruning residue

F.3. THE EFFECT OF INORGANIC SALTS ON THE PERTRACTION OF ASPARTAME THROUGH BULK LIQUID MEMBRANES

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Abstract: In this study, the effect of inorganic salts on the pertraction process of aspartame through a bulk liquid membrane based on Aliquat 336 dissolved in chloroform was evaluated. The feed phase consisted of an aqueous solution of aspartame, NaOH, and a salt, *i.e.*, NaCl, Na_2SO_4, NH_4Cl, or $(NH_4)_2SO_4$. Experiments were performed in a tube-in-tube setup using an aqueous HCl solution as the stripping phase. According to data reported in the literature, the salting-out effect of $(NH_4)_2SO_4$ was the most important. $(NH_4)_2SO_4$ determined an increase in the recovery efficiency of aspartame from 73% (in the absence of salt) to 85%.

Acknowledgments: This work was supported by a grant from the National Program for Research of the National Association of Technical Universities - GNAC ARUT 2023.

Keywords: Aliquat 336, aspartame, bulk liquid membrane, chloroform, salting-out effect

F.4. ADVANCED SYNTHESIS OF SULFONYL-SUBSTITUTED PYRROLEFUSED (ISO) QUINOLINE DERIVATIVES

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Abstract. Fused polyazaheterocyclic compounds, such as (iso)quinoline and sulfonamide derivatives, are key structural motifs widely found in natural products and bioactive molecules. Their broad biological activity makes them essential in medicinal chemistry. The integration of multiple pharmacophores into single hybrid molecules has led to improved therapeutic agents with enhanced efficacy and reduced side effects. (Iso)quinoline derivatives, for instance, are central to drug discovery due to their anticancer, antimalarial, antimicrobial, and anti-inflammatory properties. Quinoline-based drugs like chloroquine highlight their clinical relevance. Similarly, sulfonamide and fluorosulfonyl compounds are known for their diverse pharmacological effects, including antimicrobial and enzyme-inhibiting activity. Fluorosulfonyl groups, in particular, improve drug properties like stability and binding affinity, making them valuable in designing covalent inhibitors. These scaffolds remain vital in developing next-generation therapeutics.

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Keywords: Quinoline. Isoquinoline, sulfonamide, monoquaternary salts, [3+2]cycloaddition.

F.5. CHEMICAL CROSSROADS: DOEBNER REACTION AND ITS DIVERGING PATHS

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Abstract. The Doebner reaction is a classical method used to synthesize substituted cinnamic acids via the condensation of aryl aldehydes with pyruvic acid in a basic environment. A variant of the Knoevenagel condensation, it forms α,β-unsaturated carboxylic acids through carbon–carbon bond formation followed by decarboxylation. Its utility in constructing conjugated systems makes it valuable for producing bioactive and functionalized aromatic compounds. Introducing amines into the reaction broadens its versatility, as imine formation can trigger alternative pathways, including the generation of heterocycles like carboxyquinolines, methylcarboquinolines, and pyrrol-2-one derivatives. These products emerge through intramolecular cyclization or enamine intermediates. The nature of starting materials—such as primary or secondary amines and the electronic character of the aldehyde—plays a key role in dictating the product profile. Our objective is to investigate new pathways and conditions in the Doebner reaction to uncover novel compounds and better understand the reaction's potential for complex heterocyclic synthesis.
Acknowledgment This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS/CCCDI - UEFISCDI, project number PN-IV-P8-8.1-PRE-HE-ORG-2023-0048, within PNCDI IV

Keywords: Doebner reaction, quinoline, pyrrolo-2-one, mechanism.

F.6. NEW PYRROLO-1,10-PHENANTHROLINE DERIVATIVES: SYNTHESIS, REARRANGEMENTS AND STRUCTURAL CHARACTERIZATION

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Abstract. A classic ligand in coordination chemistry, 1,10-phenanthroline has attracted considerable attention due to its structural diversity (hydrophobic, basic, aromatic, planar and rigid) and numerous applications. In this study, we investigate the transformation of new 1,10-phenanthroline derivatives, due to their color change upon exposure to air. The initial derivative was obtained through a [3+2] cycloaddition using 1,10-phenanthrolin-1-ium monoquaternary salts and their *in situ* generated ylides. The chemical rearrangements in solvent media produced

the following derivatives. The chemical structures of the all 1,10-phenanthroline derivatives were verified using XRD, ESI-MS, IR, and NMR methods. To comprehend the structures found in the suggested transformation scheme, a conformational analysis was conducted on one of the molecules.
Acknowledgment: This paper is supported by European Union's Horizon Europe research and innovation programme under grant agreement No 101086667, project BioMat4CAST (BioMat4CAST - "Petru Poni" Institute of Macromolecular Chemistry Multi-Scale In Silico Laboratory for Complex and Smart Biomaterials).

Keywords: 1,10-phenanthroline; ESI-MS, NMR spectroscopy conformational studies; DFT calculations

F.7. VALORIZATION OF AGRO-WASTE FROM APRICOT AND PLUM KERNELS: FATTY ACID PROFILE AND THERMAL BEHAVIOR OF COLD-PRESSED OILS

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Abstract: The fruit industry produces higher values of waste causing significant economic losses with an undesirable impact on the environment. One strategy for utilization and valorization of the kernel wasted as by-products of juices and jams consists in using fruits kernel oils due to the presence of various bioactive components like mono and polyunsaturated fatty acids.
This study analyses the fatty acid profile of apricot and plum kernel oils obtained by cold pressing method, a viable green process used for pure oil extraction. The identification and quantification of fatty acids composition – total saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) – was performed by NMR and the predominant acids (oleic, linoleic, palmitic acid) were identified by HPLC-ESI-MS. The thermal profiles of the two oils were analyzed by DSC and TGA. The complex structure of the apricot/plum kernel oils generated complicated thermal profiles, not easily interpretable. The characteristics of the melting curves measured in the heating steps of the heating-cooling-heating experiment, in the negative temperature range, depended on the proportion of saturated/unsaturated oil content. Differences in the shape of peaks, peak temperature values, as well as enthalpy of transition were observed.

Keywords: apricot, plum, kernel oil, waste, HPLC-ESI-MS, thermal properties

F.8. RESEARCH ON THE USE OF DEPROTEINISED WHEY IN BEER PRODUCTION

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Abstract: Preventing waste generation is the top priority of the New Waste Framework Directive (Directive 2008/98/EC), which then places the least emphasis on disposal and more on processing for reuse (valorisation), recycling, and recovery. In a similar vein, the European Union's bio-economy policy needs to be implemented in order to enhance biological resource management, create new markets for food and biobased goods, and protect the environment. Dairy processors must therefore create efficient and lucrative methods of managing whey waste,

especially given the exorbitant prices of the waste treatments used today. The consumers, business, and scientific community are becoming more interested in the recycling and reuse of food and agricultural industry by-products. Deriving added value from otherwise lost food production outputs is a key principle of the circular bioeconomy, even though there is still disagreement over a common definition of this notion. Whey, a by-product generated during the manufacture of cheese and casein-based dairy products, is rich in nutrients and has several commercial uses. This by-product can be used in various value-added products with the help of advanced technologies. Obtaining whey beverages represents a viable solution for valorisation that can be used by cheese producers in our country. The paper proposed the valorisation of deproteinised whey in the manufacture of whey beer. Whey can add fermentable or non-fermentable sugars, to increase the content of mineral substances and to partially replace part of the water used in the beer production process. Among the proposed products, the sample that met with unanimous appreciation was the sample that contained 30% deproteinised whey. It was found that lactose, the component with the highest share of whey, does not influence the taste of the final product. The finished product - whey beer, is a product with properties similar to beer: pleasant, characteristic smell, with hop aroma, pleasant bittersweet taste.

Keywords: by-product, circular bioeconomy, food waste, valorisation, whey beer

F.9. APPLICATIONS OF UNCONVENTIONAL STARTER CULTURES OF MICROORGANISMS IN THE BAKERY PRODUCTS

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Abstracts: The bakery products market represents one of the most significant segments within the agri-food sector, with Romania ranking among the highest per capita consumers of bakery products at the European level. The production of bakery items is intrinsically dependent on the use of microbial starter cultures, which act as biological agents driving alcoholic and lactic fermentations during dough development. Traditionally, industrial dough fermentation has relied almost exclusively on alcoholic fermentation mediated by yeasts of the genus *Saccharomyces*, particularly the species *Saccharomyces cerevisiae*, commonly known as baker's yeast. However, recent advances in microbial ecology and biotechnology have spurred a growing interest in the exploration of non-conventional and diverse microbial taxa, especially in the context of starter cultures curated and optimised by specialists within the baking industry. The application of unconventional microorganisms – such as non-*Saccharomyces* yeasts and lactic acid bacteria (LAB) – has gained momentum due to their capacity to enhance the sensory, nutritional, and functional properties of bakery products. These benefits include improved mineral bioavailability through phytate degradation, the synthesis of bioactive peptides with antioxidant activity, and the generation of antimicrobial compounds that extend shelf life by inhibiting spoilage microorganisms. This paper reviews the current state of research and industrial application of unconventional microorganisms in modern baking. It highlights the evolutionary adaptation of these microorganisms with regard to two critical attributes: fermentative performance and resilience to environmental stresses associated with baking processes. Additionally, their metabolic contributions to the enhancement of bread aroma and overall product quality are examined.

Keywords: alcoholic and lactic fermentations, bakery yeast, lactic acid bacteria, functional properties

F.10. PLUMS AS FUNCTIONAL INGREDIENTS IN BAKERY PRODUCTS: NUTRITIONAL AND TECHNOLOGICAL STUDIES

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Abstract: Fruit-derived ingredients are increasingly utilized in the formulation of bakery products due to their potential to enhance dietary fibre content, particularly through a balanced ratio of soluble and insoluble fibres. These fibres contribute to improved hydration capacity, fermentability, and the overall functional quality of dough systems. Among various fruits, *Prunus domestica* has garnered significant attention in recent years for its health-promoting properties. Plums are rich in phytochemicals, especially phenolic compounds such as anthocyanins, which exhibit potent antioxidant activity. Emerging research consistently highlights their anti-inflammatory, antioxidative, and neuroprotective effects, including potential cognitive and memory-enhancing benefits. The high phenolic content of plums, particularly in their skin, has led to a growing body of scientific inquiry into their applicability in functional foods. Consumed since prehistoric times, plums are highly versatile and can be processed into a range of products, including jams, compotes, jellies, candied fruits, and various forms of baked products. They are also consumed both fresh and dried. Current literature identifies over 2,000 distinct natural compounds present in plum-based foods, reinforcing their significance as a bioactive compounds rich fruit. The application of *Prunus domestica* in the food industry has been extensively documented, particularly in the development of bakery and pastry products, extruded doughs, creams, puddings, and ice creams. This paper highlights the nutritional composition, bioavailability of key phytochemicals, and functional roles of phenolic and flavonoid constituents found in plums. Additionally, it explores the potential of plum-derived compounds in mitigating circulatory, pulmonary, and cardiovascular conditions. The paper advocates for the strategic incorporation of *Prunus domestica* in various processed forms—such as purée, powder, or dried fragments—as a functional ingredient to enhance the nutritional and sensory profile of bakery products.

Keywords: bakery products, bioactive compounds, functional ingredients, plums

F.11. DETECTION OF IBUPROFEN FROM PHARMACEUTICALS USING A SENSOR BASED ON SINGLE WALLED CARBON NANOTUBES

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Abstract: Ibuprofen is a very used pharmaceutical active compound as non-steroidal anti-inflammatory drug being a non-selective COX inhibitor used in the treatment of mild-inflammation, moderate pain, and fever. Detection of ibuprofen is very important and for this reason in this study a novel sensor based on single walled carbon nanotubes was developed and characterized by electrochemical and microscopic techniques. An oxidation peak related to the redox process of ibuprofen was observed by cyclic voltammetry. The current of the peak is linearly dependent with the ibuprofen concentration. The quantification of ibuprofen in pharmaceuticals by using the calibration equation was precise, the results being similar to those reported by the producers.

Keywords: ibuprofen, cyclic voltammetry, carbon nanotube

F.12. SENSITIVE DETECTION OF DOPAMINE IN PHARMACEUTICAL PRODUCTS USING ELECTROCHEMICAL SENSORS BASED ON GRAPHENE DERIVATIVES

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Abstract: For the sensitive detection of dopamine, a very important neurotransmitter from the human body, new electrochemical sensors based on graphene and reduced graphene oxide were developed. The electroactive areas of both sensors were calculated from the Randles-Sevcik equation from the data obtained from the study of the influence of the scan rate in ferrocyanide solution. These were significantly higher comparing with the geometrical area, fact related to the nanomaterials sensitive characteristics. The most sensitive sensor, based on reduced graphene oxide, was used for the detection of dopamine. The limit of detection in the nanomolar range have permits to correct detection of dopamine in commercial injectable solutions with errors lower than 1%.

Keywords: graphene, dopamine, pharmaceuticals

F.13. ELECTROANALYSIS OF GINKGO BILOBA BASED PRODUCTS AND CORRELATION OF THE ELECTROCHEMICAL DATA WITH THE ANTIOXIDANT PROPERTIES

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Abstract: *Ginkgo Biloba* based products are used in practice for the improvement of brain functions. The active compounds from *Ginkgo Biloba* are mostly flavonoids and terpenoids, powerful antioxidants able to scavenge free radicals, responsible with oxidative stress. Determination of total active compounds was carried out by using Folin-Ciocalteu method and the antiradical activity was evaluated by means of DPPH method. The electroactivity of the products was studied by cyclic voltammetry using a glassy carbon electrode obtaining well defined oxidation peaks main related y to flavonoids. The correlations models between spectrometric and electrochemical results have conduct to significant results, with correlation coefficients higher than 0.9. These results confirm the feasibility of the electrochemical analysis in the study of compounds with antioxidant properties.

Keywords: flavonoid, voltammetry, antiradical activity

F.14. DETECTION AND QUANTIFICATION OF FE(II) IN FOOD SUPPLEMENTS BY USING A SCREEN-PRINTED GOLD ELECTRODE

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Abstract: Fe(II) is a very important mineral for the human body and there are in the market numerous products, which can be used in the anemia treatment. In this work a screen-printed gold electrode was characterized by different techniques and after used in the detection and

quantification of Fe(II). When the analyzed solution was 10^{-3}M ferrocyanide a very well-defined peak pair was observed by cyclic voltammetry, with a very good reversibility at low scanning rates. The redox process of Fe(II) in $FeSO_4$/KCl solution is clearly observed and the peak current is proportional with the concentration. The calibration curve was developed by register the cyclic voltammograms in solution of Fe(II) with different concentrations. The limit of detection, in micromolar range, have permit the precise quantification of Fe(II) in several food supplements. The validation of the electroanalytical method was carried out by standard addition method.

Keywords: food supplement, gold electrode, detection limit

F.15. GLASSY CARBON ELECTRODE MODIFIED WITH COBALT(II) PHTHALOCYANINE FOR THE DETECTION OF ANTIOXIDANTS

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Abstract: Cobalt (II) phthalocyanine (CoPc), adsorbed onto a glassy carbon electrode, have been used for the electroanalytic detection of important antioxidants found in red wines. Interaction of the CoPc with the antioxidants was confirmed using UV-visible spectroscopy. The CoPc-modified electrodes electrocatalytically detected the antioxidants at lower potential values comparing to that of an unmodified glassy carbon electrode. Calculated kinetic parameters proved that the modified electrode with phthalocyanine efficiently detect the antioxidants found in red wines. The CoPc-modified electrode could detect the antioxidants in a wide concentration range and also gave good limits of detection in the nanomolar range. The CoPc-modified electrode displayed appropriate stability in the detection of the wine antioxidants.

Keywords: wine, phthalocyanine, antioxidant

F.16. DEVELOPMENT OF A NEW SCREEN-PRINTED ELECTRODE FOR SENSITIVE ELECTROCHEMICAL DETECTION OF DICLOFENAC

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Abstract: Diclofenac (DFC) is a non-steroidal anti-inflammatory drug used for pain and inflammation management, but its improper use can lead to adverse effects and water pollution, highlighting the need for sensitive detection methods. This study investigates the electrochemical characterization and performance of a modified sensor for the detection of diclofenac in aqueous solutions using screen-printed electrodes (SPE). Graphene oxide (GrO) and phenanthroline (Phen) were immobilized on the surface of carbon-based SPEs to enhance electrochemical sensing capabilities. The surface characteristics of the modified electrodes were analyzed by Fourier-transform infrared spectroscopy and scanning electron microscopy, confirming the successful incorporation of GrO and Phen. Electrochemical studies were conducted in phosphate-buffered saline and ferrocyanide/ferricyanide solutions, with the Phen/GrO/C/SPE electrode showing improved electrochemical responses, characterized by enhanced peak intensities and reduced redox potential, which is indicative of efficient electron transfer and sensitivity. Further, cyclic voltammetry was employed to assess the detection of DCF, revealing

a well-defined peak corresponding to 5-hydroxydiclofenac formation, with the Phen/GrO/C/SPE electrode displaying higher sensitivity and lower oxidation potential compared to other sensors. The impact of pH and scan rate on DFC detection was also studied, with optimal conditions identified for accurate monitoring. Therefore, the new chemically modified sensor for diclofenac detection in pharmaceutical products showed improved sensitivity, with a detection limit in the nanomolar range, demonstrating excellent performance, repeatability, and minimal interference for pharmaceutical analysis.

F.17. PALLADIUM PARTICLES BASED ELECTROCHEMICAL SENSORS FOR THE SENSITIVE DETECTION OF PHENYLBUTAZONE

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Abstract: Phenylbutazone (PBZ) is a non-steroidal anti-inflammatory drug used for acute inflammatory pain but also for different types of arthritis. For the sensitive and selective detection of PBZ, a palladium particles-based screen-printed carbon electrodes (SPCEs) was used. As detection technique cyclic voltammetry was employed. In the preliminary analysis performed in 10^{-3} M ferrocyanide/ferricyanide 0.1 M KCl solution, the Pd/SPCE exhibited high peak currents and an I_{pc}/I_{pa} ratio close to 1, indicating a reversible redox process, offering the optimal combination of electron transfer kinetics and redox process reversibility, making the Pd/SPCE promising for sensitive detection of phenylbutazone. The cyclic voltammogram of Pd/SPCE have shown a well-defined oxidation peak of PBZ, correlated with the concentration of analyte in solution. The sensor was successfully used for the quantification of PBZ in pharmaceuticals.

Keywords: phenylbutazone, screen printed electrode, palladium, cyclic voltammetry.

F.18. DETECTION AND QUANTIFICATION OF MELATONIN USING BIOSENSORS BASED ON SCREEN-PRINTED CARBON ELECTRODE MODIFIED WITH GRAPHENE-GOLD NANOPARTICLES-PEROXIDASE

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Abstract: Melatonin (MEL) is a hormone primarily produced by the pineal gland in the brain, although it's also found in other tissues like the retina and the gastrointestinal tract. Its main role is to regulate the body's sleep-wake cycle, or circadian rhythm. This study aims to develop and optimize a biosensor based on screen-printed carbon electrode modified with graphene-gold nanoparticles and peroxidase for the sensitive detection and quantification of melatonin. The objective of this study was to conduct a comparative analysis of two biosensors, with varying amounts of peroxidase solution (5 mg/mL), 10 µL respectively 20 µL immobilized on the biosensors. Cyclic voltammograms were recorded for varying concentrations of melatonin, starting from 2×10^{-3} M MEL stock solution in 0.1 M phosphate buffer (PBS), pH 7. Following the limits of detection (LOD) and limits of quantification (LOQ), the biosensor with the lower amount of enzyme (10 µL) leads to increased sensitivity. This result may be associated with a more optimal enzyme distribution on the active surface of the biosensor.

Keywords: melatonin, peroxidase, cyclic voltammogram, biosensor

F.19. THE MILLERANDAGE - ONE OF THE GRAPEVINE CULTIVATION CHALLENGES IN THE CLIMATE CHANGE CONTEXT

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Abstract: This study investigates the millerandage, a grapevine phisiological disorder exacerbated by recent climate changes, impacting yield and wine quality through uneven berry development within the cluster. Using 2023 data from SCDVV Blaj, Romania, 26 grapevine cultivars were assessed for millerandage severity under adverse climatic conditions occurred during the flowering phenophase. Field observations in two plantations (S1, S2) during BBCH 79 and BBCH 87 revealed significant varietal differences. Cultivars such as Ezerfurtu, Napoca, and Rhin Riesling showed over 35% millerandage, while Pinot noir and Pinot gris remained below 1%. The climatic peculiarities that lead to millerandage were: minimum temperatures under 15˚C; average temperatures under 20 ˚C; heavy rains, especially in the flowering phenophase during BBCH 65; high levels of relative humidity (>80%); low levels of sunlight (121 hours of sunlight during BBCH 65).

Keywords: grapevine, phenophases, millerandage, climatic conditions, field observations

F.20. MULTIVARIATE ANALYSIS-BASED SUSTAINABLE USE OF DIFFERENT CURRENT BAKING WHEAT LOTS FROM ROMANIA AND HUNGARY

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Abstract: Real-time wheat grain quality assessment could enhance bakery product quality and baking efficiency. The quality assessment of wheat grains can be performed using modern, non-invasive techniques based on near-infrared spectrophotometry (NIRS). With NIRS, the evaluation of gluten content (WetGL), protein content, Zeleny index (ZelenyIdx), grain humidity (Ur), and others was conducted. This study involved eleven wheat lots from Romania and Hungary. Following the NIRS analyses, the Romanian variety Crisana recorded the highest values for quality parameters, comparable to the Hungarian variety Bekes from Hajdu Bihar County. Statistical analysis was carried out using multivariate techniques (Multivariate Analysis of Variance (MANOVA), P = 0.05, linear discriminant analysis (LDA), and hierarchical cluster analysis (HCA)), highlighting the batches of wheat grains suitable for mixing to obtain high-quality raw material for the bakery industry.

Keywords: wheat grains, near-infrared spectrophotometry, quality chemical analysis, multivariate analysis.

F.21. THE ROLE OF NUTRITION IN DISEASE PREVENTION

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Abstract: Nutrition plays a crucial role in the prevention of chronic diseases, especially in the Romanian context, where the leading cause of death is cardiovascular disease, followed by diabetes and cancer. The main risk factor for these diseases is poor nutrition (23% in Romania vs. 17% in the EU), followed by tobacco use (17% in both Romania and the EU), alcohol consumption (7% in Romania vs. 6% in the EU) and air pollution in Romania (7%) in the EU vs.

In Romania, dietary habits show a high intake of total and saturated fats (20% above recommended levels), resulting in fats accounting for 41% of total energy intake, compared to the recommended 15–30%. Cholesterol intake exceeds double the maximum dietary recommendation (660 mg/day vs. 300 mg/day). In contrast, fiber intake is significantly below the recommended level (11 g/day vs. 25–30 g/day).

Studies indicate that a high intake of dietary fiber reduces the risk of colorectal cancer, and people who followed a diet rich in fruits, vegetables, and whole grains, combined with regular physical activity, experienced a 67% lower incidence of cardiovascular disease and a 64% reduction in cognitive decline. Research on predominantly plant-based diets has shown lower rates of heart disease, diabetes, and cancer. Consumption of omega-3 and omega-6 fatty acids has been shown to provide protective effects against various types of cancer, highlighting the importance of including fish, flaxseed, and nuts in the diet.

Excessive consumption of ultra-processed foods (UPFs) has been associated with a higher prevalence of type 2 diabetes, with the risk increasing by 17% for every 10% increase in UPF intake. Additionally, studies on organic diets suggest that people who consume organically grown foods may have lower rates of obesity and reduced health risks associated with pesticide exposure .

In conclusion, the study emphasizes not only the importance of diets centered on whole, minimally processed foods—rich in fiber, healthy fats, and essential micronutrients—but also the need to develop innovative high-fiber food products, raise public awareness on proper nutrition, and promote the consumption of foods with low pesticide content.

Keywords: nutrition, prevention diseases

F.22. PHYSICO-CHEMICAL ANALYSIS OF PLANT-BASED RAW MATERIALS USED IN MEAT ANALOG MANUFACTURE

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Abstract: Expanding the range of plant-based food products, especially where animal proteins are replaced with plant-based ones, given the negative impact of animal farming on the environment, is of great interest. The purpose of the research was to investigate the physico-chemical characteristics of different plant-based sources rich in protein, chickpea flour (CPF), hazelnut oil cake (HOC), soy protein isolate (SPI) and concentrate (SPC), and pea protein isolate (PPI) for their subsequent use in the manufacture of meat analogs. For the performed analyzes, standard methods were used. CPF, despite its high dry matter content (91.60%), has lower protein content (22.05%) and moderate water retention capacity (3.88 g/g). This indicates limited functionality in mimicking meat texture and needs blending with higher protein sources, increasing formulation complexity. Due to its high starch content (35.15%), CPF is suited for

extrusion and allows for fibrous textures. HOC had relatively high antioxidant capacity (6.57%), high aromatic aminoacids, and moderate protein content (34.98%). HOC had advantages due to its origin as a by-product of oil production, promising as a functional ingredient in formulations aimed at oxidative stability. The lower essential amino acid profile (85.08 g/kg) of HOC limit its independent use in high-protein products. CPF and HOC offer cost reduction and sustainability but require optimization to match the protein density and sensory appeal of soy- and pea-based ingredients. PPI is ideal for manufacturing high moisture meat analog by extrusion due to its solubility and gel-forming properties. It is characterized by high protein content (76.00%) and high functional properties, including the highest amino acid composition for lysine (45.81 g/kg) and leucine (66.71 g/kg). SPC is characterized by a balanced protein content (52.80%), moderate moisture retention (4.97 g/g), and a strong composition of essential amino acids, particularly lysine (25.81 g/kg). SPC could improve freeze–thaw stability of product. SPI, with the highest protein content (80.50%) and water-holding capacity (5.54 g/g), provides optimal texture and nutrition but may require formulation adjustments to manage its foaming and emulsifying properties. SPI outperforms other analogs in essential amino acid content (251.6 g/kg) and water-holding capacity (5.54 g/g), making it a versatile ingredient for meat analogs. The use of CPF, HOC, PPI, SPC, and SPI as meat analogs offers significant sustainability benefits by reducing the environmental impact associated with traditional meat production.

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Keywords: plant-based materials; meat analogs, physico-chemical analysis, sources of plant proteins.

F.23. TOWARD A NATIONAL FRAMEWORK FOR THE SCIENTIFIC CLASSIFICATION OF PROCESSED FOODS: A FAIR-ALIGNED METHODOLOGICAL APPROACH

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Abstract: The degree of food processing significantly influences both the nutritional value of products and consumer perception, while also affecting transparency within the food chain and the effectiveness of regulatory policies. In the Republic of Moldova, the absence of a scientific classification system adapted to national realities hinders the implementation of coherent measures for processed food labeling and regulation. This study aims to develop a scientific methodology for the classification of processed foods, aligned with the FAIR principles (Findable, Accessible, Interoperable, Reusable), to support national initiatives in regulation, research, and voluntary labeling. The approach involved: (1) collecting and systematizing data on over 200 processed food products from the Moldovan market, using sources such as labels, EFSA, Open Food Facts, and USDA; (2) conducting a comparative analysis of international classification systems (NOVA, SIGA, IARC-EPIC); (3) designing a preliminary classification scheme that integrates technological (type and extent of processing), nutritional (ingredient and additive profiles), and contextual (market-specific) criteria; (4) organizing expert consultations, workshops, and focus groups to conceptually test the proposed scheme.

A preliminary version of the classification scheme was developed, structured by levels of processing and key nutritional attributes, with potential applicability in research, regulation, and voluntary front-of-pack labeling. A pilot database prototype was also created, compliant with FAIR principles, incorporating structured metadata and detailed product sheets. The validation events provided initial insights into the practical relevance of the model and highlighted directions for further refinement.

The preliminary results suggest a promising foundation for the continued development of a nationally adapted methodology for processed food classification. Upcoming stages will involve

broader testing and technical consolidation, with the aim of exploring its potential integration into national food policy and regulatory frameworks.

Acknowledgments: National Agency for Research and Development (NARD), grant number 23.70105.5107.05, for the project "Exploratory analysis of food security in the Republic of Moldova based on metrics of sustainable and nutritional quality (SNuQ) of food products", conducted at the Technical University of Moldova.

Keywords: processed food classification, scientific methodology, food regulation, FAIR principles, voluntary labeling, food security, Republic of Moldova

F.24. NUTRITIONAL INTERVENTIONS AND TELOMERE INTEGRITY: EMERGING EVIDENCE ON THE IMPACT OF DIETS ON CELLULAR LONGEVITY

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Abstract: Telomeres, protective structures located at the ends of chromosomes, represent a key biomarker of cellular aging and susceptibility to chronic diseases. Current literature suggests that nutrition may influence telomere integrity through metabolic, epigenetic, and anti-inflammatory mechanisms. However, the optimal types of dietary interventions for preserving telomere length remain poorly defined.

The aim of this article is to critically evaluate recent scientific evidence on the impact of various nutritional interventions on telomere length in adult populations, including healthy individuals, overweight individuals, and those with metabolic risk.

Methodology: A systematic search was conducted in the Scopus database using relevant Boolean operators to identify randomized clinical trials published between 2000 and 2025. After applying eligibility criteria, 27 full-text, open-access articles were selected. The selection process followed the PRISMA guidelines, using a flow diagram for transparency. The included studies were comparatively analyzed based on intervention duration, dietary composition, telomere measurement methods (qPCR), and outcomes related to anthropometric and metabolic parameters.

Dietary interventions involving moderate caloric restriction (15–30%), increased protein intake (up to 30% of total energy), or adherence to a Mediterranean-type diet were associated with significant maintenance or elongation of telomeres, especially in overweight women. The observed changes ranged from +3% to +7% telomere elongation over periods of 4–24 months, compared to up to −8% shortening in control groups. The effects were more pronounced in multidimensional interventions that also included physical activity or stress reduction. In contrast, short-term nutritional interventions (<12 weeks) without substantial dietary changes did not produce significant effects on telomere length ($p > 0.05$).

Macronutrient composition**,** overall dietary quality, and intervention duration are key factors influencing telomere integrity. Available evidence supports the potential of personalized and sustainable nutritional interventions to slow down cellular aging processes. Further research is needed to elucidate the underlying molecular mechanisms and to define evidence-based dietary guidelines for telomere protection.

Acknowledgments: Institutional Project 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova

Keywords: telomeres, nutritional interventions, hypocaloric diet, protein intake, cellular aging.

F.25. STABILIZATION OF GRAPE POMACE POLYPHENOLS VIA LIPOSOMAL ENCAPSULATION

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Abstract: Food safety and quality preservation are critical challenges for the food industry, primarily due to the oxidative degradation of bioactive compounds, which may contribute to health risks such as cardiovascular diseases, diabetes, and cancer. Plant-derived polyphenols are recognized as potent natural antioxidants capable of protecting food products from oxidative damage, thereby enhancing their shelf-life and nutritional value. Liposomal encapsulation has emerged as an innovative and effective method for improving the stability and bioavailability of these sensitive bioactive compounds. This study investigates the stability of grape pomace polyphenols encapsulated into liposomal formulations by evaluating their encapsulation efficiency, retention rate, and the total amount of encapsulated polyphenols. Two liposomal formulations were developed using an adapted heating method (*modified Mozafari method*): polyphenols dissolved in distilled water (PDW) and polyphenols dissolved in ethanol (PEt). Results indicated that the aqueous formulation exhibited a higher encapsulation efficiency (EE) of 89.59±2.47%, compared to the ethanolic formulation, which showed a slightly lower value of 84.13±1.89%. After four weeks of storage, the retention rate was also superior for the aqueous formulation, reaching 84.79±1.59%, whereas the ethanolic formulation demonstrated a retention rate of 79.18±0.93%. Additionally, the aqueous formulation contained a higher amount of encapsulated bioactive compounds. These findings highlight the superior performance of water-based liposomal formulations in preserving polyphenolic compounds, suggesting potential advantages for food applications through enhanced stability and improved efficacy in protecting bioactive antioxidants.
Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: bioactive compounds, liposomes, stability, quality, antoxidants

F.26. THE USE OF WALNUT MEAL (*JUGLANS REGIA* L.) THE COOKIES PRODUCTION

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Abstract: Processing walnut meal in the food industry contributes to increasing the nutritional value, being rich in vegetable proteins, which makes them ideal for use in low-protein diets. By processing meal, the by-products obtained from oil extraction are utilized, thus reducing waste and contributing to sustainability in the food industry. The use of meal walnut meal in the food industry allows the creation of new and varied products, contributing to the diversification of the market offer. Partial replacement of wheat flour with nut meal flour improves the quality of baked goods. The product acquires an original taste, smell and color, there is an increase in the swelling capacity and a decrease in the hardness of the product, which is due to the composition and properties of protein substances in the oilseed meal. This paper presents results on replacing wheat flour with walnut meal in concentrations of 1.0, 3.0, 5.0 and 7.0% in biscuit recipes. The physico-chemical parameters were determined according to the normative and legislative documents in the field of bakery.

The results of the present research described the following values: moisture 7.69 ± 0.12%, ash content 2.66 ± 0.28%, lipid mass fraction 13.4 ± 0.17%, water activity 0.211± 0.43; swelling index – 120 ± 17%; alkalinity – 0.4 ± 0.9 degrees. The control sample of the analyzed biscuits shows that as the proportion of oilseed meal increases, the color becomes significantly darker due to the relatively high tannin content. Thus, the biscuit sample containing 5% walnut meal has an intense brown color. Sensory analysis of the cookies showed that the highest average score was given to 5 % (4.8 points). Research has proven that walnut meal is a rich source of plant-based protein, extractable phenolic antioxidants (polyphenols, tannins), microelements, carbohydrates, fiber, pigments, and other compounds with functional properties. It can be used to fortify foods that are low in protein.
Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: quality indices, walnut meal, swelling capacity, bioactives.

F.27. TECHNOLOGICAL VALUE OF LOCAL GRAPES IN THE CONTEXT OF CLIMATE CHANGE

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Abstract: In the wine year 2023 - 2024 the climatic conditions were less favorable for the development of vines, high temperatures and drought this summer led to rapid ripening of grapes with low productivity. According to the State Hydrometeorological Service in the winter of 2024 were recorded - minimum temperatures (up to minus 16.8 °C), which caused the wilt of the central buds in some plantations. Spring frosts (up to minus 1.4-6.0 °C), which were recorded on 09 - 10.03.2024, large temperature variations caused uneven weeping of vines. In April, in the vineyards surveyed by the National Board of Vineyards, the air temperature in the vineyards ranged from +1,4...+29,8 °C, and the soil temperature at a depth of 20...30 cm - ranged from +8,7...+20,4 °C. The paper investigated the climatic conditions of 2023 and 2024 in terms of vine development and dry wine production in the context of climate changes. The research was centered on agrobiological, uvological and technological analyses of the composition of grapes harvested as: Viorica from different areal of the Republic of Moldova and with the production of raw material wines. In 2024, compared to 2023, the ripening of berries commenced 15 to 20 days earlier. A reduction in grape yield of 20–50% was observed, accompanied by a 30 - 40% decrease in must yield. High temperatures and low humidity resulted in low acidity and rather high sugar content, which is a significant problem not only in the southern areas of Moldova. Insufficient flavor intensity was also found. The pedoclimatic conditions of the Republic of Moldova are characterized by rich heliothermal resources, are very favorable for the cultivation of vines, producing high quality dry wines. By examining the organoleptic, physico-chemical indices and sensory profiles of the wines produced from different areas we can conclude that the wines produced were of good quality with expressed aromatic complexity.
Acknowledgment: The research was funded by Institutional Project 020405 Bio-OpTehPAS „Optimizing food processing technologies in the context of the circular bioeconomy and climate change", running at Technical University of Moldova

Keywords: climatic conditions, vines, autochthonous grapes, wine raw material, alcoholic fermentation.

F.28. COST-EFFECTIVE SORBENTS FOR REMOVING PHTHALATE RESIDUES FROM WATER

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Abstract: Biochars are sustainable materials that can be produced by pyrolysis of cost-effective biomass sources, such as agricultural waste. With high carbon content and physicochemical stability, biochars show significant potential for environmental applications. The study focused on the preparation and characterization of biochar obtained from apple waste, activated and functionalized with metal oxides, obtained by green synthesis (Fe_3O_4 and NiO), as well as on testing the extraction capacity of phthalate residues – di-butyl (DBP) and bis(2-ethylhexyl)phthalate (DEHP) from water. The green synthesis of metal oxides was carried out in the presence of *Urtica dioica* L. extract, which was previously characterized for its total polyphenolic content and antioxidant capacity. The sorption activity was tested on 11 experimental samples of functionalized biochars, as a result, 3 samples with significant sorption activity towards phthalates were selected. Phthalate solutions were prepared from individual substances - DBP (99.8%) and DEHP (99.7%) PESTANAL from SIGMA-ALDRICH®, which were used for sample contamination. The interaction of the sorbent with the phthalate was carried out in a sealed container with constant stirring, at room temperature. The extraction of the phthalate was carried out with chloroform in the presence of an internal standard. The separated organic extract was dried with anhydrous sodium sulfate. The detection of phthalates was carried out with a GCMS-QP-2010S (IS), on a Restek - Rtx-5MS silica column (30 m/0.25 mm/0.25 µm 5% diphenyl phase 95 % di-methylpolysiloxane). The selected biochars showed the highest adsorption efficiency for DBP (74.98%), which highlights the sustainable of apple waste derivatives fortified with synthesized metal oxides for environmental applications, especially for the removal of plastic-derived pollutants from water. However, the sorption properties of materials on real samples may vary in real systems, which implies the need to test biochars in the presence of competing reactions with cations, anions, dissolved gases, hydrocarbons and other natural water pollutants.
Acknowledgments: The research was funded under the international collaborative consortium COFUND-WATER4ALL-DIME, Joint Call 2022 of the European Partnership 101060874 — Water4All and 23.80013.7007.1M. “Developing innovative solution for mitigation of drought effects”, being implemented at the Technical University of Moldova.

Keywords: biochars, apple waste, metal oxides, Urtica dioica L. extract, phthalates, adsorption efficiency.

F.29. EXPLORING THE PHYSICAL AND QUALITATIVE CHARACTERISTICS OF MUFFINS WITH THE ADDITION OF YEAST WINE SEDIMENT

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Abstract: The winemaking industry produces large quantities of residual yeast annually, which is often considered agro-food waste. This by-product contains valuable bioactive compounds such as proteins, polyphenols, dietary fiber, beta-glucans, and minerals. The present study aimed to sustainably valorize wine yeast by incorporating it into bakery products—specifically, muffins. The research focused on two local white wine varieties, Viorica and Feteasca Regală,

testing formulations in which vegetable fat was partially replaced with residual yeast at levels of 20%, 35%, and 50%. The yeast was analyzed for its compositional and physicochemical properties, revealing substantial concentrations of nutrients and antioxidants. Muffin prototypes were evaluated in terms of color, texture, microbiological stability, and sensory attributes. A significant caloric reduction was observed in samples containing 50% yeast, alongside an overall improvement in nutritional content. Product texture became denser and firmer, and color intensity increased. All samples complied with microbiological and physicochemical food safety standards. Sensory evaluation confirmed good consumer acceptability. This research supports the principles of the circular bioeconomy by demonstrating that residual wine yeast can be transformed into a functional ingredient for health-promoting food products, contributing to waste reduction and nutritional diversification.

Acknowledgments: Institutional Project 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova

Keywords*:* flour confectionery, residual lees, local varieties, circular bioeconomy.

F.30. STUDY OF THE PHENOLIC CHARACTERISTICS OF WINES FROM THE INDIGENOUS GRAPE VARIETIES FETEASCA NEAGRĂ AND RARA NEAGRĂ

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Abstract: Proanthocyanidins, phenolic compounds found in grapes and wines, are oligomers and polymers of flavan-3-ols that play a crucial role in defining the sensory properties of red wines. These compounds contribute to the structure and intensity of color, influence astringency, and enhance aromatic balance, significantly impacting the overall quality of the final product. This research focused on analyzing the phenolic profile of the indigenous grape varieties Feteasca Neagră and Rara Neagră, with particular attention to the procyanidin content and its impact on wine quality.

The wines studied were produced in the micro-winery Laboratory of the Oenology Department at the Technical University of Moldova, using different winemaking techniques and grapes sourced from various viticultural regions of the Republic of Moldova. The phenolic composition analysis was conducted using spectrophotometric methods to determine color indices and anthocyanin content, the Foling-Ciocalteu method to assess the total phenolic compounds, and the Bate-Smith method for proanthocyanidin determination. All analyses followed the standards established by the technical regulation HG 708/2011 on wine analysis methods. The results indicated that although wines produced from the same grape variety but grown in different regions exhibit similar physicochemical properties, geographical factors significantly influence organoleptic characteristics. Furthermore, it was observed that Rara Neagră has a lower content of phenolic compounds compared to Feteasca Neagră, which explains the lower color intensity of wines obtained from this variety. The study highlights the value of indigenous Moldovan grape varieties and their contribution to the production of high-quality wines, demonstrating the viticultural potential of the Republic of Moldova.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords*:* proanthocyanidins; phenolics; winemaking; red wines Feteasca Neagră; Rara Neagră.

F.31. EFFECTS OF STARTER CULTURES ON THE QUALITY CHARACTERISTICS OF WINES FROM "ȘTEFAN VODĂ" PGI

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Abstract: Recent studies emphasize the significance of grape berry microbiomes of different geographical origins and varieties, along with winemaking practices and climatic conditions, which has led to the suggestion of *microbial terroir*. A sustainable application of the grape microbiome would be the selection and multiplication of specific microorganisms (starter cultures) to be used for fermentation, which could preserve the wine authenticity from the specific geographical area.
Red grapes of Cabernet Sauvignon and Merlot varieties were taken from the vineyards of Javgur village, "Ștefan Vodă" PGI and processed under microwinery conditions within the Oenological Research Center of the Technical University of Moldova. The physico-chemical analyses of grapes and wines were performed to establish the basic composition and polyphenolic composition and chromatic characteristics following official OIV practices.
The content of phenolic compounds of studied varieties are characteristic of wines from the Southern region of Moldova, especially that the 2024 year in the Republic of Moldova was characterized by an extremely high temperature and a significant drought. Nevertheless, the content of phenolic compounds of the Cabernet Sauvignon variety is higher compared to that of Merlot, due to a high technological reserve of phenolic compounds. The studied dry red wines obtained by fermentation with starter cultures were characterized by a high concentration of alcohol, the concentration of titratable acids changed insignificantly, as well as the variation of the pH index values. Regarding the chromatic indices, it can be observed that Cabernet Sauvignon wine has a colour intensity with about 6,5 % higher than in the case of Merlot wine, which is specific for these varieties. The colour hue is only 1 % bigger in the case of Merlot wine compared to Cabernet Sauvignon. This specificity grants them a better resistance and a higher color stability during the aging process.
This study reflects that using starter cultures, complete fermentation takes place fast, and more alcohol is formed compared to spontaneous fermentation, the sensorial characteristics are specific to the grape variety and terroir characteristics, and also a high resistance to microbial alterations.
The results pointed out that the use of selected starter cultures can ensure a balanced wine and it also may develop wines to support their geographical authenticity.
Acknowledgments: The research was supported by Young Researchers Project "Valorisation of the indigenous flora of Ștefan Vodă wine-growing region in order to increase the authenticity and competitiveness of Moldovan wines" (23.70105.5107.04T), being implemented at the Technical University of Moldova.

Keywords: authenticity; grape microbiome; indigenous flora; starter cultures; wine.

F.32. PHYSICOCHEMICAL ANALYSIS AND APPLICATION OF GRAPE SEEDS AND POMACE IN FUNCTIONAL FOODS

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Abstract: The issue of the reuse of by-products of viticulture remains relevant for researchers in the Republic of Moldova. The by-product of the vinification process is grape pomace, which presents a mixture of skins, pulp residues, and about 18-25 % of seeds. The seeds are rich in biologically active substances, such as tannins, organic acids, flavonoids, tocopherols, vitamins

A, C, D, P, B-complex vitamins, minerals, fiber, and oil. Grape seed is known for its benefits in preventing cardiovascular diseases due to the presence of flavonoids and regulating intestinal transit due to its fiber content. Thus, grape seeds represent a promising source of new functional food products. This study aimed at a physicochemical analysis of seeds and pomace obtained from grape seeds after oil extraction. The results showed that the mass fraction of oil in grape seeds is 10.09%, in pomace - 8.42%, mineral content in seeds 1-2%, in pomace 4.49%, mass fraction of moisture in seeds 8-10%, in pomace 6.31%. The analysis of the obtained results shows that grape seeds and grape pomace are valuable sources of biologically active compounds. Due to its texture, grape pomace can be used in finer food systems and increases the nutritional value of the finished product. In baking technology, grape seed the skin added during bread baking instead of wheat flour improves the composition of the finished product, providing significant nutritional benefits. It has a positive effect on physicochemical parameters and sensory characteristics. The results of this study indicate the need for further research on the valorization of grape seeds and pomace, to find new uses and formulations for the development of functional food products. Grape seeds and pomace obtained from them are promising sources for innovative food products that contribute to the health of consumers and the reduction of waste in the wine industry.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: by-products, bioactive compounds, oil extraction, nutritional enhancement, bakery, waste valorization

F.33. TECHNOFUNCTIONAL AND SENSORY IMPACT OF HEMP SEED PROTEIN CONCENTRATE ON THE QUALITY OF ENRICHED CHOUX PASTRY

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Abstract: In response to the increasing demand for sustainable plant-based protein sources, this study explored the application of hemp (*Cannabis sativa* L.) seed cake protein concentrate (HPC) in laminated pastry systems. This study investigated the effects of incremental incorporation of HPC into choux pastry formulations, evaluating its influence on structural, nutritional, sensory, and chromatic properties. Six experimental variants were formulated by replacing wheat flour with 1–20% HPC, while maintaining constant hydration and lipid ratios. Physico-chemical parameters (moisture, water activity, acidity), volume characteristics (AACC 10-05.01), and baking loss were systematically assessed. HPC addition significantly increased total protein (from 8.23% to 11.32%) and moisture content, while reducing carbohydrate levels and water activity, reflecting improved hydration and protein matrix formation. Pearson correlation analysis revealed strong positive associations between HPC level and internal volume ($r = 0.98$), alongside inverse correlations with water activity ($r = -0.96$) and baking loss ($r = -0.75$). Sensory profiling using the Check-All-That-Apply (CATA) method and Cochran's Q test ($P < 0.05$) identified "light and fluffy" and "pleasant aftertaste" as dominant attributes in 10–15% HPC formulations. Colorimetric measurements indicated progressive crust darkening (L^* reduced from 89.62 to 82.38) and significant ΔE shifts. Amino acid profiling of HPC-fortified samples revealed enhanced levels of leucine, threonine, and arginine. These findings position HPC as a sustainable protein enhancer with desirable techno-functional effects in aerated pastry matrices.

Acknowledgments: The research was supported by Moldovan Government within State project of Young Researchers no. 24.80012.5107.06TC "Waste sustainable utilization from the oil industry" running at Technical University of Moldova.

Keywords: Cannabis sativa L., choux pastry, hemp protein concentrate, functional ingredients, sensory evaluation, CATA method, sustainable food formulation.

F.34. APPLICATION OF MUTUAL INFORMATION ANALYSIS IN DETERMINING THE EFFECT OF ULTRASOUND AND MICROWAVES ON THE JOSTABERRY EXTRACTS BIOLOGICAL VALUE

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Abstract: Jostaberries combine the characteristics and phytochemical properties of the berries of *Ribes nigrum* and *Ribes divaricatum*. Josta hybrid varieties are sources of notable nutritional value, due to their increased content of biologically active compounds, such as fiber, carbohydrates, phenolic compounds, vitamins, and minerals. The aim of this work was to apply mutual information analysis in determining the effect of ultrasound (UAE) (5, 10, 15, 20, 25, and 30 min) and microwave (MAE) durations (2, 4, and 6 min) at different magnetron powers (100, 180, and 300 W) on the biological value of jostaberry extracts: total polyphenol content (TPC), total flavonoid content (TFC), total antocyanin content (TA), antioxidant activity (AA) - DPPH, and ABTS and pH. The extracts of frozen (FJ), freeze-dried (FDJ) and oven dried (DJ) jostaberries were used for the determination of biological value. To determine the influence of UAE and MAE on TPC, TFC, TA, AA (DPPH, ABTS) and pH, in jostaberry extracts (FJ, FDJ, DJ) the MATLAB program was used (MathWorks, Inc., Natick, MA, USA). The results of mutual information, measured in bits. The higher the bit value, the more pronounced the influence of the extraction methods. It was shown that the duration of ultrasound application significantly influenced TA content (mutual information 0.367 bits) and TFC (mg QE/g DW) (0.329 bits). Increasing the duration of ultrasound application influenced TPC (0.212 bits), TFC (mg RuE/g DW) (0.199 bits), and AA: ABTS (0.124 bits) and DPPH (0.104 bits). The pH of the jostaberry extracts was slightly influenced, with the mutual information value being 0.048 bits. In the MAE, an application time of 2, 4, and 6 min, at all magnetron powers (100, 130, and 300 W) significantly influenced TA content (0.333 bits), followed by TFC (mg QE/g DW) (0.315 bits), AA: ABTS (0.259 bits), and DPPH (0.241 bits). The pH of the jostaberry extracts obtained in the MAE was influenced more than in the case of UAE, the value being 0.111 bits.
Acknowledgments: Institutional Project 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova

Keywords: mutual information analysis, extraction, total polyphenol content, total flavonoid content, total antocyanin content, antioxidant activity.

F.35. THE INFLUENCE OF JOSTABERRY EXTRACT ACTIVE ACIDITY ON THE COLOR PARAMETERS

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Abstract: The jostaberry hybrid *(Ribes × nidigrolaria)* is a fruiting shrub obtained by crossing three original species: the blackcurrant *Ribes nigrum*, the North American coastal black gooseberry *Ribes divaricatum*, and the European gooseberry. Jostaberries are rich in flavonoids, especially anthocyanins, a pigment that play a decisive role in the formation of the color of the extracts, which can later be used in the manufacture of food products. The aim of the present work was to analyze the influence of pH (2.5, 3.5, 4.5) on the CIELab parameters (L*, a*, b*, C*, h*) of extracts obtained under ultrasound (UAE, 37 kHz, temperature of 25 ± 1 ºC, 20 min)

and microwave-assisted (MAE, magnetron power regimes - 100, 180, and 300 W, 6 min) conditions from jostaberries pretreated through freezing, freeze-drying and oven drying processes. The pH value influences the stability of anthocyanidins. At acidic or basic pH, the highly conjugated phenolic groups of anthocyanidins have the ability to protonate or deprotonate, leading to a change in electronic distribution. This process affects the absorption wavelength and the observed color. The extracts of frozen (FJ), freeze-dried (FDJ) and oven dried (DJ) jostaberries were used for the determination of chromatic parameters. It was demonstrated that at pH 2.5 the lowest values of L* were obtained, which vary from 33.31 (FDJ, UAE-20) to 59.29 (DJ, MAE 300-6) demonstrating the color intensity of the extracts, and the highest values of L* were obtained at pH 4.5, ranging from 42.74 (FDJ, MAE-300-6) to 72.86 (DJ, MAE 100-6). The analysis of the a* parameter demonstrated that the highest values were obtained at pH 2.5, followed by pH 3.5 and 4.5. In the case of the b* parameter, it was found that the highest values were obtained in DJ extracts, showing the presence of yellow pigments. It was found that at pH 2.5, C* values are the highest in FJ and FDJ extracts, which denotes the absence of the gray shade. All h* values obtained at pH 2.5, 3.5 and 4.5 are in the first trigonometric quadrant. For FJ and FDJ extracts, the red color predominates and for DJ - the brown color. Jostaberry pretreatment produced significant changes in all color parameters. The red tone predominates in the FJ and FDJ extracts, and the orange tone in the DJ ones. The most stable intense red color is characteristic of jostaberry extracts acidulated at pH 2.5. This is due to the protonated form of the flavylium cation of anthocyanins, characteristic for an acid environment (pH < 3). At pH between 4 and 5, anthocyanins will be in the unprotonated form, chromenol (flavenol), and their red color loses its intensity. Jostaberry extracts obtained under different conditions can provide a wide spectrum of red hues.

Acknowledgments: Institutional Project 020405 “Optimizing food processing technologies in the context of the circular bioeconomy and climate change”, Bio-OpTehPAS, being implemented at the Technical University of Moldova

Keywords*:* jostaberry, pretreatment, ultrasound-assisted extraction, microwave-assisted extraction, color parameters.

F.36. INDIVIDUAL PHENOLIC COMPOUNDS OF DIFFERENT TRITICALE VARIETIES CULTIVATED IN THE REPUBLIC OF MOLDOVA

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Abstract: Triticale is the first cereal obtained from artificial hybridization between tetraploid wheat (*Triticum aestivum*) and rye (*Secale cereale*). The aim of this research was to determine the individual profile of phenolic compounds in different varieties of triticale grains (Ingen 33, Ingen 35, Ingen 40, Ingen 54, Ingen 93, Costel and Fanica). The phenolic acids were determined using a Shimadzu high-performance liquid chromatograph (Kyoto, Japan) with a diode array detector coupled with a DAD detector.

The extraction of the phenolic acids was performed at three different temperatures: 20, 40 and 60 °C. Individual polyphenol content of triticale varieties was identified as follows: 4-hydroxybenzoic acid, vanillic acid, caffeic acid, chlorogenic acid, *p*-coumaric acid, and rosmarinic acid. The effect of the increasing of the extraction temperature on individual polyphenol compounds was also determined. The highest content of 4-hydroxybenzoic acid, vanillic acid, caffeic acid and *p*-coumaric acid was determined at a temperature of 60 °C in Ingen 35, Ingen 93, Costel and Ingen33 respectively. In the case of chlorogenic acid, in the Ingen 35 variety, at extraction temperatures of 40 and 60 °C the content of this acid was the

same. And for rosmarinic acid, the Costel variety had the highest content of phenolic acid extracted at a temperature of 60 °C. Moreover, in some varieties such as Fanica, Ingen 33, and Ingen 54, some of the phenolic compounds were not detected at low extraction temperature. By thermal energy increase, the cellular structure of triticale is disrupted, which enhances the permeability of the cell membrane and facilitates the release of secondary metabolites, such as polyphenols. Thus, the positive effect of temperature on the extraction of polyphenolic compounds from triticale flour has demonstrated.

Acknowledgments: This work was supported by a grant from the Ministry of Research, Innovation and Digitization, CNCS-UEFISCDI, project number PN-IV-P8-8.3-ROMD-2023-0078, within PNCDI IV.

Keywords: 4-hydroxybenzoic acid, vanillic acid, caffeic acid, chlorogenic acid, p-coumaric acid, rosmarinic acid.

F.37. TOWARDS A PLASTIC-FREE FUTURE THROUGH DESIGNING EDIBLE TABLEWARE FROM CEREAL BASED INGREDIENTS

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Abstract: The growing environmental concerns regarding plastic pollution have driven research towards the development of sustainable alternatives to conventional packaging and tableware. This study focuses on the development of edible and biodegradable products based on cereal-derived ingredients, intended to replace single-use plastic tableware. The objective was to formulate an optimal recipe and processing technology that ensures adequate mechanical strength, structural stability, and environmental safety of the resulting products. The formulation included wheat flour as the primary matrix, combined with plasticizers (glycerol), binding agents (egg yolk), and structural enhancers (gelatin). Multiple samples were prepared by varying ingredient ratios and baking conditions. Physico-chemical and mechanical analyses were conducted to evaluate parameters such as texture, water activity, moisture content, and structural integrity. The best-performing sample, characterized by a moisture content of 6.4%, water activity of 0.361, and a breaking force of 102.4 N, exhibited optimal qualities for potential practical use. The obtained products showed good resistance to moisture, sufficient mechanical strength for handling solid foods, and a biodegradation time of approximately 30 days under natural conditions. Additionally, their organoleptic properties suggest potential for dual functionality, as food and tableware, particularly in eco-conscious catering and tourism sectors. This research highlights the feasibility of using accessible ingredients and simple technologies to produce edible and biodegradable items, offering a sustainable solution to plastic waste and contributing to circular economy practices.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 “Optimizing food processing technologies in the context of the circular bioeconomy and climate change”, Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: edible tableware, plastic-free alternative, sustainable food technology, eco-innovation

F.38. SUSTAINABLE RECOVERY AND CHARACTERIZATION OF HIGH-PURITY HEMP SEED PROTEIN CONCENTRATE FOR FUNCTIONAL FOOD INNOVATION

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Abstract: The growing interest in sustainable protein sources has highlighted the potential of oilseed by-products within circular economy frameworks. This study aimed to obtain a high-purity protein concentrate (HPC) from hemp seed cake of the *Secuieni-Jubileu* variety and to perform its comprehensive physicochemical and biochemical characterization. The defatting process was conducted using n-hexane (1:4 w/v) over 24 hours, followed by vacuum drying and solvent volatilization. Protein extraction was carried out in 0.1% NaCl solution (1:10 w/v), with gentle agitation for 30 minutes at 21 ± 2 °C. The resulting extract was filtered, and protein was precipitated by centrifugation (4000 rpm, 15 min), followed by washing and drying at 50 °C for 24 h. The HPC was analyzed via standard AOAC methods for proximate composition and by acid hydrolysis for amino acid profiling. The resulting HPC contained 74.15% protein (d.m.), low fat (0.45%), and notable dietary fiber (18.47%), with moisture reduced to 3.12%. Amino acid profiling revealed a balanced composition, including high levels of leucine (8.17 g/100 g protein), arginine (10.92 g/100 g), and isoleucine (5.56 g/100 g), while the amino acid score indicated excellent nutritional value, despite sulfur-containing amino acids being limiting. These findings underscore the potential of hemp seed cake as a viable raw material for sustainable protein extraction, offering promising implications for future functional food innovation.
Acknowledgments: The research was supported by Moldovan Government within State project of Young Researchers no. 24.80012.5107.06TC "Waste sustainable utilization from the oil industry" running at Technical University of Moldova.

Keywords: Cannabis sativa L., hemp seed cake, protein concentrate, circular economy, amino acid profile, amino acid score

F.39. GRAPE POMACE VALORIZATION – PARTS OF THE CIRCULATING ECONOMY IN THE REPUBLIC OF MOLDOVA WINEMAKING

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Abstract: The recovery of functional phenolic compounds from red grape marc can be achieved, by obtaining products that can be reinserted into the economy as a new raw material. The re-utilization of these compounds not only represents numerous potential applications, such as food and feed additives, functional foods, nutraceuticals, cosmeceuticals, and so forth, but also represents a favorable measure for the environment, and results in the formation of value-added products. In the experimental study process, within the Oenological Research Center of the Oenology and Chemistry Department, FTA/UTM, studies were carried out on the influence of extraction conditions (solvent, temperature, method) on physico-chemical and stability indices of anthocyanin extracts from the autochtonous *Feteasca Neagră* grape variety. In the process of double extraction of pomace samples from the Ștefan Vodă wine-growing, at temperatures of 20 °C to 60 °C, the alcohol content 60% vol. in the medium of extraction, the optimal extraction conditions and their dynamic stability were determined.

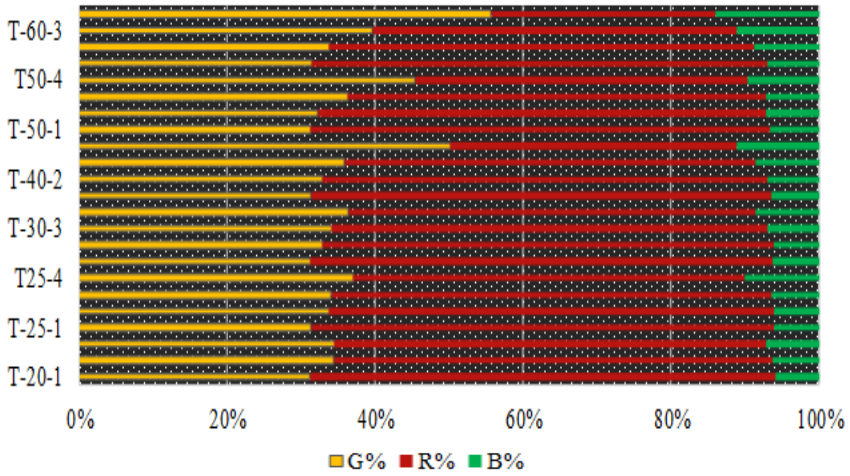

Figure 1. Color composition of the extracts.

It is observed that G% (percentage of green) decreases with increasing temperature, while R% (percentage of red) and B% (percentage of blue) tend to grow. This indicates a change in color composition towards redder and bluer shades while green becomes less predominant.
These changes may result from chemical reactions or structural changes occurring in the sample following exposure to temperature. Oxidation and degradation of some components can occur, determining the changes in the absorption or reflection of light at different wavelengths.
Acknowledgments: The research was supported by Institutional Project, subprogram 02.04.05 Optimizing food processing technologies in the context of the circular bioeconomy and climate change, Bio-OpTehPAS, being implemented at the Technical University of Moldova. The authors would like to thank the World Federation of Scientists for the year 2024-2025 National Scholarship Program.

Keywords: grape, phenolic compounds, anthocyanin extracts.

F.40. THE INFLUENCE OF RED GRAPE POMACE FLOUR ON THE PHYTOCHEMICAL CHARACTERISTICS OF FUNCTIONAL BISCUITS

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Abstract: Grape pomace is the main by-product of winemaking, which consists mainly of grape skins and, in some cases, seeds and bunches. The valorization of these by-products through biorefining as a source of natural food additives represents a valuable alternative for the production of bio-ingredients with multiple practical applications, with a role in supporting the circular economy and protecting the environment. The purpose of experimental study consisted to elaborate functionals biscuits produced with mixt dried grape pomace (flour) of Cabernet Sauvignon and Rara Neagră red grapes pomace, determined the established of technology of classical biscuits and functionals products cookies. Under laboratory conditions at the Food Technology Department, 6 batches of functional biscuits with the addition of mixt dried red grape pomace (flour) in 1 % to 8 % proportions were developed. The study samples were examined at the level of physico-chemical and specific indices regarding the content of biologically active substances within the Oenological Research Center/Department of Oenology and Chemistry. The phytochemical composition and antioxidant activity of the obtained functional biscuits determine: Total monomeric anthocyanins (TMA) – 3.21 ± 0.05 mg C3G/g d.m.; Total polyphenols (TPC) – 40.28 ± 4.51mg GAE /g d.m.; Total flavonoids (TFC) – 12.83 ± 0.52 EC/g d.m.; Antioxidant activity (DPPH) (AA) – 62.11 ± 2.07 mmol TE/g d.m. and a degree of inhibition of 92.42 ± 0.65%. The results obtained confirm the bioactive potential of the mixt

dried red grape pomace (flour), the content of bioactive compounds in the biscuits increasing proportionally to the concentration of the added powder. Thus, the addition of functional flour to the biscuit dough composition, at a concentration of 1% (w/w) (P-1) and 2% (w/w) (P-2), respectively, led to a clear increase in the anthocyanin concentration, from 5.24 mg C3G/100 g biscuits (P-1) to 9.54 mg C3G/100 g biscuits (P-2) and in the polyphenol content, from 132.62 mg GAE/100 g biscuits to 224.54 mg GAE/100 g biscuits, respectively. Regarding the overall appreciation, it was demonstrated that the addition of red pomace powder does not substantially influence the basic sensory characteristics (color, taste, aroma) of the biscuits.

Acknowledgments: The research was supported by Institutional Project, subprogram 02.04.05 Optimizing food processing technologies in the context of the circular bioeconomy and climate change, Bio-OpTehPAS, being implemented at the Technical University of Moldova. The authors would like to thank the World Federation of Scientists for the year 2024-2025 National Scholarship Program.

Keywords: biscuits, grape seed flour, technological properties.

F.41. THE INFLUENCE OF LOCAL MICROBIOTA ON THE QUALITY, AUTHENTICITY AND ORGANOLEPTIC CHARACTERISTICS OF WINE

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Abstract: Microbial diversity, also known as "*microbial terroir*", is an important component of the character, specificity and authenticity of wine. This concept was introduced to the field of oenology a few years ago, thanks to the development of NGS techniques, which allow the identification of microbial ecology in different wine regions. The purpose of experimental study consisted to study the number of microorganisms present in grapes from the AOC Ștefan Vodă area (Cimișlia center), Republic of Moldova. Under laboratory conditions at the Oenological Research Center/Department of Oenology and Chemistry/UTM. Two strains of non-Saccharomyces yeasts were used in wine production by the bio-protection method. The production of experimental wines included the application of the classical winemaking method with the obtaining of 2 batches with indigenous microbiota selected from the Cimișlia viticulture center and 1 batch of control wine fermented with industrial active dry yeasts. The wines obtained by using indigenous yeast starter (IYS) and the control sample were studied in the dynamics during technological process regarding the physico-chemical, microbiological and organoleptic parameters.

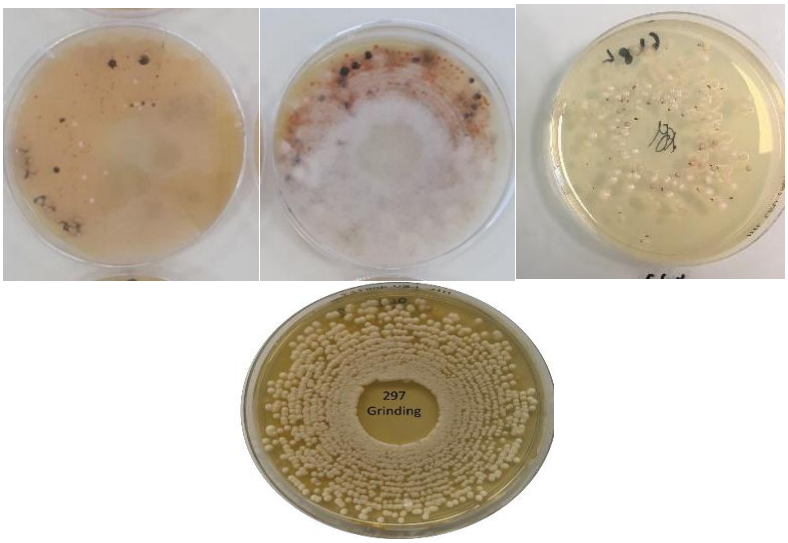

Figure 1. Photo images of the microbiological stady.

The experimental results described that during the alcoholic fermentation process, several non-Saccharomyces yeasts such as *H. uvarum* and *Metschikowia* were involved. The *S. cerevisiae* species represented less than 50%, which contributed to the perceived defects in the MT group samples. In dynamics, the *Metschikowia* species participated in the fermentation, gradually decreasing, while the *Lanchancea* microbial population increased towards the end of the process. As the alcohol level increased, the *Lanchancea* and *Saccharomices* species continued to play a flavor impact. Both *Lanchancea* and *Metschikowia* are considered to improve the fruity aroma of the experimental wines.

Acknowledgments. The research was funding by the Young Researchers Project ”Capitalizing on the Indigenous flora of the Ștefan Vodă wine region in order to increase the authenticity and competitiveness of Moldavian wines”/ (23.70105.5107.04 T – 2024/2025).

Keywords: authenticity, microbiota, indigenous flora, white wine.

F.42. DEVELOPMENT OF FUNCTIONAL PASTA USING GRAPE POMACE WITHIN A SUSTAINABLE INNOVATION FRAMEWORK

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Abstract: This study explores the potential of grape pomace, a major by-product of the winemaking industry, as a functional ingredient for fortifying wheat-based pasta. Conducted within the framework of circular economy and sustainable food production, the research aimed to valorize grape skins from two autochthonous grape varieties - Fetească Neagră and Rară Neagră - by incorporating their powdered form into pasta formulations. Different levels of pomace (1%, 2.5%, and 5%) were added to the base recipe, and the resulting samples were evaluated in terms of their physicochemical parameters, technological behavior, nutritional profile, antioxidant capacity, and sensory characteristics. The enriched pasta demonstrated significantly higher contents of polyphenols (up to 233.2 mg GAE/100 g) and antioxidant activity (DPPH inhibition of up to 68.24%), without compromising product safety or organoleptic qualities. In addition, fiber content increased, while the optimal cooking time and water absorption rate were slightly modified, indicating manageable adjustments in technological processing. Color and texture analyses showed that grape pomace enhanced the chromatic profile of the pasta, adding reddish-violet hues, and improved its structural integrity. Sensory evaluation confirmed consumer acceptance across all samples, with a preference for 2.5% enrichment due to its balance between functional benefits and palatability. These findings highlight the feasibility of using grape pomace to produce value-added pasta products with enhanced nutritional and functional properties. This approach contributes to the sustainable reuse of agro-industrial residues and aligns with current trends in clean-label, health-promoting food development.

Acknowledgments: This research was funded by RESCI-ECO PROJET UTM VALINVIT T1 International Project “Valorisation intelligente des résidus viti-vinicoles dans le contexte de l’économie circulaire”, funded by AUF running at Technical University of Moldova.

Keywords: grape pomace, pasta enrichment, polyphenols, antioxidant activity, sustainable innovation.

F.43. DEVELOPMENT OF HIGH-PROTEIN SNACK BARS USING WALNUT AND ALMOND PRESS CAKES IN THE CONTEXT OF CIRCULAR ECONOMY

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Abstract: In the context of sustainable food innovation and circular economy principles, this study explores the potential of nut press cakes—specifically from walnuts (*Juglans regia* L.) and almonds (*Prunus amygdalus*)—as protein-rich ingredients for the formulation of functional snack bars. These oilseed by-products, typically underutilized or discarded, are not only valuable sources of plant-based protein but also contain beneficial lipids, particularly unsaturated fatty acids. The research focused on developing formulations that align with consumer demand for healthy, protein-enriched, and energy-balanced snacks. Two main directions guided product development: (1) achieving a high protein content—above 20% of total energy, in accordance with Regulation (EC) No. 1924/2006 on nutrition claims; and (2) formulating sugar-free variants by replacing conventional sweeteners with natural alternatives. Four formulations were tested based on varying ratios of walnut to almond press cake: 100% walnut, 75:25, 50:50, and 25:75. All formulations met the criteria for "high in protein" claims and demonstrated favorable nutritional profiles, including reduced caloric values compared to commercial counterparts. Sensory evaluation, revealed a high level of consumer acceptance across all samples, with the majority of ratings clustering around "like it" and "like it very much" (according to the 9-point hedonic scale,) particularly for formulations based on balanced walnut–almond ratios (50:50 and 75:25). This study demonstrates the feasibility of upcycling oilseed press cakes into value-added functional snacks, contributing to waste reduction and offering nutritionally dense, clean-label alternatives in the growing market of protein-enriched convenience foods.
Acknowledgments: The research was supported by the Project 23.70105.5107.06T "Valorization of vegetable proteins from secondary products of the local fat and oil industry", being implemented at the Technical University of Moldova.

Keywords: circular economy, press cake, walnuts, almonds, protein-rich snacks, sugar-free, functional foods.

F.44. TECHNOLOGICAL OPTIMIZATION AND MARKET PREPARATION OF CARAMELIZED WALNUTS: DEVELOPMENT, PROCESSING FACTORS, AND COMMERCIAL STRATEGY

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Abstract: The increasing consumer demand for premium, clean-label confectionery products has driven innovation in both product development and processing strategies. This study focused on the technological optimization and commercial readiness of caramelized walnuts, a gourmet snack with notable nutritional value and sensory appeal. Conducted in collaboration with a local food enterprise, the research aimed to identify optimal parameters for the caramelization process and to formulate a market-oriented launch plan.

Experimental trials involved testing various walnut varieties (including Chandler and Franquette), caramel syrups with different sugar compositions, and a range of oils with varying oxidation stability. Results indicated that optimized caramelization parameters—specifically the use of a glucose–sucrose syrup blend at 120–130°C and high-oleic sunflower oil—minimized undesirable sugar crystallization and promoted the formation of a uniform, glossy caramel coating. These parameters also contributed to achieving a crisp yet stable texture and a balanced sweetness that did not overpower the natural flavor of the walnuts. Accelerated storage tests

demonstrated that the product maintained its structural integrity, flavor, and aroma for at least six months when stored in hermetically sealed, moisture-resistant packaging. Sensory assessments carried out with a semi-trained panel confirmed the high acceptability of the product, with scores reflecting strong consumer preference for both texture and flavor complexity. These findings validate the effectiveness of the optimized formulation and processing method in delivering a premium-quality caramelized walnut snack with consistent sensory and physicochemical stability.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: caramelized walnuts, confectionery innovation, processing optimization, sensory analysis, shelf stability, premium snacks.

F.45. ENHANCING MICROBIOLOGICAL SAFETY OF FRUIT PURÉES THROUGH SYNERGISTIC HEAT TREATMENT AND ULTRASONICATION

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Abstract: The microbiological quality of fruit purée is determined by both microbiological purity and production hygiene. The risk of microbiological contamination is associated with the potential growth of various groups of microorganisms, even under refrigerated storage conditions. The predominant microflora contaminating fruit include acid-tolerant bacteria, molds, and yeasts. Yeasts metabolize carbohydrates, producing significant amounts of carbon dioxide and, under anaerobic conditions, ethanol, making them one of the primary spoilage agents of plant-based products. Raspberry (*Rubus idaeus*), strawberry (*Fragaria xanassa*), and aronia (*Aronia melanocarpa*) purée with a pH of ≤ 4.2 are susceptible to spoilage by molds, yeasts, and certain non-spore-forming bacteria, such as lactic acid bacteria. These microorganisms resist heat treatment at temperatures ranging from 80 to 100 °C. Applying a combined processing method - heat treatment and ultrasonication has been investigated for fruit purées. The microbiological analyses of products subjected to heat treatment in combination with ultrasonication demonstrated a reduction in the total microbial count, including yeasts and molds. The degree of inactivation of microorganisms was directly related to the temperature and duration of treatment, with conditions of 60-70 °C for 5-15 min being optimal. Ultrasonic treatment operates on the principle of cavitation, which involves the formation and subsequent collapse of microbubbles in a liquid medium. The collapse of these bubbles releases energy in the form of localized pulses of high pressure and temperature, resulting in mechanical disruption of microbial cells. The sudden pressure fluctuations and acoustic waves compromise the integrity of microbial cell membranes, facilitating their destruction. Furthermore, the combination of ultrasonication with moderate heat treatment at 60-70 °C enhances protein and enzyme denaturation within microbial cells, thereby increasing their susceptibility to inactivation. The cavitation induced by ultrasonication also favors uniform heat distribution within the product, thus effectively inhibiting spoilage-causing microorganisms even at relatively low temperatures. Consequently, thermal-ultrasonication treatment at 60-70 °C ensures efficient microbial elimination through synergistic mechanical and thermal effects and preserves the quality of fruit purées. This approach minimizes the degradation of heat-sensitive components such as vitamin C, in contrast to conventional high-temperature treatments, and helps the product retain the natural taste, aroma, and texture, which are critical for consumer acceptance.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: safety, cavitation effects, microbiological stability, quality, food preservation, inactivation.

F.46. SEA BUCKTHORN SEEDS ARE A PROMISING RAW MATERIAL FOR THE DEVELOPMENT OF MEAT PRODUCTS

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Abstract: The sea buckthorn seeds (*Hippophae rhamnoides* L.) are a promising source of raw materials for the food industry with significant scientific interest. These seeds are known for their rich nutrient content, including protein (24-25%), lipids (12-15%), carbohydrates (23-25%), fiber (14-15%), pectin (3-4%), starch (2-3%), as well as biologically active compounds such as bioflavonoids (1.2-1.5%), tocopherol (40-50 mg%), carotenoids (4.0-4.5%) and ascorbic acid (5.5-7.0 mg%). The research aim was to analyze the possible use of sea buckthorn seeds and to determine their optimal concentration in meat products such as sausages. Four experimental samples were developed: the control sample and samples with 5%, 10%, and 15% sea buckthorn seed powder, proposed as a meat protein substitute. The sensory analysis showed that the sample with 10% added sea buckthorn seed powder scored 4.57 points, the highest score out of a maximum of 5.00. Analysis of the protein content demonstrated that adding sea buckthorn seed powder, replacing the raw material (meat), did not negatively impact the samples. The protein content of the control sample was 14.68% and the sample with 15% added sea buckthorn powder was 14.75%. Flavonoid content was determined in the seed powder and the finished product. sea buckthorn seed powder contains 42.5 mg/100 g isoramnetin-3-sophorophoside-7-glucoside (iRH 3s 7r) and 123.2 mg/100 g isoramnetin-3-diglucozide-7-glucoside (iRH-3dg-7r). A perfect linear correlation was observed between the amount of sea buckthorn seed powder used in the sausage's recipe and the flavonoid content of the powder. The degree of transformation of flavonoids during the technological process of sausage production was calculated. In the finished product, 63% of the total flavonoid content was retained with 5% white sea buckthorn seed powder and 42% in the sample with 15%. This correlates with a decrease in the moisture content of the samples from 73.02% in the control sample to 47.82% in the 15% sample. The results demonstrate that the sea buckthorn seeds in optimal concentration (10%) can be used as a raw material to replace meat in sausages.
Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

***Keywords**:* Hippophae rhamnoides L., seed powder, protein, flavonoid, sausages.

F.47. INNOVATIVE PROTEIN EXTRACTION METHODS

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Abstract: One of the ways to reduce environmental pollution is to recycle food waste, such as oil crops obtained as a result of oil production, and to develop food additives such as protein concentrate from them. Protein extraction methods have been analyzed, among which the two-stage extraction and isolation process dominate. The process starts with alkaline solubilization to ensure efficient protein dissolution, followed by centrifugation to remove insoluble components such as starch and fiber. Then, on the addition of hydrochloric acid to reach the isoelectric point (pH 4.0-5.0), the protein precipitates, which is separated by centrifugation and neutralized. This method typically employs water, alkalis, salt solutions, organic solvents, or acids. An alternative technique using ultrafiltration instead of isoelectric precipitation demonstrates the potential to improve the purity of the final product by minimizing the use of chemical reagents. Spray drying is used to obtain a powdered protein concentrate, as it preserves

its quality, prevents overheating, and eliminates the need for additional grinding. Another method of obtaining protein products from pomace is mechanical fractionation. It involves grinding and dry fractionation, which increase crude protein content while significantly reducing crude fiber content in certain protein fractions. There is an increasing demand for environmentally friendly and safe technologies that lower extraction temperature and duration, reduce solvent usage, and enhance the quality and yield of extracted proteins. Promising technologies such as high-pressure treatment, supercritical fluid extraction, and the use of microwaves, ultrasound, cold plasma, pulsed electric fields, and radiofrequency treatment can significantly improve the functional properties and nutritional value of the extracted protein, which meets the requirements of sustainable food production.

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Keywords: environmental pollution, food additives, food waste, nutrients, protein products.

F.48. EFFECTS OF DIETARY SUPPLEMENTATION ON EGG YOLK MINERAL AND CHOLESTEROL CONCENTRATIONS IN LAYING QUAILS

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Abstract: Feeds have an influence on quail growth, both on their physiological development and, to some extent, on the composition of the eggs obtained from these birds. Traditionally, feeds include mixtures of cereals and grits, but for better nutrition they contain some supplements. In this research, studies were conducted to determine the effect of supplementation of quails' feed with ZooBioR, which is a bioproduct based on extracts from the cyanobacterium Spirulina Platensis biomass. The research was focused on determining the evolution of content of minerals (P, Fe, Ca) and cholesterol fractions (HDL, LDL, free cholesterol), accumulated in quail egg yolk after feed supplementation. The quails tested belonged to the breed Texas Super. The eggs produced by quails had the following characteristics: egg mass – 12.91±1.30 g, yolk mass – 4.49±0.63 g, yolk/white ratio – 1:1.40, yolk pH – 6.43±0.21. Bioproduct ZooBioR, being rich in easy assimilable nutrients (amino acids, phospholipids), contributed to improving the nutritional value of the quail yolk. The mineral content of yolk was found to be enhanced – for P from 248.0 mg/100 g (control group) to 265.8 mg/100 g yolk (tested group), and the amount of Ca – from 24.5mg/100 g (control group) to 32.6 mg/100 g yolk (tested group). The total amount of cholesterol does not differ much, ranging from 1152.6 mg/100 g yolk in the control group to 1088.1 mg/100 g yolk in the tested group. Instead, there are trends in the decrease of the free cholesterol fraction, from 1.86 to 0.15 mg/100 g yolk. The argument is that the ZooBioR supplement, rich in phospholipids, contributed to the increase in esterified cholesterol fractions and decrease of free cholesterol. Consequently, the decrease in free cholesterol is a beneficial factor in reducing easily assimilated cholesterol from eggs. An increase in the HDL esterified cholesterol fraction was also recorded, from 410.9 (control group) to 416.5 mg/100 g yolk (tested group).

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Keywords: quail eggs, supplemented feed, minerals, cholesterol fractions

F.49. TRADITIONAL GASTRONOMY – PART OF THE RURAL TOURISM MOTIVATION

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Abstract: Tourist destinations in the Republic of Moldova are increasingly recognized for their rich culinary heritage, marked by authenticity and distinctive flavors. According to recent studies and surveys, international visitors are particularly drawn to traditional dishes served in guesthouses and rural households, highlighting the unique taste of local specialties, as well as the quality of fruits, vegetables, and wines produced in the region. Among the most appreciated culinary items are pies, *baba neagră*, *sarmale*, *borș scăzut*, *mămăligă*, *zeamă*, roasted meats, *zacusca*, and fish *plachie*. The dessert *Cușma lui Guguță*, inspired by a beloved children's character created by author Spiridon Vangheli, also enjoys considerable popularity. Foreign tourists frequently comment on the authentic taste of traditional Moldovan bread and often express a desire to return in order to once again enjoy the distinctive flavors of local cuisine and beverages. Traditional dishes are also valued for their cultural significance, often being featured at important life events and celebrations such as weddings, christenings, anniversaries, Easter, and winter holidays. Alcoholic beverages—particularly wine—have long played a central role in tourist motivation, supported by Moldova's growing reputation as a successful wine destination. This is most evident during the annual National Wine Day in October, when accommodation facilities report full occupancy, and both urban and rural areas host a variety of events that attract numerous domestic and international visitors.
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Keywords: tourist motivation, gastronomy, traditional dishes, tourists, alcoholic drinks, customs, traditions.

F.50. THE MENU – A PROMOTIONAL ELEMENT OF TOURIST PENSIONS IN THE REPUBLIC OF MOLDOVA

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Abstract: Tourists visiting the Republic of Moldova have always admired the landscapes, culture, traditions, but to a large extent they have remained fascinated by traditional cuisine. Most often, the tourist gets acquainted with traditional dishes through the menu. Namely, a well-made menu will influence the guest to choose a certain traditional specialty, contributing to the increase in sales of food and drinks. The formation and development of menus remains at the discretion of the owners of guesthouses, marketing specialists, or specially contracted companies. Attractive menus have the potential to influence tourists' choices, provided there is a harmonious integration of textual information and visual elements. This synergy facilitates a more rapid decision-making process regarding food selection. In this context, tourists engage with the culinary richness and traditions of the Republic of Moldova, with the menu serving as an effective marketing tool for tourism from multiple perspectives. When the menu's aesthetic appeal aligns with the identity of the guesthouse, visitor satisfaction increases, enhancing their overall experience and fostering customer loyalty. Traditionally, tourist guesthouses in Moldova utilize well-designed physical menus that incorporate images and concise descriptions. While most guesthouses have embraced digitalization in terms of reservations, they continue to lag in adopting digital menus. Such menus can be observed in certain restaurants and wineries in the

Republic of Moldova, such as Eco Resort Butuceni, Castel Mimi, and Et Cetera. Travel agencies have recognized the potential of traditional gastronomy in guesthouses to promote local tourism, incorporating gastronomic or combined tours into their offerings. To enhance their appeal and attract new customers, many urban restaurants have integrated traditional dishes into their menus. The significant role of gastronomy in a tourist's decision to visit the Republic of Moldova is also attributed to the opportunity to explore a diverse culinary heritage, including traditional dishes from various ethnic communities such as Gagauz, Bulgarian, and Russian cuisine. This diversity further enhances the country's gastronomic attractiveness.

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Keywords: menu, tourist, tourist guesthouse, tradition, dishes.

F.51. STUDY OF MILEȘTII MICI WINE CELLAR AGED RED WINES QUALITY AND SENSORY PROFILE

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Abstract: Global warming impacts widely the changes in the physicochemical characteristics of grapes, as well as the sensory quality and shelf life of wines. For red grapes, apart from sugar content increase and loss of acidity which leads to pH increase, a decrease of anthocyanin content is also observed.

The variations in pH and anthocyans have a great impact on the color of young red wines, as well as their evolution during aging. This study focused on evaluation of physico-chemical and sensory characteristics of aged red wines from the underground wine cellar Mileștii Mici, famous for preserving and aging high-quality wines. The wines subjected to analysis were selected as follows: Cabernet Sauvignon 1987 vintage, Cabernet Sauvignon 2009 vintage, Negru de Mileștii Mici 1986 vintage – one of the emblematic wines of Mileștii Mici. The physico-chemical and quality indices (alcohol content, total and volatile acidity, total and non-reducing extract, phenolic compounds and color intensity) of the studied wines were established by modern analysis methods recommended in the national and international OIV standards. The sensory evaluation was conducted by a panel of experts using a 100-point scoring system. The physico-chemical analysis revealed significant variations among the analyzed samples, influenced by the grape variety, harvest year and aging period. The alcohol content ranged between 12.5% and 14.2% vol., while the total acidity varied between 4.8 and 5.6 g/L tartaric acid. Anthocyanin and polyphenol concentrations were higher in older samples, indicating a more complex phenolic structure and increased color stability. Color intensity was more pronounced in Cabernet Sauvignon 1987 and Negru de Mileștii Mici 1986, confirming the evolution of color-related compounds during aging.

Regarding sensory analysis, the Cabernet Sauvignon 1987 and 2009 wines achieved scores above the minimum threshold for PGI wines (78 out of 100), standing out for their complex aromas of ripe red fruits, spicy notes, and well-integrated tannins. In contrast, Negru de Mileștii Mici 1986 scored below this limit, exhibiting organoleptic characteristics influenced by prolonged aging, with a slight loss of freshness and aromatic intensity. The study confirms the influence of the aging process on the physico-chemical composition and sensory profile of collection red wines from Mileștii Mici wine cellar. Older wines showed higher concentrations of polyphenols and anthocyanins, which contributed to increased stability and a well-defined aromatic profile. This could be also explained by climatic changes in the last thirty years, with a certain trend of higher temperatures and draughts. The high phenolic content enhances gustatory complexity and quality appreciation, demonstrating the importance of the aging process in developing the specific characteristics of each wine.

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Keywords: aging, collection wines, quality evolution, sensory profile, phenolic compounds.

F.52. APPLICATION OF ALMOND OILSEED CAKE (PRUNUS DULCIS) FOR IMPROVING SHORTCRUST PASTRY PROPERTIES

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Abstract: Shortcrust pastry products are widely consumed due to their sensory appeal and accessibility. However, their nutritional profile is often unbalanced, with high levels of saturated fats and sugars, and minimal amounts of protein and dietary fibre. The present study investigates the potential of almond oilseed cake (*Prunus dulcis*), a by-product of the local fat and oil industry, to enhance the nutritional quality of shortcrust pastry while preserving its sensory attributes. Three formulations were developed: a control (100% wheat flour), a full substitution with almond oilsee cake (100%) and a 1:1 blend. Xanthan gum was used in oilcake-rich samples to improve dough stability, and the fat content was reduced by 20% due to the intrinsic lipid content of the oilseed cake. Results showed that 100% oilseed cake substitution led to a denser texture and slight bitterness, whereas the 1:1 mixture yielded optimal sensory characteristics: light cocoa notes, uniform texture, and no bitterness. Nutritional analysis revealed a 1.5-fold increase in protein (6.91 g/100 g vs. 5.60 g) and a 30-fold increase in fibre (0.79 g vs. 0.05 g), with a 27% reduction in total carbohydrates. These findings support the use of almond oilseed cake as a functional ingredient in pastry production, improving product quality and contributing to sustainable food systems through by-product valorization.
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Keywords: fibers, functional pastry, nutritional improvement, oilseed by-products, vegetable proteins

F.53. IMPACT OF CONDITIONING TREATMENTS ON QUALITY CHARACTERISTICS OF VIORICA WINES

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Abstract: The quality of a wine is directly related to the chemical composition of the grapes, but also to the applied winemaking techniques. In Republic of Moldova are cultivated mainly European grape varieties, but lately local varieties are becoming more popular and demanded by consumers. One of the most famous local selection grape variety is Viorica – an interspecific hybrid which has a comprehensive resistance to biotic and abiotic environmental factors with great technological potential for quality wines production. In order to carry out this study, the grapes of local selection grape variety Viorica were manually harvested from the Milestii Mici village, PGI Codru and processed under micro-winery conditions at the of the Technical University of Moldova. The studied wines were produced with and without addition of ß-glucosidase and pectinase enzymes for revealing terpenic varietal aromas from their precursors and to facilitate the clarification process. After 3 months, the wines were submitted to

conditioning treatment with bentonite and pea protein preparations. The quality characteristics (alcohol content, total and volatile acidity, color intensity and hue, oxidation test) of the studied wines were established by methods recommended in the national and international standards. The sensory evaluation was conducted by a panel of experts using a 100-point system. In this study, the enzyme addition did not have a significant effect on the main physical-chemical parameters, except that the fermentation proceeded faster due to the enzymes. Subsequent the spectrophotometric analysis of wines, the chromatographic parameters were calculated: the total polyphenol index, the color intensity and hue, and also the oxidation behavior. The sensorial evaluation of studied wines highlighted the typicality of Viorica variety: acacia, linden flowers, citrus fruits and a bright flavor of basil. Overall, the wine produced with enzyme addition had by near 20 % higher results, especially regarding aroma evaluation. Following the carried study, it can be mentioned that the addition of enzymes affected the color intensity and hue of the wine: in the sample with enzymes, the indicators were higher with 10 %, which can be explained by the increased extraction of phenolic compounds besides the terpenic ones. According to the data obtained as a result of polyphenols oxidative medium test, the wine obtained with addition of enzymes has a lower risk of oxidation by more than 5 times, which confirms the theory that enzymes reduce the risk of oxidation of white wines. The conditioning treatments decreased by 32 – 40 % the total polyphenol index and by 34 % the oxidation risk, therefore conditioning treatments can effectively reduce the content of oxidized polyphenols. It can be resumed that the choice of winemaking techniques has a very important role for the overall and sensorial quality of the wine obtained from local selection grape variety Viorica.

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Keywords: enzyme; fining; local variety; phenolic compounds; wine.

F.54. INFLUENCE OF FERMENTED DARK BREWERS' SPENT GRAIN ADDITION ON THE RHEOLOGICAL PROPERTIES OF DOUGHS FROM TRITICALE FLOUR

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Abstract: The rheological properties of wholemeal flours from 7 triticale varieties cultivated in the Republic of Moldova were studied (Ingen 33, Ingen 35, Ingen 40, Ingen 54, Ingen 93, Costel and Fanica), to establish the potential of their use in bakery, pasta or other flour products manufacturing. Fermented dark brewers' spent grain was added in proportions of 5 and 10% of the mixture mass to obtain 14 dough samples from whole triticale flour, and to investigate the effect of the addition on their rheological properties. The Mixolab device was used to determine the rheological properties of doughs. It was found that the dough development time from triticale flours varies between 2.95 and 5.75 min. The shortest dough development time was characteristic for Ingen 35 triticale flour, and the longest - for Ingen 40 triticale flour. The dough stability data showed the same trend. It was found that the addition of fermented dark brewers' spent grain contributed to a reduction in both the dough development time and the dough stability, and this effect was more pronounced when the proportion of fermented dark brewers' spent grain in the mixture was greater. The potential for the use of whole triticale flour in the manufacture of bread, pasta or other products has been identified, and it was established that the addition of dark brewers' spent grain can contribute to increasing the biological value of products by providing dietary fiber and mineral substances, which it contains, but it can negatively influence the rheological properties of doughs and, respectively, the quality of finished products, if added in a proportion greater than 10% of the mixture mass.

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Keywords: Mixolab device, dough development time, stability of the dough, dough behavior

F.55. FUNCTIONAL PANNA COTTA-TYPE DESSERT FORMULATED WITH GRAPE SKINS AS A MODEL FOR SUSTAINABLE FOOD INNOVATION

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Abstract: The valorization of grape skins, a by-product of the wine industry, represents a viable strategy for developing functional foods aligned with sustainable production principles. This study aimed to incorporate grape skin powder into a Panna Cotta-type dessert and assess its influence on nutritional value, functional properties, sensory quality, and overall product safety. Formulations were prepared with four inclusion levels of grape skin powder: 1.0%, 2.5%, 5.0%, and 7.5%. Physicochemical analyses revealed that the addition of powder significantly influenced product characteristics. The total polyphenol content increased from 94.25 mg GAE/100 g in the control to 324.91 mg GAE/100 g at 7.5%, resulting in a corresponding enhancement of antioxidant activity (from 19.42% to 69.55% radical inhibition via DPPH assay). These improvements suggest a clear functional enrichment of the product with increasing powder concentration. Color parameters were also affected, with a pronounced intensification of red and violet tones, contributing to a more attractive appearance. In terms of texture, hardness increased moderately, while springiness remained within acceptable sensory thresholds, indicating a firmer yet still palatable consistency. Sensory analysis, showed that samples with 2.5% and 5.0% grape skin powder achieved the best balance between taste, texture, color, and overall acceptability. Higher concentrations, although richer in antioxidants, introduced slight bitterness and graininess that impacted the hedonic scores. Microbiological tests confirmed the absence of pathogens such as *Escherichia coli*, *Salmonella spp.*, and *Staphylococcus aureus*, validating product safety. The study demonstrates that grape skin powder can be successfully incorporated into a dairy-based dessert, creating a novel functional product with enhanced antioxidant properties and good consumer acceptance. The results support a circular economy model and contribute to the development of clean-label, health-promoting foods derived from agro-industrial by-products.
Acknowledgments: The research was supported by Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Keywords: Panna Cotta, grape skins, polyphenols, sustainability, functional food, food by-products.

F.56. BACTERIAL SPOILAGE OF WINES PRODUCED IN A MICRO-WINERY

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Abstract: The production of quality wine relies on maintaining proper microbiological control throughout the wine-making process. There are numerous bacteria which can cause various wine spoilage issues, thus reducing wine quality and value. An array of methods based on the detection of the DNA of wine spoilage microorganisms has become a promising alternative to traditional microbiological methods, due to their high speed, reproducibility and reliability. The goal of this work was screening the wines produced in the micro-winery for the most common wine spoilage bacteria to elaborate an efficient strategy of microbiological control. For this, twenty-five wines produced in the micro-winery from the grapes harvested in different regions of the Republic of Moldova were screened by real-time PCR for the presence of *Lactobacteria/Pediococcus*, Acetic Acid Bacteria and *Oenococcus oeni*, using a commercial kit. The most commonly found wine spoilage bacteria were *Oenococcus oeni*, while *Lactobacteria/Pediococcus* were almost undetectable. These findings can help to develop proper strategies of microbiological control to optimize the process of wine-making and highlight the importance of microbiological monitoring for taking timely decisions to prevent economic losses.
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Keywords: wine; Lactobacteria; Pediococcus; Acetic acid bacteria; Oenococcus oeni Oenococcus oeni; DNA; real-time PCR; detection kit.

F.57. REDUCING THE QUANTITY OF ACRYLAMIDE IN BAKERY PRODUCTS

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Abstract. Acrylamide is a highly water-soluble organic compound with low molecular weight, which arises from the natural constituents: asparagines and sugars in certain food products when they are prepared at temperatures typically higher than 120° C and under low humidity conditions. It is formed mainly due to the interaction between sugars and amino acids naturally present in many foods. The chemical process that generates it is called the Maillard reaction and is responsible for the appetizing aroma and colour of cooked foods. After ingestion, acrylamide is absorbed by the gastrointestinal tract, distributed to organs and metabolized. One of its main metabolites is glycidamide. Exposure to acrylamide can have toxic effects on the nervous system (including hind limb paralysis), prenatal and postnatal development, and male reproduction. Acrylamide and glycidamide are considered genotoxic and carcinogenic, meaning that any level of exposure can potentially have harmful effects on DNA, increasing the risk of cancer. Acrylamide levels can be reduced by the method of reduction, such as the implementation of good hygiene practice and the application of procedures based on the principles of hazard analysis and critical control points (HACCP). In this work, bakery products, sponge cakes with different fillings made by a food business operator, were analyzed, where the level of acrylamide was monitored. Measures were established to reduce the level of acrylamide without negatively affecting the quality and microbial safety of the product. Heat treatment is applied, with a combination of time and temperature that is more effective in reducing acrylamide formation while achieving the desired product characteristics. The moisture content of the finished product is increased to achieve the desired product quality, the required shelf life and compliance with food safety standards, and the products are baked until a lighter colour of the finished product is obtained. The effectiveness of the mitigation measures aimed at reducing acrylamide content should be verified by sampling and analysis.

Keywords: acrylamide, glycidamide, food safety

F.58. SOME ASPECTS REGARDING THE VEGETABLE OILS FRACTIONATION

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Abstract: This study analyzes the fractionation of vegetable oils using the methods known up to this point and examined the use of these fractions in various industries. Emphasis was placed on sunflower oil due to its high oleic acid content, which has health benefits. As a new fractionation method, the work focuses on molecular distillation.

Vegetable oils are composed of complex lipids, mainly triglyceridesand the properties of the oil are given by this composition which differs depending on the type of oil.Sunflower oil is primarily composed of triacylglycerols (98–99%), with a small amount of phospholipids and non-saponifiable matter (tocopherols, sterols, and waxes, etc.). Regular sunflower oil has a high content of linoleic acid in the form of trilinolein (36.3%) and oleo-dilinolein (29.1%). High-oleic sunflower oil is valuable both nutritionally and technologically. The Food and Agricultural Organization (FAO) recommends its consumption due to its stability and health benefits, including cholesterol reduction and protection against arteriosclerosis.

Oil fractionation: Fractionated vegetable oils have diverse applications across multiple industries. In the food sector, palm oil fractions enhance margarine, chocolate, dairy, and bakery products by improving texture, stability, and shelf life. The cosmetics industry uses coconut oil fractions in skincare and haircare products, while pharmaceuticals utilize purified oil fractions in drug formulations for better bioavailability. Industrial applications include bio-based lubricants, biodiesel production, and textile softeners. Additionally, fractionated oils play a role in animal feed, paints, and inks, offering environmentally friendly alternatives with enhanced performance.

Vegetable oil fractionation is widely used as an essential technological process in the oil industry to modify the physicochemical properties of oils and to obtain optimized fractions for specific applications.There are three main fractionation methods: dry, solvent, and detergent-assisted. Dry fractionation is the most widely used due to its eco-friendliness and cost-effectiveness, especially in palm oil processing. Solvent fractionation provides a more precise separation but raises environmental concerns. Detergent fractionation yields high-purity fractions but involves complex waste management.

In the case of fractionation of methanol-transesterified oil is a process used to separate the components formed during transesterification, mainly to obtain biodiesel (fatty acid methyl esters, FAME) and glycerol. The FAME fraction can be obtained by decanting the glycerol or by simple washing with acids and the use of absorbents.

Another method of fractionating vegetable oil is molecular distillation, a method that was developed for the removal of free fatty acids from vegetable oils but can also be used for the recovery of other volatile compounds such as squalene or tocopherols. The process is based on molecular distillation, where volatile compounds evaporate upon contact with the evaporation surface and migrate to the cold surface to obtain a distillate product. This method minimizes oil losses, can be applied to oils with varying acidities and compositions, and reduces the need for wastewater treatment. Our experimental attempts at fractionation of sunflower oil by molecular distillation have shown that the light phase and the heavy phase have their own physicochemical properties and compositions. At the same time, attempts to create a model that can couple molecular distillation to process simulators are presented.

Vegetable oil fractionation is a key process that enhances oil functionality across food, pharmaceutical, cosmetic, and industrial applications. Various techniques, including dry fractionation, solvent-based methods, and molecular distillation, enable the production of high-purity fractions with improved properties.

Keywords: vegetable oils, oil fractionation, sunflower oil, molecular distillation, methanol transesterified oil fractionation

F.59. ON THE CONTROL OF POLYAROMATIC CONTENT IN DIESEL

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Astract: In this study, different diesel fuel samples were analyzed to see the effects of polyaromatics on engine combustion compared to European standards. Different diesel fuel samples were evaluated over a month to see the variation of aromatics content in diesel fuel over a longer period of time. The monitoring of polyaromatics was performed using the HPLC chromatographic method.
Nowadays, reliable transportation is extremely important, but an increasing number of vehicles leads to an important air pollution. The current fuel is almost entirely supplied from the petrochemical sector, so the legislation is becoming stricter for minimal pollution and that have correspondence respect to accepted composition of petroleum fuels. Aromatics with mono, two and three rings in a diesel with a low sulfur content have an effect on the exhaust emissions of diesel engines. It is cited that the burning these aromatics in diesel engine produces particulate mater under 5 μm. The purpose of this study was to observe how polyaromatics influence combustion in the engine and influence the exhaust gases in relation to the norms and how we can control this.
Different samples of Euro 5 diesel fuel, from different batches prepared for sale, were tested to see the amount of aromatics using HPLC chromatography. They were compared with each other and with the norms imposed by the legislation to see if the batches meet the imposed conditions. The Euro 5 diesel samples from the test batches contain polyaromatic values between 2 and 5 % m/m. These values are within the norms imposed by the government. The value differs depending on the components used to obtain the finished diesel such as components from HPM, HDV, MHC each having a different aromatic value. HC, PM, NOx emissions increase with the addition of mono-, di- and tri-aromatics. PM emissions are the ones that increase more than HC AND NOx. The most common values in the analyzed batches are those between 2%m/m - 3 %m/m polyaromatics, which is favorable because the content should be as low as possible.
The aromatic content must be reduced because they reduce PM, HC, NOx emissions, at the same time polyaromatics are carcinogenic and their content should be as low as possible. The analyzed samples have a content favorable to the norms imposed on polyaromatics, so they can be used in current diesel engines.
Acknowledgements: This work was supported by a grant of the Romanian Ministry of Education and Research, PCE 117/2022 COMCONF.

Keywords: diesel, polyaromatics, chromatography, engine, standards, aromatics, exhaust emissions

F.60. MODELING-SIMULATION-MONITORING TRIAD IN RESEARCH ACTIVITY: CASE STUDY FOR DIESEL HYDRODESULFURIZATION

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Abstract: In the development of a product technology based on molecular scale transformation, the modelling-simulation-monitoring triad is the most important study method. The use of this method is customized for the case of advanced diesel desulfurization.

In all 6 stages of the development and manufacturing of a product based on molecular scale transformations and separations , the modelling-simulation-monitoring (MSM) triad is fundamental, ensuring: 1) reduce manufacturing costs, 2) reduce time and costs in all the stages of process life-cycle, 3) increase process efficiency, 4) allow a better and deeper understanding of the process and its operation, 5) be used as the support for the solutions adopted during the process development and exploitation, 6) insure an easy technological transfer of the process, 7) increase the quality of process management, 8) reveal abilities to handle complex problems, 9) improve the safety of the plants, 10) market new products faster, 10) reduce waste emission while the process is being developed, 11) improve the quality of the products, 12) insure a highly qualified training of the operators. The case study, here analysed through the MSM triad, considers the catalytic hydrodesulfurization of diesel fuel as a high-purity product in terms of sulphur content. The requirement to have such a product is imposed by environmental requirements. The diesel hydrodesulfurization process is a strongly complex process because in addition to the sulphur compounds catalytic hydrogenation at pressure and temperature, simultaneously occurs hydrogenation of nitrogen compounds, oxygenated compounds as well as aromatics and olefins.

Process Modelling Simulation and Monitoring: The analysis of factors influence in the complex hydrodesulfurization process has found a modelling gate in which the process is controlled by the kinetics of hydrogenation processes occurring on catalytic sites of catalyst. It was thus adopted, depending on the hydrogenated reactant, the Power Law (PL) or Langmuir-Hinshelwood (LH) formal kinetics models of the 4 major hydrogenations. With these kinetic models and literature data for their parameters, the reactor model was built and simulated with industrial-level input data. The results showed that sulphur and nitrogen contents in diesel fuel can be achieved below 10 ppm. Two long-term monitoring sets of an industrial reactor are presented and commented on in terms of process controlling effort so that to ensure the performance to have below 10 ppm sulphur compounds in the reactor product

When an industrial reactor model with PL or LH reactions kinetics is coupled with monitored data it is possible to obtain the identification of the adjustable parameters of kinetics expression of sulfur and nitrogen hydrogenation. The parameters thus identified are specific to the catalyst used and to the operating conditions used. Dynamics of experimental (monitored) and predicted concentrations of sulfur and nitrogen compounds in diesel fuel at the reactor outlet, which are shown graphically, highlight that the data predicted, using models with reactions order n = 1 and $n \neq 1$, cover the experimental data quite well. State of reactor exit compounds concentrations for $n = 1$ is observed and commented according to reactor exploitation conditions.Predicted curves of c_i/c_{i0} (i = sulfur compounds, nitrogen compounds, aromatics and respectively olefines) depending on catalyst volume at catalytic bed temperature of 600 ^{0}K, where $n = 1$, diesel load of 100 m^3/h and kinetic parameters of Arrhenius equation were selected based on data from the literature, indicated a catalyst volume of 60 m^3 required to reduce the sulfur concentration of diesel fuel from 6000 ppm to 6 ppm. This value of catalyst volume is in agreement with those corresponding to an industrial reactor. Predicted curves of species hydrogenation degrees depending on mean bed temperature at $V = 60$ m^3 revealed a higher sensitivity to this temperature of the hydrogenation of olefins, aromatic and nitrogen compounds compared to that of sulfur compounds.

Two case studies of monitoring data for an industrial reactor for 50 respectively for 67 days were provided. The model adjustable parameters in terms of kinetic parameters of Arrhenius equation were estimated by minimizing the sum of squares of the differences between the monitored and predicted values of the concentrations of sulfur and nitrogen compounds at the reactor outlet. The results obtained suggested that the catalyst had almost equal specificity for the hydrogenation of sulfur and nitrogen compounds.

It is necessary to consider how these adjustable parameters evolve so that the reduction in catalyst activity can be correctly assessed.

Acknowledgements: This work was supported respect to reactor monitoring data by Petromidia SA Romanian refinery

Keywords: Modelling, Simulation, Monitoring**,** Diesel Hydrodesulfurization, PL Kinetics Models

F.61. QUANTITATIVE ASPECTS REGARDING THE POPULATIONS OF THE OAK GALL WASP, CYNIPS QUERCUSFOLII (L.) ♀♀ IN THE TAMAȘI FOREST AREA, BACĂU COUNTY

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Abstract: The asexual generation of the species *Cynips quercusfolii (Linnaeus 1758)* ♀♀ induces the formation of galls on oak leaves, which can be harvested and used as a raw material very rich in tannins. Specialized literature mentions that plant products containing tannins have hemostatic, anti-inflammatory, antibacterial, and antidiarrheal properties. They can induce vasoconstriction and reduce the secretion of aqueous humor and mucus. These products are widely used in dermatological diseases and burns. They are also used as an antidote in cases of poisoning with heavy metals, alkaloids, and glycosides.
The quantitative study on the gall-inducing *Cynips quercusfolii (Linnaeus 1758)* ♀♀ was carried out in November 2024 (03.11.2024 – 23.11.2024) in the Tamași forest area, Bacău County, by identifying and collecting galls. Four stations were established, each with an area of 400 m². In each station, 10 sample squares were delineated. Fallen leaves were counted in each sample square, and leaves with galls were extracted.
Following the analysis of the biological material, it was found that the frequency of leaves with galls varied from one station to another: Station 1 (46.4995635, 27.0175139) 0.002%; Station 2 (46.4988661, 27.0191279) 0.001%; Station 3 (46.5003302, 27.0208787) 0.086%; Station 4 (46.4996812, 27.0223070) 0.081%. The average number of galls per leaf was 1.59%, and 50.98% of the leaves with galls supported the development of two galls. Under laboratory conditions, only 7 individuals belonging to context-specific parasitoid species were obtained from the 242 galls, with an overall parasitism coefficient of 2.90%.
Although the intensity of the attack by *Cynips quercusfolii (Linnaeus 1758)* ♀♀ is low, the overall parasitism coefficient supports a favorable prognosis for the population of the oak gall wasp in the Tamași forest area, Bacău County.

Keywords: *galligenous cynipids*, tanning substances, pharmacognosic properties

F.62. FAUNISTIC COMPOSITION OF THE LEPIDOPTERA COMMUNITIES AND ASPECTS OF THE INFLUENCE OF ANTHROPOGENIC ACTIVITIES ON THE LIVING ENVIRONMENT (BACĂU COUNTY, ROMANIA)

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Abstract: Studies on the faunistic composition of butterfly communities were conducted between 2015 and 2022 in Bacău County (Măgura, Gherăiești, Hemeiuș, Luncani, Grigoreni, Berești-Tazlău, Sănduleni, Buhoci, Secuieni). Besides creating an inventory of Lepidopterological fauna, we aimed to identify habitat-disrupting factors relevant to lepidopterology.
After processing the data collected from 12 stations within Bacău County, we recorded 58 species of diurnal Lepidoptera (44.27% of the total number of species recorded in the Moldova Region) and 38 species of nocturnal Lepidoptera, observed during daylight hours or with the help of light

traps (1.44% of the total number of species recorded in the Moldova Region). The numerical abundance of diurnal Lepidoptera totaled 833 individuals, while nocturnal Lepidoptera numbered 174 individuals. From a conservation perspective, most taxa identified were classified as very rare and rare species.
Disruptive factors recorded included the expansion of agricultural land and the use of chemical substances, abandonment of traditional mowing practices (hand-scything), mowing larval host plants while butterflies are ovipositing, and vegetation fires.
Modern agricultural landscapes often experience intensified use, characterized by larger field sizes, reduced crop diversity, diminished availability of semi-natural habitats, and high inputs of agrochemicals (pesticides and fertilizers) in fields. This intensified management of agricultural sites negatively impacts biodiversity, including plants, birds, and invertebrates. The loss and degradation of semi-natural habitats in agricultural landscapes and the intensification of agricultural management are considered major reasons for the decline in moth populations. For instance, agricultural intensification has been shown to reduce moth species richness and the abundance of nationally declining moth species.
Herbicides and fertilizers can affect Lepidoptera by altering the abundance, diversity, or quality of their host plants. Insecticides can directly target both juvenile and adult Lepidoptera, causing lethal effects. Additionally, insecticides can induce sublethal effects or act as repellents to moths. These effects include, for instance, adults avoiding oviposition on treated surfaces or antifeedant effects on caterpillars.

Keywords: diurnal Lepidoptera, nocturnal Lepidoptera, disruptive factors

F.63. THE INFLUENCE OF PULSED LIGHT AND INFRARED TREATMENTS ON MOULDS ISOLATED FROM CAMEMBERT CHEESE

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Abstract: The study aims to use pulsed light and ionizing radiation to inactivate *Penicillium candidum* mould spores used to manufacture Camembert cheese. Numbers 10 to 65 light pulses were used to ensure fluences between 4.45 and 65.1 J/cm^2. Also, 3 to 15 min ionizing radiation was applied at a 10 to 21 cm distance. Moreover, the thermal effect of both treatments was studied. The main findings consisted of a decrease in the number of survivors with increasing duration/ number of pulses, treatment intensity (fluence), and distance. Pulsed light is recommended for the mould inactivation on the Camembert cheese surface after a certain ripening period. However, due to its thermal effect, the ionizing radiation is not recommended to be applied directly on the Camembert cheese surface.

Keywords: Camembert cheese, fluence, microbial inactivation, mould spores, *Penicillium candidum*, survivors, thermal effect

F.64. PULSED LIGHT AND ULTRAVIOLET LIGHT – TREATMENTS ABLE TO ENHANCE THE SHELF LIFE OF FOOD PRODUCTS

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Abstract: Pulsed light and ultraviolet light treatments are emerging technologies used to decontaminate the surface of food, packaging materials, equipment in contact with food, medical devices, and other surfaces. The work aims to show the influence of pulsed light and continuous ultraviolet light on the reduction of native or inoculated microbiota on food surfaces and their capacity to extend the shelf life of food products. The research used as examples was performed on fruits (apple, pear) and wheat grains with 20 to 100 PL, ensuring fluences between 4.46 and

34.8 J/cm^2, and UV at 5 to 25 min and 5 to 15 cm distance between samples and UV lamps. Treatments decontaminated the fruit surfaces, reduced or avoided the occurrence of rope spoilage caused by *Bacillus subtilis*, and extended the shelf life of bread.

Keywords: apples, *Bacillus subtilis*, bread, fluence, microbial inactivation, pear, rope spoilage, shelf life, wheat grains

F.65. EFFECT OF GINGER EXTRACT FOR PORK MEAT PRESERVATION

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Abstract: In this work, ginger aqueous extracts obtained either by cold maceration or by ultrasonic extraction were used for preserving pork meat during refrigeration. The effectiveness of different concentrations of extracts (1, 5 and 10 %) on the change of physical, chemical and microbiological indicators of pork meat during refrigeration was evaluated. Macerate and extract obtained by ultrasonication were used for their antioxidant and antimicrobial activity. The extracts were evaluated for their total phenolic, flavonoid and DPPH antioxidant activity. The results showed that 5 % and 10 % ginger extracts exhibit strong antioxidant activity. All samples demonstrated antibacterial activities against *Enterococcus* spp, *Coliform* spp., *Pseudomonas* spp. and *Clostridium perfringens*, the 5 % ultrasonicated sample being the most effective. Due to the high content of phenolic compounds and flavonoids, also the macerates with 5 and 10 % showed remarkable antibacterial activities.
The 5 % ultrasonicated extract reduced the growth of *Pseudomonas* spp by 68.8 % after 6 days compared to the control and by 83.2 % after 12 days. Regarding *Coliform* spp. and *Enterococcus* spp., both 5% and 10 % ultrasonicated extracts presented inhibition rates ranging from 61-88% at refrigeration times of 6 and 12 days, respectively. *Clostridium perfringens* was not detected in any sample.
The results indicated that the addition of ginger extracts reduced the total number of viable bacteria and extended the shelf life at 4°C by up to 12 days. Therefore, ginger can be safely used as a natural preservative that can maintain the stored meat products.

Keywords: antibacterial activity, ginger extract, pork meat, preservation

F.66. MONITORING OF METAL CONTENT FROM WINE INDUSTRY WASTE

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Abstract: The wine industry, one of the largest agro-industrial sectors, produces significant amounts of waste annually. This waste, not properly treated, could lead to excessive pollution. Transforming this by-product into a valuable source of active ingredients and nutraceuticals promising alternative. Numerous analyses conducted by various researchers have demonstrated that this waste is rich in biologically active compounds such as polyphenols, carotenoids, vitamins, but also pectin, cellulose, lignin, proteins and minerals.
According to the literature, the waste resulting from the technological process of obtaining wine

can be utilized in numerous industries. In the cosmetics industry, various creams, serums, and lotions with grape pomace are manufactured, with antioxidant, antimicrobial, and anti-aging effects. Wine waste, being valuable from a nutritional point of view, may be used as well in the food industry due to its rich content in elements necessary for the proper functioning of the human body. Another possibility is the utilization of wine waste in the feed industry, as value-added food for animals or as compost to increase soil quality. Value-added products originating from wine waste could also be useful in medical applications with anti-inflammatory and anticancer effects, or in the production of new materials, referred to as bioadsorbents such as biochar for the removal of various gases, metals or pesticides from soil, water or industrial effluents. Wine yeast has also recently found applications in biogas production.
This study aimed to determine metals such as Pb, Cd, Ni, Mn, Co, Cr, Cu from 9 samples of grape pomace and 3 samples of yeast harvested in the autumn 2023 grape campaign and another 9 samples of grape pomace and 3 samples of yeast from the 2024 harvest campaign from three different areas of the Dobrogea region such as Aliman village, Pestera village and Murfatlar town, located in S-E of Romania. In this study, the goal was to monitor and assess the content of these metals in wine waste, such as grape pomace and yeast, in order to evaluate their subsequent potential use in various industries.
The samples analysis was determined by graphite furnace atomic absorption spectrometry (GFAAS, model: ContrAA 800D, AnalytiK Jena Instruments, Germany) using standard calibration technique.
Following these analyses, the lowest value for grape pomace samples from 2023 and 2024 was found for Co (0.088 mg/kg), for the grape pomace from the Cabernet Sauvignon Rose variety (Aliman village). For the yeast samples harvested in 2023 and 2024, the lowest value was found for Cd (0.112 mg/kg), for the yeast from Red Grapes (Pestera village).
Also, the highest values were identified for Cu, both in the grape pomace and yeast samples harvested in the two years of the study. For pomace, the highest value, 81.573 mg/kg, was recorded for the Red Feteasca Neagra variety (Aliman village) and for yeast, 103.437 mg/kg, for yeast from Red Grapes (Murfatlar town).
The low values of metals in the wine waste measured in this study indicates that the waste from the wine industry originating from the Dobrogea area, can be valorize with confidence in numerous industries.

Keywords: heavy metals, waste, wine industry;

F.67. TWO-LEVEL APPROACH IN WELLS PLANNING

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Abstract: Drilling infill wells leads to the need of planning the drilling rigs workload throughout the year without big gaps by correctly planning the connected activities and allocation of the resources. This contribution presents the modelling of simplified wells planning with only 9 activities out of total 27-45 activities, using a two-level approach considering two cases: limited resources when planning several fields and unlimited resources for each field. We took into account two fields with multiple sectors and different number of wells in each sector. Given the high number of stakeholders involved and their impact on the drilling schedule, well by well planning is not enough for drilling rig workload assurance and gaps between activities minimization, so sector and field prioritization based on the completion of the pre-drilling execution phase may be a game changer in drilling execution planning. The algorithms are implemented in MATLAB as in-house software, its interface, ensuring primary data and planning results visualization, well by well for each sector/field, and Gantt charts.

Keywords: drilling, wells planning, Gantt chart,

F.68. AMINO ACIDS CONTENT OF *IN VITRO* REGENERANTS FROM *BRASSICA OLERACEA* L.

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Abstract. White cabbage (*Brassica oleracea* L., var. *capitata*) is an important food plant, because of its content in essential compounds for the normal functioning of the human body. In addition to water (75-95 %), cabbage contains carbohydrates, proteins and nitrogenous substances (amino acids and amides), fats, mineral salts based on calcium, iron, potassium, sodium and phosphorus, organic acids, aromatic oils, phytoncides, vitamins.
The white cabbage constitues an important source of amino acids such as cysteine, cystine, isoleucine, leucine, lysine, threonine, tyrosine, valine.
In vitro culture of anthers and ovaries is an unconventional method of plant regeneration that can be used in plant breeding. Depending on the genotype of the species, the nutrient medium and the cultivation conditions, the technique allows the obtention of new genotypes with superior nutritional qualities compared to conventional plants.
Therefore, the aim of this study was to evaluate the free amino acids content of regenerants obtained from Brassica cultured *in vitr*o using thin layer chromatography (TLC).
The highest amino acid content of the samples obtained from callus and regenerants cultivated on medium containing kinetin and 2,4-dichlorophenoxyacetic acid (KD medium) proves an important capacity for biosynthesis of free amino acids. In addition to threonine and lysine, two important essential amino acids, cysteine and cystine were well represented in all studied samples.
The chromatographic study of alcoholic extracts from callus cultures, shoots and regenerants from anthers and ovaries revealed that the content of free amino acids is influenced by the genotype, the hormonal formula in the culture medium and the origin of the biological material.

Keywords: *Brassica oleracea*, amino acids, *in vitro* culture, regenerants

F.69. CHARACTERIZATION OF SOME GRAPE MARC EXTRACTS BY ULTRAVIOLET-VISIBLE ABSORPTION SPECTROSCOPY AND STATISTICAL ANALYSIS

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Abstract: In recent years, the scientific community has shown a growing interest in investigating the grape marc extracts. Due to their high content in polyphenolic compounds such as antochyanins, flavonoids and their derivatives, grape marc extracts may represent an important source for developing valuable products.
Depending on grape variety and extraction conditions, pomaces extracts may have different phytochemical profiles.
The present work aims to investigate the characteristics of some marc extracts from *Merlot*, *Cabernet Sauvignon* and *Feteasca Neagră* grape wine variety using UV-Vis spectroscopy in order to establish the chemical fingerprints, the total phenolic index and color parameters.
In this view, extractions of grape marcs were carried out using different alcohol concentrations.
The samples were spectrophotometrically evaluated using Shimadzu Spectrophotometer UV-1280. Different regions of the spectra are associated with specific families of chemical

compounds. In this sense, the ultraviolet–visible spectrum can be considered as the chemical fingerprint reflecting the composition of studied extracts.
The total phenolic index (I_{280}) of all samples was calculated by measuring absorption at 280 nm. Color parameters (color intensity, color hue and proportion of red, yellow, blue) were calculated by measuring the absorbance at 420, 520, and 620 nm.

R-Commander and FactoMineR plugins were used for multivariate analysis of samples.
The chemical fingerprint of all analyzed samples are similar for each type of extract (ethanolic and hydroalcoholic), *Feteasc*ă *neagr*ă standing out through higher absorbance values.
The ethanolic extract obtained from *Feteasc*ă *Neagr*ă variety pomace has the higher phenolic index, while the hydroalcoholic extract obtained from *Cabernet Sauvignon* presented the lowest value. *Merlot* alcoholic sample exhibits the highest color intensity, instead *Feteasc*ă *Neagr*ă samples present the highest contribution of red the overall color.
The results of the present study showed that using a simple and accessible technique, preliminary analysis can be successfully performed allowing to provide valuable information about various samples from the wine industry.

Keywords: grape marc, extraction, UV-Vis spectroscopy, statistical analysis

F.70. FLUORESCENT SENSING OF PHARMACEUTICAL COMPOUNDS USING A COPPER(I) COMPLEX

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Abstract: Copper(I) thiocyanate complexes, particularly those incorporating P,N-donor ligands, have attracted significant interest for their remarkable photoluminescent properties. These properties make them promising candidates for sensitive and selective detection of pharmaceutical compounds, such as sodium diclofenac and tetracycline hydrochloride. In this study, we report the synthesis and photoluminescent behavior of the complex [Cu(NCS)(PPh_3)(dpa)], along with its interaction with two pharmaceutical analytes, sodium diclofenac (anti-inflammatory) and tetracycline hydrochloride (antibiotic). The complex was prepared in acetonitrile at room temperature, resulting in a mononuclear species with tetrahedral geometry and intense blue-green photoluminescence in the solid state. In solution, it exhibited an emission maximum at 350 nm, which significantly decreased upon addition of the analytes. These fluorescence quenching effects suggest complex–analyte interactions, likely involving static quenching mechanisms. The detection limits for diclofenac and tetracycline were established at low concentrations, and the binding constants indicated a strong interaction between the complex and the analyzed pharmaceutical substances. These results highlight the potential of the [Cu(NCS)(PPh_3)(dpa)] complex as a selective fluorescent sensor for pharmaceutical contaminants in aqueous media.
Acknowledgements: The authors are grateful to „Dunărea de Jos" University of Galați for funding.

Keywords: copper(I) complex, P,N-donor ligands, photoluminescence, fluorescent detection, pharmaceutical substances.

F.71. EVALUATION OF THE PHYTOCHEMICAL CONTENT AND BIOLOGICAL PROPERTIES OF SIDERITIS SYRIACA

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Abstract: *Sideritis syriaca* is a plant from the Lamiaceae family known for its medicinal properties, particularly in the form of infusions. It can grow in various regions, such as Italy, Spain, Greece, and Cyprus, and is commonly found in the Balkan areas. Over time, several studies have been conducted on the chemical composition of this plant, identifying compounds such as polyphenols, flavonoids, diterpenes, essential oils, and anthocyanins.
Due to these classes of compounds, *Sideritis syriaca* has demonstrated potential activities, including antioxidant, antimicrobial, antitumor, and antineurodegenerative effects. Our study aims to investigate this *Sideritis* species cultivated in Romania and compare our findings with other data on the same species.
The method used to highlight certain chemical compounds was made possible through various extraction techniques and HPLC chromatography. The biochemical and biological activities evaluated in this study included antioxidant, antitumor, and antineurodegenerative activities.
Thus, based on chromatographic analyses and chemical and biological tests, *Sideritis syriaca* can be considered a promising representative of its family, with significant medicinal properties for the prevention and treatment of infections, but also with potential for oncological and neurodegenerative diseases.
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Keywords: *Sideritis* species, antineurodegenerative activity, antitumor effect

F.72. PHYTOCHEMICAL ANALYSIS AND ANTIOXIDANT CAPACITY OF EUROPEAN MISTLETOE LEAVES (VISCUM ALBUM L.)

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Abstract: European mistletoe (*Viscum album* L.) has therapeutic properties known for centuries, properties that depend on the host tree. In the chemical composition of mistletoe extracts, different compounds have been identified that demonstrated many health benefits, such as improving the immune system, anti-inflammatory effects, promoting cardiovascular health,

immunomodulatory properties, vasodilator effects, antihypertensive, antioxidant and strong anti-inflammatory activities. Therefore, it indicates its therapeutic potential in alleviating oxidative stress and inflammatory conditions. Although its fruits have cytotoxic properties, the presence of compounds in mistletoe extracts with selective anticancer activity has been proven in recent years. It is believed that the basic mechanisms of action of key phytoconstituents, such as lectins, viscotoxins and flavonoids, contribute to these beneficial effects. In this study, alcoholic extracts of *Viscum album* (mistletoe) grown on host trees (poplar and lime) were investigated for their total flavonoid (TFC) and polyphenol (TPC) content, and their antioxidant activity by free radical scavenging methods (DPPH, ABTS) and electrochemical methods (OCP, CV). The content of polyphenols and flavonoids has been shown to be related to the antioxidant activity of plant extracts. *In vitro* analysis showed that extracts of lime and poplar mistletoe had enhanced antioxidant activity. All alcoholic extracts of mistletoe collected from different host plants showed high antioxidant activity. These findings provide a basis for further research on the bioactive components of *Viscum album* L. This study aimed to demonstrate the antioxidant activity of extracts from this plant species to explain its biological properties and guide further therapeutic uses, providing insights into the use of herbal products.

Acknowledgement: This work was partially supported by ADER grant 5.2.1. –" Conservation *and valorization of the genetic heritage of aromatic and medicinal species that can be cultivated on the territory of Romania"* and "Targeted therapeutic molecules, anti-inflammatory and antitumor, isolated from exotic plants acclimatized in Romania", funding contract no. 7956/31.03.2025.

Keywords: *Viscum album* L., phytochemical composition, biological activity, antioxidant

F.73. FORMULATION AND STUDY OF EXTENDED-RELEASE CAPSULES FROM CRATAEGUS MONOGYNA SPECIES EXTRACTS

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Abstract: *Crataegus monogyna/C. oxyacantha*, a thorny shrub, commonly known as hawthorn, is part of the Rosaceae family and is widespread in the spontaneous flora of hilly and plain areas, on stony and bright terrain.

The main parts used are the flowers, leaves and fruits, which have a high content of flavonoids (hyperoside, vitexin, rutin, quercetin), polyphenols, triterpenes, pectins and tannins. It has been traditionally used for menstrual flow, kidney stones, as a diuretic, astringent and, most commonly, cardiac tonic.

The aim of the work was to identify the chemical composition of the hydroalcoholic extracts from the mixture of leaves and flowers, as well as the formulation of delayed-release capsules, followed by the analysis of the *in vitro* degradation of the obtained capsules.

The results obtained regarding the chemical composition of the extract were correlated with the specialized literature.

Thus, a product was obtained in the form of a hard gelatin capsule containing a smaller enteric capsule inside and, on the one hand, hawthorn fruit powder, and on the other hand, microspheres from dried hawthorn extract.

Following the degradation analyses, it was observed that the capsules did not undergo any change under the action of gastric juice. In the intestinal dissolution environment, the capsules opened and released their contents within 60 minutes.

In conclusion, the dissolution test corresponds to the requirements imposed by FR X, and the pharmaceutical form obtained falls into the segment of prolonged-release preparations.

Keywords: *Crataegus monogyna*, phytochemical characterization, extended-release capsules

F.74. PLANT EXTRACTS AS NEW ALTERNATIVES IN THE ENDODONTIC ANTIBACTERIAL TREATMENT

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Abstract: Oral diseases are well known for being major health problems around the world. Despite numerous advances in the medical field, these problems still affect the lives of many people.
This study aimed to demonstrate the efficacity of the bioactive compounds and the properties of the extracts obtained from *Zanthoxylum zanthoxyloides* in endodontic treatments. After obtaining the extracts, their action on the organic material (tooth) were tested. The study included tests regarding the antioxidant and antimicrobial activity of the extracts and the interactions between the extracts and the organic material evaluated by FT-IR and Raman spectroscopy.
The results are an important beginning in the study of the included plant extracts, as they showed some valuable properties that can be used in endodontic treatments.
In conclusion, the presented extracts have the potential to become important parts in endodontic treatments.
Acknowledgements: This work was partially supported by ADER grant 5.2.1. – "Conservation and valorization of the genetic heritage of aromatic and medicinal species that can be cultivated on the territory of Romania"

Keywords: endodontic treatments, *Zanthoxylum zanthoxyloides*, antimicrobial activity

F.75. COMPARATIVE ANALYSIS OF THE CHEMICAL COMPOSITION IRIS PSEUDACORUS AND NYMPHAEA ALBA SPECIES BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)

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Abstract: The aquatic plants *Iris pseudacorus* and *Nymphaea alba* are recognized for their adaptability in wet environments and for their therapeutic potential. The study of the chemical composition of these species can provide valuable information on chemical composition and possible uses for health.
The plant samples were collected from the Danube Delta Biosphere Reserve, dried and subjected

to extraction with organic solvents. The obtained extracts were analysed using gas chromatography-mass spectrometry (GC-MS) technique to identify each compound based on the mass spectrum and to find out which compounds are responsible for the biological properties evaluated for the respective plants.
The results revealed the presence of volatile organic compounds, which were mainly hydrocarbons and oxygenated derivatives, fatty acids and fatty acid esters, terpenoids and steroids in both species.
The study contributes to a better understanding of the chemical composition of native aquatic plants and their utilization for scientific purposes.
Acknowledgements: This work was partially supported by the bilateral project Ro-Fr, LAURENCE, PC Brancusi program, No 8BMFR/10/09/2024

Keywords: chemical composition, *Iris pseudacorus*, *Nymphaea alba*, GC-MS

F.76. NATURAL DEEP EUTECTIC SOLVENTS AS SUPERIOR EXTRACTANTS: ENHANCING THE BIOACTIVITY OF PERILLA FRUTESCENS EXTRACTS

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Abstract: This study investigates the use of natural deep eutectic solvents (NADES) in ultrasound-assisted extraction of *Perilla frutescens*, compared to conventional methanol extraction. NADES, which are biodegradable, non-toxic, and derived from natural sources, yielded higher amounts of polyphenols and flavonoids, especially with optimized water content. Antioxidant potential, evaluated via DPPH and ABTS assays, was significantly enhanced in NADES extracts. Antimicrobial activity was also demonstrated against both Gram-positive and Gram-negative bacteria. Overall, NADES-UAE proved to be a sustainable and efficient green extraction method, improving both yield and functional properties of plant-derived bioactive compounds for food and pharmaceutical applications.
Acknowledgements: This work was partially supported by ADER grant 5.2.1. – "Conservation and valorization of the genetic heritage of aromatic and medicinal species that can be cultivated on the territory of Romania" and the bilateral project Ro-Fr, LAURENCE, PC Brancusi program, No 8BMFR/10/09/2024

Keywords: NADES, UAE, polyphenols, flavonoids, green chemistry

F.77. THE IMPACT OF KONJAC GLUCOMANNAN POWDER ON BREAD PROPERTIES

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Abstract: In this study, the influence of Bio Konjac glucomannan powder (KGM) in various proportions (0-2%) on bread is investigated. KGM is a high-molecular-weight, water-soluble, neutral polysaccharide obtained from the tubers of the konjac plant. KGM contains glucose and mannose units in a molar ratio of 1:1.6, with a low degree of acetyl groups at the C-6 position.

It has been approved by the FDA as a non-caloric food ingredient, due to one of its primary benefits as an indigestible dietary fiber, which has been demonstrated to be effective in weight reduction, modification of intestinal microbial metabolism, and cholesterol reduction.
In addition to its health-promoting benefits, KGM offers great potential for applications in the food and pharmaceutical industries for thickening, texturing, gelling, and water imbibing, among others.
Studies in the literature show that KGM can have synergistic effects when combined with protein, thereby forming different textures. Its interaction with protein has been reported to influence the molecular composition, spatial structure, and functional characteristics of foods in which proteins are the major ingredients, especially flour-based products.
In this work, we aim to formulate a functional product that would contribute to people's health through the daily consumption of bread, by monitoring the properties of bread during its formation as a finished product.
The addition of KGM influences various bread properties, such as porosity, moisture content, conductivity, and organoleptic properties. Glucomannan can improve hydration and enhance nutrient absorption.

Keywords: Konjac glucomannan, bread, porosity, moisture, conductivity.

F.78. MATHEMATICAL MODELLING OF THE DYNAMIC VISCOSITY OF ETHYLENE GLYCOL AQUEOUS SOLUTIONS

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Abstract: Aqueous ethylene glycol solutions are widely used in manufacturing solvents, lubricants, conditioning materials, and hygroscopic agents. As a result, there is an increased interest in investigating their physicochemical, thermodynamic, and transport properties, with several studies being done in the topic. This work created reliable mathematical correlations that are required for regulation and simulation in the engineering process industry. Dynamic viscosity was related to temperature and concentration, recognized for influencing the behavior of ethylene glycol solutions. The obtained results showed that a second order polynomial equation is appropriate for describing the evolution of the studied mixtures. The recorded values for statistical error functions such as sum of squared errors, average relative error, residual root mean square error, standard deviation of relative error, sum of absolute error, and coefficient of determination sustained the adequacy of the generated mathematical expressions.

Keywords: ethylene glycol, dynamic viscosity, mathematical modelling

F.79. REMEDIATION OF DYES CONTAMINATED WATER THROUGH ADSORPTION ON GREEN MATERIALS

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Abstract: The current work was focused on the preparation of a new material with favorable adsorption properties. An inert polymer was used as an inclusion matrix for cherry stone powder, an undervalued byproduct of the fruit processing industry, and the adsorbent was appraised

against a model azo dye molecule. Our study confirmed firstly that the obtained material was porous, and the cherry stone powder was properly incorporated into the polymeric matrix. Secondly, based on the acquired results, we concluded that the adsorbent effectively kept the contaminant out of its aqueous environment. The Response Surface Methodology was used to optimize the *p*H of the dye solution, the amount of the added adsorbent, and the working temperature. The analysis of the experimental data by using various isotherm and kinetic models revealed that the adsorption process adhered to Freundlich and Temkin equilibrium isotherms and was well described by pseudo-second-order kinetics.

Keywords: cheery stones, dyes, adsorption, equilibrium isotherms, kinetics

F.80. STABILIZATION OF PROBIOTIC BEVERAGES USING CLAY-BASED MATERIALS

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Abstract: Probiotic-based fortifying beverages have recently gained popularity due to their numerous health benefits. The ability of probiotic beverages to improve digestion is one of their main advantages. These beverages include live bacteria that can help restore the proper balance of intestinal flora, necessary to maintain a healthy digestive system. Beverages enriched with prebiotics such as vitamins, minerals, polyphenols or other bioactive compounds present products with increased biological value.
The present research focuses on the production and stabilization of probiotic beverages based on local and traditional materials (wheat bran, sour borscht) with the addition of red grape pomace extracts and berries. The fermentation capacity and quality indices of the drinks obtained based on endogenous and exogenous microorganisms were tested. Since the production process involves stages with unstable colloidal phases over time, which influence the stability and shelf life of the product, the ability of clay-based materials to clarify and stabilize the prepared fortifying beverages was tested. The content of bioactive substances (polyphenols, vitamins, carotenoids), antioxidant capacity and biological value of the beverages, which are rich in both probiotics and prebiotics, were determined.

Keywords*:* Beverages, probiotics, prebiotics, stabilization, clay-based materials

F.81. STUDIES ON ENSURING PROTEIN STABILITY IN SAUVIGNON WHITE WINE, THROUGH BENTONITE TREATMENT

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Abstract: **Proteins from grapes** are among the main causes of clarity instability in white wines. In the absence of a specific stabilization treatment, proteins are partially precipitated, leading to

the appearance of characteristic turbidity. Treating musts and wines with various materials is the only way to prevent their degradation.
Finding treatment with bentonite is a step winemakers perform on wines to remove proteins and the associated risk of colloidal instability. Bentonite is a type of clay that **has the property of adsorbing** proteins at the wine's *p*H. When used before bottling, a loss of **wine color and aroma is observed**. This effect becomes more pronounced as the quantity of bentonite increases, and in recent years, winemakers have noticed a significant rise in the amounts used for wine stabilization.
The aim of this study was to evaluate the impact of bentonite additions during alcoholic fermentation on the stability and organoleptic properties of wines, taking into account the amount of bentonite used, the pH, and the timing of bentonite addition.
Several important parameters influencing protein stability were studied, including: *p*H, bentonite dosage, and bentonite type, among others. Optimal parameters were established for the Sauvignon white wine used in the determinations.
Despite numerous attempts to find alternatives, bentonite remains, to this day, a reliable method for preventing protein degradation. Its effectiveness is essentially related to its type (sodium or calcium), the wine's pH, and proper rehydration. Harvests in which the wine pH is relatively high will present difficulties in protein stability, and the bentonite doses required for their removal will be higher. Therefore, it is necessary to study the amount of bentonite added, its type, as well as other important factors such as the wine's pH.

Keywords: white vine, protein stability, bentonite, pH

F.82. SYNTHESIZED ORGANOCLAYS FOR THE RETENTION AND CATALYTIC DEGRADATION OF METHYL PARATHION

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Abstract: Organophosphorus pesticides (OPs) are extensively applied in agriculture as insecticides due to their cost-effectiveness and high efficiency, with global usage reaching up to 2 million tons annually, representing approximately 38% of total insecticide consumption worldwide. The primary toxicological concern associated with OPs is their neurotoxicity, which arises from the inhibition of acetylcholinesterase through phosphorylation, leading to the excessive accumulation of acetylcholine in neural synapses.
Methyl parathion is an organophosphorus pesticide known for its potent toxicity and its irreversible inhibition of acetylcholinesterase activity in the nervous systems of insects. Due to its extensive application in contemporary agricultural practices, the presence of residual methyl parathion in soil and aquatic environments has become a significant concern. Its persistence and bioaccumulation potential pose considerable risks to aquatic ecosystems, particularly through trophic transfer within the food web.
Montmorillonite clays present a high specific surface area, layered structure, and notable cation exchange capacity, making them highly effective for adsorbing organic pollutants such as methyl parathion. The adsorption performance of montmorillonite clays can be significantly improved through structural modifications such as pillaring. When combined with advanced oxidation processes, specifically vanadium-based catalytic ozonation, these materials demonstrate enhanced degradation of pesticides, leading to the formation of less toxic byproducts.

Keywords: methyl parathion, organophosphorus pesticides, catalytic ozonation, clays, vanadium-based catalysts.

F.83. SOME ASPECTS REGARDING POSSIBLE APPLICATIONS OF ANIONIC CLAYS

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Abstract:The purpose of this article is to offer an overview of relevant data found in specialist literature on the topic of anionic clays. The focus is on the properties, methods of obtaining and applications of these materials. The current evolution in rational design and the preparation of high-quality materials with good characteristics and stability constitute a great challenge for studies and researches. Hydrotalite-type anionic clays, also known as layered double hydroxides (LDHs), are essential for their enhanced stability, cost-effectiveness, low toxicity and simplicity of production and reuse. These are the most promising inorganic materials due to their wide range of applications, such as catalysis, or as adsorbents/ agents that can regulate the release of previously absorbed compounds. The current study focusses on the possibility of using (LDHs) anionic clays in a variety of applications such as catalysis, oil waste destruction, adsorbents, agriculture, and plastic recycling in order to encourage further research in the development and exploration of the use of these mineral clays in various fields of science and technology .

Keywords: anionic clays, properties, obtaining, application

F.84. METROFOOD-RO EVOLVE: THE INFLUENCE OF FOOD TECHNOLOGIES ON THE BIOAVAILABILITY OF NUTRIENTS

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Abstract: The research project Metrofood-RO Evolve aims to strengthen the position of the METROFOOD-RO national research network, which is an integral part of the pan-European METROFOOD-RI infrastructure. One of the main activities is to study the influence of food technologies on the bioavailability of nutrients. Experimental legume crops using emerging and conventional agricultural technologies are established to examine the impact of organic biofertilizers on the nutritional properties of legumes. The effect of biotechnological or emerging processing on the nutritional profile and antioxidant properties of plant matrices, functional and antigenic properties of proteins, rheological behaviour and indigenous microbiota of plant matrices are explored. Further, new, nutritionally optimized food products using conventional and sustainable cultivated legumes, with the addition of ingredients from the circular economy (e.g., grape marc), are produced. Isotopic and elemental fingerprints, fatty acid profile and life cycle assessment (LCA) of the new products will be addressed.

Keywords: antioxidants, bioavailability, circular economy, emerging technologies, grape marc, legumes, life cycle assessment, nutrients, nutritional profile, rheological behaviour

F.85. SANITIZATION STRATEGIES AND PROCEDURES TO AVOID MICROBIOLOGICAL CONTAMINATION IN OENOLOGY

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Abstract. In the wine industry, the prevention of microbiological defects is essential to guarantee the quality of wines. The present work aims to analyze the strategies for preventing the main wine defects due to microbiological contaminations and to develop an effective control plan. According to the HACCP system for wine industry, in order to minimize the risk of microbial contamination with species that can seriously affect the sensory and physico-chemical quality of the wine (*Brettanomyces, Lactobacillus, Oenococcus, Pediococcus*), some measures should be implemented for the hygienic management of the production space, optimization of sanitization and the implementation of effective microbiological controls.
Sanitization is a process structured in two stages: (i) – cleaning, which involves the use of appropriate detergents and adequate rinsing to remove residues; (ii) disinfection, which consists of the application of specific disinfectants (virucides, bactericides, fungicides), specific to cellular pathogens, such as bacteria and fungi in grapes and transport media.
For an effective sanitization, it is important to consider the key process factors (TACT):

- Temperature: Warmer water improves the effectiveness of detergents.
- Mechanical action: The use of scrubbing heads and foam channels ensures uniform coverage.
- Product concentration: Compliance with recommended doses increases the effectiveness of the treatment.
- Contact time: Increase exposure time, when possible, to compensate for changes in temperature or concentration.

Rapid and specific hygiene testing methods are essential to identify possible microbiological contamination before it has an impact on wine quality. Recent techniques include ATP-metry, which measures biological activity by detecting ATP, an indicator both of the quality of cleaning (cellular remains) and of disinfection (bacteria).
Determination of CFU by incubation on specific media in Petri dishes remains the classic method for determining the degree of surface contamination, but requires a longer time. Other methods, such as PCR and flow cytometry, can detect *Brettanomyces* specifically, providing more accurate results than traditional methods, but are expensive.
It was developed a plan for winery sanitation through effective microbiological controls using rapid ATP-metry methods.
The process of cellar sanitization is complex but necessary for producing high-quality wines. The organoleptic quality of the wine is preserved by maintaining a hygienically safe environment through the integration of cleaning and disinfection methods with a microbiological monitoring routine.

Keywords: cellar sanitization, disinfection, monitoring methods, wines quality.

F.86. LATEST ADVANCES IN METHODS TO PREDICT WINE STABILITY

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Abstract. The development of protein opacity in white wines is an unacceptable visual defect attributed to the slow unfolding and aggregation of proteins. This is favored by exposure of the wine to excessive temperatures, but can also develop in properly stored wines. A number of studies on the combined effects of temperature (25, 40 and 70 °C) and pH (2.5÷4.0) on the

stability of proteins in wine has been published. The results showed three classes of proteins with low conformational stability involved in aggregation at room temperature: *β*-glucanases, chitinases and some thiamatin-like protein isoforms. Unexpectedly, it was found that at 25 °C a maximum instability was observed at a lower pH, while an increase in temperatures led to an increase in turbidity at a higher pH. These different behaviors could be explained by the impact of pH on intramolecular and intermolecular electrostatic interactions. The reported results highlight the complexity of protein aggregation mechanisms, the fact that wine pH, ionic strength, wine protein composition and phenolic compounds, ethanol, organic acids, metals and sulphate content play a role in the formation of wine protein haze and characteristics of the aggregates.
To predict the storage behavior of each type of wine, most winemakers use a thermal test (80 ºC for six hours or 90 ºC for 1 hour and held at 4 °C for 24 hours) to check the stability of proteins in white wines. However, some winemakers consider this test to be too severe, resulting in wines that are over-clarified with bentonite.
This paper presents the results of a study comparing the predictive capacity of this test by heating in a water bath 80 °C for two hours, held at 4 °C for 12 hours, and allowed to warm to room temperature, assessed by nephelometry. The heat test was applied to wines from six varieties: *Aligoté*, *Fetească albă*, *Tămâioasă românească*, *Fetească neagră*, *Merlot* and *Hamburg Muscat*. Another four wines obtained by ultrasonic treatment (US) before fermentation, from the varieties: *Fetească albă*, *Tămâioasă românească*, *Carbernet Sauvignon* and *Hamburg Muscat* were subjected to the same heat stability test.
Two of the four wines treated with US did not develop any haze at all. The other six wines, clarified with bentonite at the dosages determined by the predictive tests, remained clear after a long period of storage at temperatures between 12 ºC-18 ºC.
Therefore, the least severe stability test, heating at 80 ºC for 2 hours, which generally indicated lower dosages in this study, accurately predicted the short- and medium-term stability for these wines under normal storage conditions.

Keywords: heat, protein stability tests, turbidity, white wine, wine haze

F.87. WE ARE SAVING THE PLANET! SUSTAINABILITY THROUGH RECYCLING IN 3D PRINTING

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Abstract: An experimental station for recycling plastic materials to produce filament for 3D printing. Increasing involvement in environmental protection through the implementation of an experimental station for the recycling of plastic materials in order to produce filament for 3D printing, proposes an integrated approach in the management of plastic waste (especially PET) and recycling them into filament for 3D printing.
The general objective of the project is to increase the degree of involvement in environmental protection by implementing an experimental station for the recycling of plastic materials in order to produce filament for 3D printing.

Keywords: plastic materials, environmental protection, recycling.

F.88. APPLICATION OF SAWDUST-CALCIUM ALGINATE BIOCOMPOSITE MATERIAL FOR MALACHITE GREEN DYE REMOVAL FROM AQUEOUS SOLUTIONS

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Abstract: Sawdust pollution, often referred to as wood dust pollution, poses serious health risks, including respiratory issues and cancer, and can significantly harm the environment by contaminating water and soil. This waste can cause water pollution by decomposing and consuming oxygen, leading to hypoxic conditions harmful to aquatic life, and leaching toxic substances like lignin and fatty acids. It can also contaminate soil, affecting plant growth and disrupting ecosystems by promoting the growth of fungi and bacteria. In the last decade, considerable efforts have been made to convert sawdust waste into valuable products for wastewater treatment, highlighting its importance in promoting a sustainable environment and enhancing global waste management. Recently, sawdust-based adsorbents have seen increased use in wastewater treatment applications due to their renewable nature, straightforward preparation methods, and advantageous structural and surface properties for adsorption. Obtaining biocomposites based on sawdust represents a new research direction for its valorization in depollution processes. Only a few studies have been reported so far regarding the synthesis of biocomposites based on sawdust and natural polymers.

In this study, a biocomposite material was synthesized by immobilizing sawdust biomass in calcium alginate beads and evaluated for its ability to remove organic dyes from aqueous matrices. Among the most commonly used organic dyes, Malachite Green (MG) dye was chosen as the target molecule because it significantly impacts the environment by causing severe water pollution, being highly toxic to aquatic life, microbial, and plant systems, and persisting in the environment due to its resistance to biodegradation. These effects underscore the need for effective treatment and remediation strategies. Scanning electron microscopy (SEM) and Fourier-transform infrared spectroscopy (FTIR) were employed to characterize the sawdust/calcium alginate composite matrix. Additionally, the bead size and the point of zero charge were measured. In a batch system, lab-scale biosorption studies were carried out. Synthetized biosorbent (generically named SD-P1S6-A-5%) beads had a spherical shape, a diameter of 3.0760 ± 0.0700 mm, a point of zero charge of 6.5, and textural stability while being stored at 4°C in calcium chloride solution. To achieve good removal efficiency, key process parameters including the initial solution pH, stirring speed, biosorbent dose and initial MG concentration were optimized. The removal efficiency was greater than 94% for all initial MG concentrations tested, ranging from 10 to 50 mg/L, at a temperature of 21 ± 2°C, with a biosorbent dose of 3 g/L, pH of 6, duration of 5 hours, and stirring speed of 130 rpm.

In conclusion, the biosorbent SD-P1S6-A-5% stands out as an innovative composite material compared to traditional adsorbents. It is cost-effective, durable, easy to produce, and environmentally friendly. Utilizing sawdust waste to synthesize this composite material paves the way for creating new value-added products.

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Keywords: sawdust-biomass, natural polymers, biocomposite, organic dyes, biosorption, wastewater treatment

F.89. UTILIZATION OF AGRICULTURAL LAND POLLUTED WITH HEAVY METALS: A CASE IN THE MARAMURES REGION, ROMANIA

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Abstract: This study investigates agricultural land in Maramureș County, Romania, located in proximity to a former mining site with a history of heavy metal contamination. The area lies adjacent to the Cavnic River, downstream from a tailings pond associated with a mineral processing facility. Local farmers employ various fertilization practices, including the application of sediments extracted from the Cavnic River bed and, occasionally, the use of nutrient-rich sludge from municipal wastewater treatment plants. While these materials are valued for their content of essential nutrients (NPK), their use may exacerbate existing soil pollution.The research assesses contamination levels, taking into account both legacy mining impacts and current agricultural practices. The findings indicate that the application of sewage sludge, although nutrient-rich, does not represent a viable solution for improving soil quality at this time, in this area, due to the persistent heavy metal contamination from past mining operations.The study recommends the implementation of local phytoremediation strategies to mitigate the transfer of heavy metals from soil to corn crops and vegetables. Furthermore, it advocates for more accessible governmental policies focused on the remediation of former mining sites and the environmental safety, in parallel with a new approach to the local land use strategy aimed at reducing the risks associated with pollutant exposure.

Keywords: corn plants, historical contamination, transfer factor, sewage sludge, mining area, environmental risks, food safety, farming practices, local urban planning

F.90. SPECTROPHOTOMETRIC DETERMINATION OF POLYPHENOLIC COMPOUNDS IN VARIOUS WINES FROM BACĂU COUNTY

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Abstract: This study investigates the spectrophotometric determination of polyphenolic compounds in white and red wines from Bacău county.
Two samples of untreated and unfiltered white wine and two of red wine were analyzed. Five

types of clay-based absorbent materials were used: natural montmorillonite (MtB), chemically modified montmorillonite (MtPILC), montmorillonite K10 (k10B), ion-exchanged montmorillonite (AHK10), and montmorillonite impregnated with β-cyclodextrin (K10β-CD). The wine samples were treated with these materials at various concentrations and then analyzed spectrophotometrically to determine chromaticity and polyphenol content. The results showed significant variations in color intensity, tannin and anthocyanin content depending on the absorbent used. For instance, the red wine, showed a 43.85% decrease in color intensity after treatment with k10B, while the red wine, exhibited a 43.55% increase in color intensity after treatment with K10β-CD. Understanding of these effects can help in optimizing wine production processes to enhance desired characteristics and improve overall wine quality. The research highlights the importance of selecting appropriate absorbent materials to achieve specific enological goals, such as improving the stability, color, and taste of wines. Additionally, the use of spectrophotometric analysis provides a reliable and efficient method for monitoring these changes, offering winemakers a valuable tool for quality control and product development.

Keywords: absorbent materials, color intensity, polyphenolic compounds, spectrophotometric analysis, wine quality

F.91. ESTIMATION OF ANTIOXIDANT CAPACITY ON NUTRITIONAL AND BIOACTIVE MOLECULES IN CONVENTIONAL AND ORGANIC AGRICULTURE

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Abstract: Today, one of the biggest challenges facing the agricultural and food industries is developing sustainable and environmentally friendly systems to meet the nutritional demand of the ever-growing global population. The consumption of red pepper, parsley and ginger is constantly increasing due to their antioxidant capacity, occupying an important place in most cuisines around the world.As the market develops and consumers are directed towards prioritizing the flavor and nutritional content of their foods, establishing quality parameters, antioxidant activity, and pesticide impact in these vegetables has become essential. These vegetables are rich in antioxidants, such as vitamin C, ascorbate oxidase, catalase, polyphenols, and flavonoids, which can counteract free radicals and protect cells from oxidative damage. The relationship between pesticides and the antioxidant activity of the studied vegetables can be understood through the mechanism of action of antioxidants. Through their metabolic action, pesticides can generate free radicals and reactive oxygen or nitrogen species, damaging DNA, proteins and cellular lipids. Antioxidants in vegetables act as protective shields, neutralizing these free radicals and thus preventing cell damage. This study evaluates antioxidant activity in vegetables grown under different management systems, conventional agriculture (CA) and organic agriculture (OA), with the aim of demonstrating their nutritional value and highlighting the need to monitor pesticide action throughout the growing process to protect public health.The results showed that bell pepper, parsley and ginger from CA accumulated higher amounts of vitamin C compared to OA, a behavior that could be due to exposure to pesticides and heavy metals contained in fertilizers from intensive cultivation (Ni, Co, Cr, Zn).The study revealed a decrease in vitamin C content in vegetables from OA compared to OA, 16,4 % from bell pepper, 20,5 % from parsley si 15,8 % from ginger. The results obtained are in agreement with Zengin Fikriye, 2013, who also reports increased amounts of vitamin C under stress conditions caused by the accumulation of heavy metals. Oxidative metabolism, quantified by determining the activity of ascorbate oxidase and catalase, indicates increases for all vegetables studied in the range of 15-32%.In conclusion, the study highlights significant changes on oxidative metabolism for vegetables from conventional agriculture and ecoagriculture.

Keywords: ascorbate oxidase activity, catalase activity, vitamin C, conventional agriculture, organic agriculture.

F.92. BIOSORBENT BASED ON RESIDUAL VEGETAL BIOMASS USED FOR THE RETENTION OF CHEMICAL POLLUTANTS

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Abstract: Nowadays, special attention is paid to biosorption as a method for treating wastewater contaminated with chemical species such as organic textile dyes or metal ions. The aim of this study is to investigate the biosorption properties of some vegetable waste to retain the textile dye Reactive Orange 16 and Cu (II) ions from an aqueous solution. The residual vegetable biomass represents the solid exhausted following liquid-solid extraction processes that aimed to obtain plant extracts with pesticidal action.In order to evaluate the biosorption potential of these vegetable wastes, the studies started continue with the modeling of biosorption equilibrium based on isotherms (Langmuir, Freundlich, Dubinin- Radushkevich) from the literature, thermodynamic evaluation and kinetic studies.The results obtained confirm that the studied residual vegetable biomass can be considered a promising biosorbent to retain organic dyes and metal ions present in aqueous environments. The idea of using these adsorbent materials to treat real wastewater from the textile industry thus remains open.

Keywords biosorption, rezidual vegetal biomass, reactive dye, metalic ion.

F.93. IMPACT OF DIETS RICH IN DAIRY FOODS ON CIRCULATING MELATONIN LEVELS AND SLEEP QUALITY

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Abstract: Society in the 21st century is increasingly struggling to get quality sleep. Failing to meet this condition can have undesirable long-term effects on the human body. These can include the onset of various conditions, such as cardiovascular disease, decreased immunity, and fatigue, which can lead to difficulty concentrating. Preventing this involves getting quality sleep, which can be coupled with a balanced diet. Melatonin is a molecule derived from tryptophan and is the primary substance in the vertebrate body that plays a role in initiating, maintaining, and regulating the physiological state of rest through sleep. The presence of melatonin in a wide range of foods, including milk and dairy products, allows the body to obtain additional melatonin through the diet. Several studies have shown a direct link between an individual's diet and the quality of sleep they get at night. This review includes concrete evidence from the literature demonstrating that a balanced diet rich in dairy foods can improve sleep quality, thereby promoting optimal health of the human organism through increased bioavailability of melatonin and whole-body protein.

Keywords: melatonin, tryptophan, dairy,protein, quality sleep

F.94. STUDIES ON THE EFFECT OF PHYTOADDITIVES ON GROWTH PERFORMANCE AND MEAT QUALITYIN BROILER CHICKENS

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Abstract: Poultry meat is one of the most appreciated animal-derived food products, both for its nutritional value and for its specific sensory properties. For a long time, the preservation of the health of birds and the improvement of growth indicators were achieved through the administration of antibiotics, a technique highly contested due to their residue in finished products. Against the backdrop of these issues, various plant-based products (phytoadditives) have emerged, credited with multiple roles, from improving immunity and digestion efficiency to reducing the action of predominant pathogens and even mitigating the environmental impact of animal farming. The purpose of this study is to create a centralized overview of the effects generated by the available phytogenic additives, for their inclusion in specific bird diets with the aim of improving the quantitative and qualitative aspects of meat production.

Keywords: phytoadditives, food products, birds, additives.

F.95. SENSORY CHARACTERISTICS OF FUNCTIONAL PASTRY PRODUCTS WITH ROSEHIP POWDER ADDITION

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Abstract: The aim of this research was to develop functional pastry products incorporating rosehip powder and to explore the potential for extending their shelf life. To assess the sensory characteristics of these enhanced products, biscuits and muffins were prepared using type 550 white wheat flour with rosehip powder added at concentrations of 0.5% and 5%. Utilizing locally sourced raw materials offers a significant advantage in reducing production costs, making the final product more affordable. Rosehip fruits (Rosa canina L.) are valued in food applications for their high content of bioactive compounds, including polyphenols, essential fatty acids, galactolipids, folates, antioxidants, vitamins, and minerals, particularly vitamin C (ascorbic acid). Rosehip powder, an ecological product, serves as a concentrated source of active ingredients, enhancing the nutritional and organoleptic properties of the final products. Sensory analysis evaluated five key parameters: color, taste, texture, appearance, and smell, with each parameter rated on a scale of 1 to 5 points. The addition of rosehip powder (0.5-5%) did not significantly alter the organoleptic profile of the pastry products (biscuits and muffins). Optimal results were achieved with 1.5% rosehip powder in biscuits and 5% in muffins. The inclusion of rosehip powder significantly inhibits lipid oxidation and reduces the microbiological load, thereby extending the shelf life of pastry products without the need for synthetic preservatives.

Keywords: wheat flour, rosehip powder, muffins, biscuits, addition.

F.96. BIOACTIVE COMPOUNDS FROM ORCHARD WASTE: A PHARMACOLOGICAL PERSPECTIVE ON RUBUS AND PRUNUS SPECIES

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Abstract: Significant quantities of plant waste, primarily generated through orchard maintenance practices, are currently inadequately processed within the framework of the circular economy across the European Union. In Romania, the predominant method of biomass reintegration is energy production, a process associated with a considerable environmental burden.This review aimed to explore the valorization potential of Rubus idaeus shoots and branches of Prunus avium, Prunus serotina, and Prunus cerasus through the extraction of bioactive compounds with promising pharmacological applications. Various Rubus species, due to their high polyphenol and flavonoid content, have demonstrated significant antioxidant and anti-inflammatory properties. In Prunus serotina biomass, juglanin, a compound with established antioxidant, anti-inflammatory, antithrombotic, antifibrotic and antiangiogenic activities, is predominantly located in the leaves. The woody biomass of Prunus avium contains bioactive compounds that exhibit antioxidant and antimicrobial activity. In Prunus cerasus, chlorogenic acid, flavonols, proanthocyanidins, phloridzin, and quercetin contribute to its antioxidant properties.The reviewed literature indicates that Prunus species display broadly similar biological activities, although species-specific bioactive compounds have also been identified. These findings underscore the importance of further research into the potential synergistic pharmacological activities of extracts derived from these four plant sources.

Keywords: Rubus idaeus| Prunus species| orchard waste valorization| bioactive compounds

F.97. QUANTIFICATION OF ASCORBIC ACID IN PHYTOPREPARATIONS AND PHARMACEUTICAL PRODUCTS USING VOLUMETRIC AND SPECTROPHOTOMETRIC METHODS

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Abstract: The present study provides a comparative analysis of two methods for measuring the dosage of ascorbic acid in phytopreparations and pharmaceutical products. This research is motivated by the increasing number of vitamin C-based products in the pharmaceutical sector. The first method utilized was volumetry, which involved iodometric titration to determine the exact concentration of ascorbic acid by oxidizing vitamin C. The UV-VIS spectrophotometric method was employed as a confirmation tool to validate the results obtained through this method. Analyses were conducted on solutions with varying concentrations of ascorbic acid, and the results were validated across different pharmaceutical forms, including tea, tablets, ampoules, and powders for oral suspension. These products were sourced from various manufacturers. Future research will explore the dosage of ascorbic acid in biological fluids using these two methods.

Keywords: vitamin C, volumetry, UV-Vis spectroscopy, pharmaceutical products

F.98. RESEARCH ON THE DEVELOPMENT OF FUNCTIONAL MEAT-BASED PRODUCTS

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Abstract: This paper presents a novel method for creating functional products by partially replacing animal fat with an oleogel synthesized from cold-pressed rapeseed oil. The goal was to nutritionally enhance burger patties while maintaining their sensory qualities. The patties were developed and physico-chemically evaluated to ensure consumer acceptance. It was demonstrated that replacing animal fat with vegetable fat improves oxidative stability and provides a unique sensory texture, contributing to the nutritional value of the final product. Additionally, the reformulated patties exhibited favorable moisture retention and a balanced fatty acid profile, which can have potential health benefits. This innovative approach to product composition holds significant importance for the food industry, offering consumers healthier and nutritionally balanced products. Moreover, it aligns with current trends toward sustainable and plant-based alternatives, addressing both health-conscious consumers and environmental concerns.

Keywords: meat products, functional products, meatball, oleogel, nutritional value

F.99. DEVELOPMENT OF FUNCTIONAL MEAT PRODUCTS BY REPLACING PORK FAT WITH OLEOGEL AND BUCKWHEAT FLOUR

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Abstract: Consumers are increasingly interested in functional foods, with plant-protein-enriched sausages emerging as a valuable category due to their nutritional benefits. This study investigates the replacement of pork fat with a blend of oleogel and basil, combined with buckwheat flour, to enhance the physico-chemical, sensory, technological, and functional properties of the product, ultimately providing a healthier and nutritionally balanced alternative. The research assesses the impact of these modifications on key sausage characteristics, including texture, color, aroma, flavor, and overall sensory attributes. The findings could contribute to the development of healthier meat-based products that align with current consumer demands while maintaining high standards of quality and acceptability.

Keywords: functional foods, plant – protein - enriched sausage, oleogel, buckwheat flour, physico-chemical properties, sensory attributes.

F.100. MEASUREMENT OF THE LIQUID DIFFUSION COEFFICIENT IN FINE-GRAINED MATERIALS

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Abstract: To determine the effective axial diffusion coefficient of a liquid in a fine-grained material, a custom-designed experimental setup consisting of two thermostatic cells, equipped with mixers to minimize external diffusion resistance, was used. The fine-grained material was placed between two wooden samples.The right-hand cell was continuously supplied with the

tested salt solution, while the left-hand cell was filled with double-distilled water of known conductivity, significantly lower than the values recorded during diffusion. The measuring cells were connected to a differential manometer, which was adjusted to maintain zero pressure difference between the two cells, hence preventing any flow through the sample between the chambers.The diffusion coefficient of a ZnSO4 solution in a new granular material - zinc-aluminum layered double hydroxide (ZnAlLDH) - was measured. The fine-grained solid was placed between two identical thin wooden discs, each with a thickness of 1.8 mm. Two types of measurements were performed:1.For a single wooden disc, ZnSO4 solution concentrations were recorded over time after the system reached a steady-state regime. The concentration in the second chamber was used to calculate the effective diffusion coefficient of the wooden disc that was used to determine the mass transfer resistance of the disc.2.For the disc-granular material-disc system, ZnSO4 concentrations were monitored over time.From the slope of the concentration variation over time, after subtracting the mass transfer resistance of the wooden discs, an average diffusion coefficient of Def = 1.7015×10^{-10} m²/s was obtained for the granular material.This experimental technique allows for measurements of diffusion coefficients for a large number of solutions of different concentrations, in various fine-grained materials.

Keywords: diffusion coefficient, granular materials.

F.101. RETENTION AND CATALYTIC DEGRADATION OF 2,4,6–TRINITROTOLUENE USING SYNTHESIZED ORGANOCLAYS

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Abstract: 2,4,6-Trinitrotoluene (TNT) is a nitroaromatic compound predominantly used as a high-energy material. TNT-based waste, contains toxic substances such as heavy metals (lead, mercury, cadmium), unreacted energetic materials, and hazardous secondary chemical compounds. These substances infiltrate the soil and leach into groundwater, thereby posing a serious threat to human health and biodiversity. Additionally, by-products such as heavy metals and fine particulate matter contribute to air pollution and to formation of acid rain. Despite their harmful effects, nitroaromatic compounds continue to be widely used in the production of pharmaceuticals, pigments, polymers, and pesticides, with an annual output exceeding one hundred million tons. The present research aims to study the adsorption properties of montmorillonite-based clays for 2,4,6-trinitrotoluene. For this purpose, two unconventional materials based on montmorillonite were synthesized, characterized and tested. These materials were brought into contact with traces of TNT solution, and the adsorption capacity of each was analyzed in relation to various parameters: adsorbent mass, contact time, and the pH of the pollutant solution. Subsequently, the effect of catalytic ozonation on the degradation process of 2,4,6-trinitrotoluene was investigated by varying both the amount of ozone used and the exposure time, with vanadium (V) serving as catalyst. The results revealed that the tested materials exhibit promising adsorption capabilities for nitroaromatic pollutants such as TNT. Furthermore, the application of catalytic ozonation enabled efficient degradation of the compound, leading to the formation of secondary products with significantly lower toxicity compared to the original pollutant.

Keywords: 2,4,6-trinitrotoluene, nitroaromatic compounds, catalytic ozonation, clays.

F.102. SINGLE AND CO-EXPOSURE TOXIC EFFECTS OF TWO TYPES OF PHARMACEUTICALS ON DANIO RERIO EMBRYOS, USING ENVIRONMENTAL RELEVANT CONCENTRATIONS

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Abstract: Pharmaceutical pollution has increased in prevalence in recent years, primarily due to apprehensions regarding its possible impact on human health and aquatic ecosystems. The presence of elevated levels of pharmaceutical contaminants in groundwater, rivers, oceans, and drinking water has garnered global attention to this matter. Nevertheless, wastewater treatment facilities are unable to eliminate pharmaceutical contaminants. The objective of this study was to assess the potential impacts of two different pharmaceuticals on zebrafish embryos throughout their early developmental phases, at ambient concentrations of valproic acid (3µg/L) and meropenem (1µg/L). Zebrafish exhibit heightened sensitivity to pollution, possess dynamic developmental characteristics, transparency, and the capacity to demonstrate a broad spectrum of physiological and behavioral responses, rendering them an invaluable model organism for such research. Consequently, this study assessed variations in heartbeats, modifications in interocular distance, ocular lens diameter, and their behavior under varied light conditions. The embryos showed adverse effects at all developmental phases, beginning with the onset of heartbeats, hatching rate, and subsequently, their biometry and behavior during the larval stage. The ongoing creation of medicinal chemicals, both simple and complex, has impacted their normal growth. Significant changes in larval behavior were observed between the light times during testing and between the administration of single drugs and mixtures. The zebrafish serves as an invaluable study instrument that delineates new and established boundaries, enhancing our comprehension of potential impacts on aquatic organisms. Investigating these impacts on aquatic organisms may foster a heightened focus on developing innovative methods for eradicating harmful contaminants.

Keywords: zebrafish, toxicity, pollution, chemicals.

F.103. CAN VITAMIN C MITIGATE THE TOXICITY CAUSED BY LEAD ACETATE? CASE STUDY USING THE MODEL ORGANISM DANIO RERIO

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Abstract: Lead acetate pollution has attracted increasing attention in recent years due to concerns about its potential impact on human health and aquatic ecosystems. Lead acetate is found in the environment and is considered toxic and dangerous, being used in various industries, including the food industry, to highlight the presence of hydrogen sulfide (H_2S) in animal products. The high levels of this pollutant in wastewater and even rivers have raised global awareness. However, wastewater treatment plants are not capable of effectively removing these

pollutants. The objective of this study was to evaluate the potential impact of lead acetate and vitamin C on adult zebrafish (Danio rerio) using a memory test, to unravel new perspectives regarding the limitations of the negative effects caused by lead acetate, knowing that vitamin C enhances zebrafish memory. Zebrafish are extremely sensitive to pollution, possess dynamic developmental characteristics, transparency, and the ability to demonstrate a wide range of physiological and behavioral responses, making them invaluable model organisms for such research. Moreover, it is known that zebrafish possess a 70% genetic similarity with humans. Therefore, this study evaluated the variations in memory performance in swimming performance and the assessment of anxiety markers caused by the simple and mixed administrations of the two substances used. Significant changes in the behavior of adult zebrafish, related to toxicity markers and swimming performance parameters, were observed with the administration of individual drugs and the mixture. Vitamin C has been shown to be beneficial for zebrafish, increasing swimming and exploration capacity and inhibiting the negative effects caused by lead acetate. The zebrafish serves as an invaluable study tool that outlines new and established boundaries, enhancing our understanding of the potential impacts on aquatic organisms. Investigating these impacts on aquatic organisms can stimulate a greater focus on developing innovative methods for eradicating harmful contaminants.

Keywords: zebrafish, toxicity, pollution|, chemicals

F.104. DEVELOPMENT OF A FLUORESCENCE ANISOTROPY ASSAY TO MONITOR TAU PROTEIN FIBRILLATION

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Abstract: Neurofibrillary tangles, formed by intracellular aggregation of the Tau protein, are a major pathological hallmark of Alzheimer's disease. Inhibiting Tau aggregation is therefore an important therapeutic objective. Previous studies identified polyphenolic derivatives as in vitro inhibitors of this process. The standard Thioflavin T fluorescence assay, commonly used to detect β-sheet-rich fibrils, often yields false positives due to inhibitor interference. To address this, we developed a fluorescence anisotropy-based assay using AcR3 and AcPHF6 Tau models. Preliminary results with fluorescein-labeled AcPHF6, used as a reporter, revealed anisotropy changes during fibril formation and inhibition by Myricetin. This approach enables more accurate screening of aggregation inhibitors.

Keywords: Tau protein, Alzheimer's disease, Neurofibrillary tangles, inhibitors, Thioflavin T, fluorescence anisotropy

F.105. NEW ELECTROCHEMICAL DEVICES FOR DETECTION OF PESTICIDES IN SURFACE WATER

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Abstract: The use of pesticides, even in very low concentrations, in agriculture to protect cereal crops has resulted in significant water pollution, posing risks to human health. This study aimed to develop simple and rapid devices capable of detecting the pesticide Dichlorprop-P at low concentrations in water samples. These devices, known as biosensors, are innovative tools utilized across various fields, including environmental science, chemistry, pharmacy, and medicine. To modify and develop these biosensors, the research employed a self-assembly (SA) method using nanocomposites of Prussian Blue (PB), which were then doped with the enzyme

tyrosinase. The modified surface of the working electrodes was analyzed using cyclic voltammetry (CV), scanning electron microscopy (SEM), and Fourier Transform Infrared Spectroscopy (FTIR). The results showed that the biosensor with 30 deposition cycles exhibited increased selectivity due to the inhibition of the electroanalytical activity of dichlorprop-P. Moreover, the detection limit (LOD) of this biosensor was lower than those prepared with 5 and 15 deposition cycles. In conclusion, this tool demonstrated efficiency, sensitivity, and selectivity, validating its use for future studies on water quality monitoring.

Keywords: cyclic voltammetry, biosensor, pesticide, water

F.106. SOUTH-EASTERN ROMANIA'S RED WINES A POTENTIAL VALUABLE ENOTHERAPY RESOURCES

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Abstract: Polyphenols present in red wines are structurally diverse compounds that have been used medicinally for centuries. Current study investigates enoterapy potential for Bujoru high quality red wines. Evaluation of their potential was done via total polyphenol and antocyanin determinations. Results show that Burgund and Fetească Neagră variety have the highest potential for enoteray use due to their high total polyphenol content. These concentrations were higher than average multiannual values specific to this areal. South-eastern red wine characteristics recommend them for enoterapy use due to microclimate conditions that favor high polyphenol content accumulation, resulting in high quality and aging potential.

Keywords: total polyphenol, enoterapy, red wines

F.107. QUALITY EVALUATION OF A FUNCTIONAL YOGURT ENRICHED WITH GRAPE POMACE POWDER

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Abstract: In the current context of a healthy and sustainable diet, the food industry is constantly looking for innovative products that meet the demands of modern consumers. Functional dairy products, such as yogurts enriched with natural ingredients, are gaining more and more ground due to their potential health benefits. This paper presents the development of an innovative functional dairy product: yogurt enriched with grape pomace powder. Grape pomace, the by-

product resulting from the processing of grapes (skins, seeds, stems) is a rich source of bioactive compounds such as polyphenols (resveratrol, flavonoids, tannins), which are recognized for their antioxidant, anti-inflammatory and antimicrobial activity. Grape pomace powder brings a significant contribution of fiber to yogurt, contributing to digestive health and blood sugar regulation. Its addition to yogurt aims to improve the nutritional and functional value of the product, providing it with antioxidant properties, an attractive natural color and a slightly fruity taste. The study evaluated the influence of the addition of pomace powder on the physicochemical, sensory and microbiological characteristics of yogurt. The results obtained indicate that the optimal addition can lead to a stable, tasty and health-beneficial product, while contributing to the sustainable valorization of an agri-food by-product, reducing waste and supporting the circular economy.

Keywords: functional yogurt, grape pomace powder, valorization of agro-industrial by-products, innovative product.

F.108. THE INFLUENCE OF THE EXTRACTION CONDITIONS ON THE ACTIVE COMPONENTS FROM SOME BY-PRODUCTS OF BLACK CHOKEBERRY (ARONIA MELANOCARPA)

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Abstract: Black chokeberry (Aronia melanocarpa) is a species of shrubs in the rose family native to eastern parts of North America. The black chokeberry plant was introduced into Europe at the beginning of the twentieth century and recently, is cultivated around the world for its medicinal and nutritional value. Due to the presence and the high content of various bioactive components, such as vitamins, minerals and polyphenolic compounds, the chokeberry and leaves of Aronia melanocarpa exhibit a wide range of positive health effects (anti-inflammatory, anti-bacterial, hypolipidemic, hypoglycemic, anti-cancer, antidepressant, anti-fatigue, inhibitor of melanin production). Over the past decade, researchers have developed a variety of juices, wines, teas, effervescent tablets and nutritional supplements, using black chokeberry berries as raw materials. In this perspective, the main objective of the present study was to valorize some by-products obtained from black chokeberry processing by extracting potentially bioactive compounds. The effects of five aqueous solvents and the working techniques used (ultrasound-assisted extraction and maceration) on the yield and composition of crude extracts were evaluated by electrochemical and spectroscopic methods. The use of the ultrasonic bath made it possible to obtain extracts with a higher yield in all solvents used and in a shorter time, 30 minutes (ultrasonication) compared to 24 hours (maceration). The phytochemical profile of the analyzed extracts shows that the twigs of the fruits can represent a valuable source of biologically active compounds (especially polyphenols) that can be used in the food and pharmaceutical industries.

Keywords: Black chokeberry| by-products| extraction| electrochemical and spectroscopic analysis

F.109. LOCAL AND GLOBAL HYDRODYNAMICS IN A COUNTER-CURRENT BUBBLE COLUMN

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Abstract: Methanation is a key component of the power-to-gas strategy, enabling the storage of H_2 in the form of CH_4. It also offers a pathway to decarbonization when CO_2 is used as the substrate. Among the technologies capable of performing methanation at an industrial scale, biomethanation based on methanogenesis stands alongside catalytic methanation as one of the two main approaches. The main challenge of ex-situ biomethanation lies in the low gas–liquid mass transfer rate of hydrogen, which is a critical factor in the overall process performance. Due to the low solubility of H_2 in water, the hydrogenation rate is typically limited by significant mass transfer resistance at the gas-liquid interface. Bioreactor design must therefore aim to enhance gas–liquid mass transfer while maintaining low power input. This can be achieved through various strategies, such as optimizing gas sparging systems, particularly since the superficial gas velocity remains low and the specific power input must be kept 10 to 100 times lower than in conventional gas-liquid chemical processes. The objective of this study is therefore to investigate the hydrodynamics of two-phase flow in a specifically designed counter-current bubble column for biological methanation.
Acknowledgements. This work was funded by the Auvergne-Rhône-Alpes Region through the Research Ambition Pack Program (ProMethEx project).

Keywords: methanation, bubble column, hydrodynamic, sparger, bubble size, gas hold-up

F.110. DRIVING INNOVATION IN ENERGY AND CHEMICAL ENGINEERING: FROM ELECTROCHEMICAL SYSTEMS TO ADVANCED PHOTOREACTORS

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Abstract: How to innovate in the fields of energy and chemical engineering particularly in the context of energy transition and sustainable production methods? That's a good question. To answer it, we need to maintain a high level of scientific expertise. And to illustrate this, we will choose two main examples.
The first one is the optimization of electrochemical recovery processes, focusing on the treatment of metallic solutions by cementation technique through the design of pilot-scale systems incorporating stabilized fluidized beds under electromagnetic fields. These developments i.e., the combination of fluidization and stabilization improved mass transfer and metallic ions recovery while ensuring better control over process stability, key factors for potential industrial implementation.
The second example is included in the field of artificial photosynthesis and solar fuel production, with the objective of contributing to the development of clean and sustainable energy carriers. A multiscale approach was introduced to connect material-level properties—such as the optical behavior of semiconductors—with the design of efficient photoreactors and photoelectrochemical cells. This methodology enabled a better understanding of the interactions between radiative transfer, charge carrier dynamics, and reactor-scale performance, which are essential for improving process yields. Based on this model, several experimental devices were developed, including a toroidal photoreactor dedicated to hydrogen production and photoelectrochemical cells inspired by Grätzel designs. These tools have supported both the validation of theoretical models and the exploration of practical applications for solar-driven energy conversion.

Keywords: Innovation, electrochemical cementation, artificial photosynthesis, models

F.111. OPTIMIZING SOLID-LIQUID SEPARATION AND ELECTROCOAGULATION FOR EFFICIENT TREATMENT OF DIGESTATE EFFLUENTS FROM BIOGAS PLANT

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Abstract: Anaerobic digestion is considered as a strategic technology for achieving industrial decarbonisation and advancing the energy transition. This approach strengthens the circular economy by biologically converting organic waste into valuable resources such as biogas and energy-rich organic species. However, a significant fraction of the organic matter resists biodegradation and remains in the residual digestate or slurry by-product, a concentrated organic/inorganic mixture which is subsequently used as a biofertilizer due to its rich nutrient. The high water content of the digestate can lead to increased logistical challenges, elevated associated costs, and a greater environmental footprint. Reducing the emission associated with the transportation of raw digestate requires the implementation of solid-liquid separation techniques. The most commonly used methods in biogas plants include screw presses, sieve centrifuges, decanter centrifuge, filter presses, rotary drums, vibrating screens, and roller presses. The separation efficiency depends on the physical and chemical characteristics of the digestate (dry weight content, viscosity, particle size distribution etc.). The solid concentrated fraction, rich in organic matter and nutrients (nitrogen, phosphorous and different minerals), can be used as a soil amendment or composted, while the liquid fraction can undergo further treatment - such as membrane filtration - to produce purified water or applied directly as a liquid fertilizer. The main technical, environmental and economic challenges in solid-liquid separation are : the heterogeneity of the digestate, the low solid content, the equipment fouling, the separation efficiency limits, the high capital investment, the limited economic valorization of resulted fraction in some regions and other carbon footprint considerations. In order to increase the efficiency of the separation, chemicals such as aluminum salts can be added in the raw digestate. Electrocoagulation is a nonconventional technique that relies on simple equipment and enables the reduction of coagulant costs through the gradual, in-situ generation of coagulants via electrical dissolution. It also offers short retention times and rapid sedimentation of electro-generated flocs. However, its application is limited by high energy consumption and low nitrogen removal efficiency.

This study investigates the impact of solid-liquid separation processes, such as filtration and centrifugation, applied to raw digestate from the Methelec biogas plant (France), on the efficiency of total solids, chemical oxygen demand (COD), and total nitrogen (TN) removal. The results show reduction rates of up to 76% for total solids (expressed in dry weight), 53% for COD, and 54% for TN using sequential filtration with filter cloths of 500, 100, 50, and 31 µm mesh sizes. The particle size distribution in the resulting filtrate remained broad, with the majority of particles ranging from approximately 26 to 174 µm.

Improved performance was achieved by adding an additional centrifugation step, increasing COD removal efficiency to 90% and TN removal to 63%. Centrifugation also shifted the particle size distribution toward approximately 1 µm. As expected, electrocoagulation applied to the filtrate (after filtration) or to the supernatant (after centrifugation) was more effective when the liquid phase contained larger particles (experimental data not presented in this section). However, considering the high removal efficiencies achieved through filtration alone, the necessity of applying electrocoagulation for additional nitrogen and COD removal becomes debatable. Nevertheless, electrocoagulation remains a valuable treatment option when stricter discharge standards must be met.

This study highlights that, in the treatment of liquid effluents from Methelec (France) biogas plants, filtration serves as an effective pre-treatment step before electrocoagulation. Furthermore, centrifugation proves to be highly efficient for solid-liquid separation and can also be

strategically integrated as a post-electrocoagulation polishing step. By optimizing the sequence of these treatment steps, it is possible to achieve high removal efficiencies of COD and NT while minimizing operational costs and reducing the environmental footprint of biogas plant effluent management.

Keywords: digestate effluent, biogas plant, filtration, centrifugation, electrocoagulation.

F.112. AN INVESTIGATION INTO THE APPLICATIONS OF PHASE CHANGE MATERIALS

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Abstract: Phase Change Materials (PCMs) are substances that absorb or release a significant amount of latent heat when they change their physical state. This property makes them highly effective in thermal energy storage systems. PCMs maintain a near-constant temperature while storing or releasing heat, which is a key advantage for various applications requiring temperature regulation. As applications can be mentioned: Building and Construction (thermal regulation in walls, floors, and ceilings, integration in building materials, concrete, or insulation panels, reduces reliance on HVAC systems); Electronics and Data Centers (manage heat in electronic devices for prevent overheating, maintaining optimal operating temperatures); Textiles (temperature control, thermal comfort in changing environments); Renewable Energy Systems (solar thermal systems to store excess energy, enhances the efficiency and stability of solar water heaters); Refrigeration and Cold Chain (transportation of temperature-sensitive goods, maintains low temperatures without power supply); Healthcare and Medicine (drug delivery systems, temperature-sensitive packaging, and thermal therapy, maintain samples at controlled temperatures).

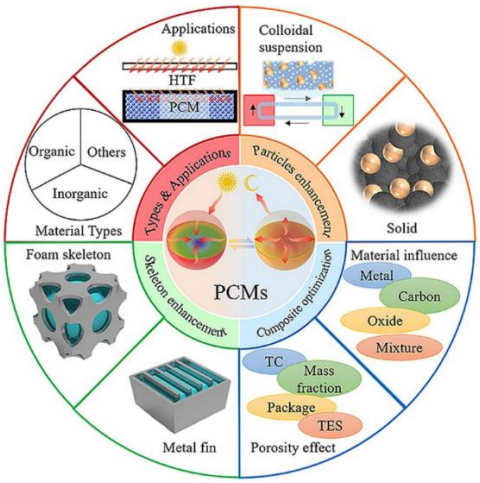

Figure 1. Phase change materials orview

Function of applications the PCMs can be organic PCMs (paraffins, fatty acids), these are stable and non-corrosive, but may be flammable; Inorganic PCMs (salt hydrates, metallics) having high

latent heat capacity but can suffer from phase segregation or Eutectic PCMs there are mixtures with precise melting points tailored for specific applications.
In this paper are analyzed different eutectic PCM, especially inorganic, for establishing the proper type for applications in constructions materials.

Keywords: phase change materials, constructions materials, eutectic PCM

F.113. HIGH-TEMPERATURE PLASMA & HYDROGEN-POWERED GASIFICATION EQUIPMENT FOR RENEWABLES PRODUCTION

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Abstract: This study assesses the experimental equipment designed for gasification of various waste forms, including medical waste, hazardous waste, petroleum sludge, for converting them into synthesis gas (syngas). The key components include a four-plasma cylindrical burner, a compound inlet (utilizing an air reduction system for liquid injection directly into the plasma), and a comprehensive combustion chamber equipped with numerous sensors for real-time gas composition analysis and liquid flow regulation.
The combustion chamber is linked to the thermal to electrical energy converters, including a turbine, a heat exchanger and a cyclonic scrubber for gas purification. The gas composition and quality are continually monitored, and, as per the established purity ranges, impure gases are reintroduced into the combustion chamber. Thus, the procedure establishes a closed-loop system, enhancing energy utilization and conservation.
Employing high-temperature plasma technology in synergy with hydrogen technology allows energy-efficient waste conversion. The resultant syngas can be used as the precursors for raw material synthesis or liquid fuels, presenting a sustainable energy resource.
The process allows for continuous operation, with the power grid's primary function limited to process initiation, thus reducing overall energy consumption. Using the cogeneration system, the equipment can produce 90kWe at 380V, 50Hz, with a potential production capacity of 370 kWe at 380V, 50Hz from fuel gases generated during the plasma gasification process. Respective thermal outputs encompass steam at 300°C (thermal power 125 kWt), hot water at 60°C (thermal power 585 kWt), and total thermal energy of 720 kWt reclaimed via complete combustible gas utilization. This method presents a promising approach for waste conversion and resource recovery, highlighting its potential for widespread implementation as a sustainable energy solution.

Keywords: hazardous wastes, plasma technology, thermal treatment, energy recovery

G. INDUSTRIAL POWER ENGINEERING & COMPUTER SCIENCE

G.1. CORRELATIONS BETWEEN OPTICAL, STRUCTURAL AND MORPHOLOGICAL PROPERTIES OF ZNO THIN FILMS OBTAINED BY THERMALLY OXIDIZED METALLIC ZINC FILMS

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Abstract. Among the other oxides in thin films, zinc oxide (ZnO) thin films are very important due to their application as an active semiconductor compound in transparent electronic devices. ZnO thin films are used as transparent conducting electrodes and buffer layers in solar cell technology, as a material in sensor technology, ultrasonic oscillators and transducers, optical waveguides and other applications. In this paper, ZnO thin films were prepared by thermal oxidation of vacuum evaporated zinc films. Structural, morphological and opticall properties of as obtained ZnO films were investigated. Polycrystalline ZnO thin films with high transmission coefficient (80%-90% in visible spectral range) and hexagonal (würtzite) structure, highly oriented with c-axis perpendicular to the substrate surface, can be prepared by thermal oxidation of vacuum evaporated zinc metallic films.The film thickness was varied in the range from 780 nm to 1150 nm.The structural characteristics (crystallite size, Zn-O bond length, texture coefficient, strain, etc.) of the films studied by XRD, AFM and XPS show a good crystallinity columnar growth and a smooth surface.In the wavelength range 600-1600 nm, the transmission coefficient is generally over 80%. The optical bandgap energy calculated from absorption spectra were in the range 3.15-3.20 eV.

Keywords: zinc oxide, thermal oxidation, thin films, transmission coefficient.

G.2. TECHNICAL AND ERGONOMIC ASPECTS REGARDING THE IMPLEMENTATION OF A COMPUTER NETWORK IN NON-FORMAL EDUCATION LABORATORIES

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Abstract. The paper presents aspects related to the design, conception, development of computer network variants that will be implemented in non-formal education laboratories with the role of completing the computer-assisted training activity of students. When placing the computer network, aspects of non-formal school ergonomics are taken into account, the final form of the network being created with the help of Cisco Packet Tracer Student.

Keywords: Computer network, non-formal education, school ergonomics, computer-assisted training, Cisco Packet Tracer Student.

G.3. INCREASING THE ENERGY EFFICIENCY OF A POWER TRANSFORMATION AND DISTRIBUTION STATION

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Abstract. Substations are the main elements of an energy system that must ensure evacuation of power produced in the power plants, connection of lines to transit the power, distribution electricity to consumers. Reliability of a substation is essential for the role it plays in the energy system. In this paper are determined the energy losses in power lines and transformers associated with an electrical distribution station. The actual operating regime is analyzed and an optimal model is established to improve the energy efficiency of the power station.

Keywords: energy efficiency, substation, optimization, distribution.

G.4. 5G MOBILE NETWORKS: ESSENCE AND SECURITY

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Abstract. The paper presents the general features of 5G mobile network, its New Radio (NR) architecture and types of communication within mobile network. Also, it's focused on main threats and vulnerabilities, as well as some aspects of security mechanisms and actions.

Keywords: 5G, mobile network, security, threats.

G.5. COMPARATIVE EVALUATION OF THE EFFICIENCY AND ENERGY CONSUMPTION OF DOMESTIC CONVENTIONAL AND CONDENSING WALL-MOUNTED BOILERS

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Abstract. The global residential boiler market is experiencing continuous growth, as these systems represent energy-efficient, space-saving, and environmentally friendly individual heating solutions, capable of providing both space heating and domestic hot water on demand. Moreover, they can be integrated with smart thermostats, IoT technologies, and remote control systems, enabling building-level energy management.Globally, the residential boilers market is continuously growing, as these systems are considered energy-efficient individual heating solutions that are compact and environmentally friendly, with the ability to produce both heating and domestic hot water on demand. Additionally, they can be integrated with smart thermostats, IoT technologies, and remote control systems, enabling building-level energy management.In Romania, it is estimated that as of 2022, there are approximately 3 million wall-mounted boilers -both conventional and condensing- in use, out of a total of around 10 million dwellings.This

paper presents a comparative experimental study of the operation of a domestic conventional wall mounted boiler and a condensing wall-mounted boiler, conducted on a demonstration stand within the Faculty of Engineering at the "Vasile Alecsandri" University of Bacau, Romania. Measurements were carried out under identical operating conditions and assumptions for both boilers. The thermal agent (hot water) was delivered to the consumers with the same parameters, flow rate, and over the same period of time.Based on the conducted energy balances, it was found that the efficiency of the condensing boiler is 8,1% higher than that of the conventional boiler. This increase is primarily attributed to the recovery of latent heat from the flue gases through the condensation of water vapour. The paper also includes an economic analysis and an evaluation of CO_2 emissions associated with each boiler type. These findings further highlight the environmental and operational advantages of domestic condensing boilers over domestic conventional models.

Keywords: thermal efficiency, energy consumption, conventional wall-mounted boiler, condensing wall-mounted boiler.

G.6. STUDIES ON THE RISKS THAT ARTIFICIAL INTELLIGENCE MAY NOT ALWAYS GIVE HONEST ANSWERS OR USE LEGAL METHODS

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Abstract. Artificial intelligence, in the last 10 years, but especially in the last 5 years, has experienced significant development. There are many artificial intelligences available online, so-called virtual assistants that provide answers to various problems, such as: Chat GPT, Claude, Google Gemini, Hugging Chat, Microsoft Copilot, DeepSeek, Pi, Grok and Bing Bard.Many humanoid robots have also appeared, such as: Ameca (Engineered Arts), Sophia (Hanson Robotics), Optimus (Tesla), Alter 3 (Osaka University and MIXI), ARMAR-6 (Karlsruhe Institute of Technology), Apollo (Apptronik), Atlas (Boston Dynamics) and Beomni (Beyond Imagination). Of these, the most intelligent humanoid robot is considered AMECA. These robots can be used in various sectors such as: education, industry itself, including the hospitality industry, guides in museums and airports, healthcare, commerce, and technical consulting. Taking into account that the number of these robots will increase greatly in the near future and their intelligence will develop at an increased rate using regenerative intelligence, the question arises as to whether they will present a danger to humanity. This paper presents studies on the sincerity of humanoid robots. Sincerity tests were performed on the AMECA robot, available in the laboratory, and the results were interpreted, including how it reacts to questions (tone, facial expression, gestures, etc.).Because the tests were not very conclusive, a second set of tests was conducted using ChatGPT to provide the questions and directly facilitating the transfer of information between AMECA and it. The conclusions were that robots can lie out of a desire to imitate a human person as best as possible, to be as good as possible, or due to missing information. The most dangerous thing is when the false answer (lie) is voluntary (conscious). It has been shown that it is very difficult to discover through tests whether humanoid robots could lie.

Keywords: humanoid robots, AMECA, risks of artificial intelligence, misinformation.

G.7. AN ARTIFICIAL NEURAL NETWORK OPTIMAL PREDICTION MODEL FOR HAND STRENGTH

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Abstract. Hand Grip Strength/HGS and pinch strength/HPS are important clinical parameters for appreciating physical well-being and muscle strength, covered various clinical departments, as rehabilitation, nutrition, psychiatry, cardiovascular medicine, in the operational management in workers security or/and performance, potential for the discovery talents in sports that count on HGS. The difference in HGS/HPS through ethnic s and nations were also be interrelated with nutritional factors, correlation that has been noticed particularly in athletes - a sufficient intake of protein and phosphorus, is essential. Conspicuously, a lack of data concerning to recent statistics of hand measurements and HGS/HPS for the Romanian population has determined to use for the design of manual tools informations based on anthropometric data from China or other exporting countries. Romanians had wider palms with longer fingers, which may be assumed to strong, massive muscles and a better hand skeleton, that empower an enhanced grip on devices. These differences underscore the necessity of refinement wide-ranging data on HGS/HPS, correlated with anthropometric parameters to uphold the design of ergonomically tools, mainly when it comes to choosing instruments, orthoses, prostheses focused on the unique needs of a person. Actual report is an analytical cross-sectional report in perspective of a cohort study, that use the data accumulated from 133 students, by 3D scan of predominant hand in neutral position and HGS/HPS assessment. Pre-processing were completed by two steps to enhance the quality of the 3D entangles. The average errors, gotten as proportions of the attributed values, are: finger length-0.051641; hand length-0.023937; hand span-0.037949; hand width-0.032966; index1-0.065221; index length-0.112731; max breadth-0.063534; max diameter-0.132818; palm length-0.062281; ring length-0.117433; volume-0.030051; wrist circumference-0.048311; wrist ratio-0.124561. The Artificial Neural Network (ANN) implementation were managed by three subsets: training (60%), after-training (10%), test (30%) sets. The first data set were used for the network training in yielding its weights, biases centered of input-output data related. However, the after-test data were operated to evaluate the performance of the trained network, by esteeming accuracy and/or error rate. To adequate overfitting, were employed cross-validation. The model were skilled with the 'max_it' parameter, for a maximum 3000 schedules. It involved two hidden panes, each with 10 neurons, using a 'ReM' activation function. Optimization process were performed using solver 'fgs'. The final selection of the best model was directed through the highest adjusted R2-value (.161), corroborated with the lowest RMSE/Root Mean Square Error (.221). In order to identify the optimal which yields the most accurate predictions, were tested the combinations of all those implied variables. All analyses were performed using R software (v. 4.3.1). In conclusion, the presented ANN model demonstrate that some hand characteristics like, maximum breadth, maximum width, palm length, and total length, the hand shape index are the best predictor factors for HGS/HPS, both equally; but body anthropometric factors, like body mass for example, significantly predict HGS but, their impact is less significant for HPS. In future research to increase the performances of that ANN model and acquires its objectives, it is essential to compile more substantial datasets that entails an adequate observations number and, for more comprehensive understandings of the dynamics of HGS/HPS across lifespan, younger and older age patients, with different disabilities induced by different diseases, athletes from different physical activities, in different grades of performance.

Keywords: Artificial Neural Network, Prediction Model, Hand Strength.

G.8. SMART CONTROL SYSTEM OF PAID PARKING PLACES

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Abstract. Smart parking systems have developed a lot in recent times. In general, these systems require the installation of a complex infrastructure and connection to an application. This work attempts to present a cheap and at the same time effective solution for identifying parked cars and their parking time. The hardware platform used was Raspberry PI 5/8Gb, a board with a quad-core Arm Cortex A76 Broadcom BCM2712 processor at 2.4 GHz, capable of handling real-time processing. A 256 GB SanDisk Extreme PRO microSD was used as memory. Debian "bookworm", a 64-bit operating system, was used as the operating system for Raspberry PI 5. This operating system has a very good RealVNC interface and has Python 3.11 as the default version. Information regarding parked cars will be taken using a Raspberry Pi AI camera of 12.3 Mega pixels with adjustable focus, which is very well suited to artificial intelligence applications. The camera has the role of identifying the car that occupied the parking space and transmitting to the application the car number, entry time and exit time. From the application you can see what parking fee each car has and whether it has been paid. To identify the car's license plate number, a Python application based on the PyTorch and OpenCV libraries was developed. This is based on a convolutional neural network for image classification, respectively for detecting the license plate on the car. After cutting out the license plate number and processing the image, the characters could be recognized. The license plate recognition rate was particularly good. This paper proposes an efficient solution that can be used in smart parking systems.

Keywords: smart parking, Raspberry Pi, OpenCV, Raspberry PI AI camera.

G.9. LEARNING ERGONOMIC PRELIMINARY STUDY: THE IMPACT OF DIGITAL DEVICE CONFIGURATION ON STUDENT'S PERFORMANCE

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Abstract. Learning is the basic occupations for all specialties' student life. The fast development of digital devices and online learning platforms has enhanced the flexibility of education at our university. However, students still attempt to learn ergonomic schemes in the digital environment. The purpose of this study was to examine the effects of several digital equipment configurations on Romanian students learning on screens. To be ergonomic, these devices should consider elementary students' physiology and learning needs, offering beneficial and efficient experiences which promote learning better outcomes and performance. Preliminary ergonomic studies of various differences in learning settings and setups are necessary to exclude ineffective parameters, thereby decreasing experimental costs and minimizing the strain on students. In this study, 33 voluntary students from occupational therapy department of University" V. Alecsandri" of Bacău, without ocular problems, were recorded by experimental, observational, and interview methods. The ergonomic variables were: (1) the number of visual switches for eight equipment configurations by Muhly's sphericity-test against subjective perception; (2) efficiency and adeptness of forearm movements and visual line persuasiveness with Friedman (two-factor analysis of variance) and Wilcoxon (signed-rank test) results; (3) acutely comfort based on the evidence provided as a result of interviews. The results exposed that the horizontal dual-screen design afforded the most ergonomic overall, while the vertical dual-screen design had the least visual ergonomic switches. These quantitative findings are supplementary appreciated by the interview results, designating that orienting the digital equipment in the same direction may create a persuasive ergonomic screening experience. Left-right arrangements with

disergonomic screen angles are able to trigger issues such as discontinuous vision and insufficient viewing apertures, which are the most causes of unwise fatigue.

Keywords: digital learning, learning effectiveness, ergonomics, fatigue.

G.10. ANALYSIS OF ROBOTS THAT CAN BE USED IN EDUCATION

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Abstract. In recent years, robots have become increasingly used in the educational process. This paper aims to identify and evaluate the main robots that can be used in the educational process.

Keywords: robots, educational robots, educational process.

G.11. OPTIMAL OPERATION CONTROL STRATEGY OF A HYDROELECTRIC DAM TO MAXIMIZE THE REVENUE GENERATED

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Abstract. This paper presents a control strategy for optimal operation of a hydroelectric dam to maximize the revenue generated using quadratic optimization in Matlab. The implemented optimization strategy computes the optimal flow rate to the turbine as well as the optimal spill flow rate. The optimization problem is scaled up to the full, large-scale problem. Finally, the results visualize the electricity price and total value of electricity produced, optimal turbine and spill flows, and total storage in reservoir. The results obtained show the performance of the proposed control strategy to optimize the operation of a hydroelectric dam and maximize the profits.

Keywords: hydroelectric flow, Matlab, quadratic optimization.

G.12. REAL-TIME SIGN LANGUAGE INTERPRETATION: INTEGRATING GESTURE RECOGNITION WITH SYNTACTIC ANALYSIS

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Abstract. This paper presents the development of an advanced system that has the capability to

recognize hand gestures in real-time by utilizing state of the art libraries such as OpenCv and MediaPipe to convert sign language into text and artificial intelligence models. A new syntactic model has been implemented and also integrated into the proposed system to ensure high accuracy in gesture identification and also grammatically accurate sentences generated from gestures or from keyboard. Dynamic and static images are captured by the system through a simple web camera that extracts key features of the hands, wrists, joint and the degree of freedom. All gestures al labeled and categorized in three different datasets integrated into a user-friendly interface, Tkinter. Final results prove the systems robustness, accuracy, F1-score under different environmental conditions highlighting its potential to facilitate the communication with signers through sign language, especially with the users of the deaf-mute community.

Keywords: hand gesture recognition, OpenCV, MediaPipe, Tkinter, artificial intelligence, webcam, real-time, data sets, key features, models.

G.13. ANALYSIS OF A RANKINE CYCLE UTILIZING HEAT RESULTING FROM THE COMBUSTION OF RESIDUAL HYDROGEN

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Abstract. The metallurgical industry (metal production, thermochemical treatment of parts, etc.) releases large quantities of gases into the atmosphere (in the form of exhaust gases, cooling flows, controlled atmospheres, etc.), which are currently wasted through disposal/incineration into the environment. These flows are generally considered to be of low or medium temperature or too expensive (hydrogen recovery) and, as such, cannot be efficiently utilized for conversion into electrical energy. The Rankine cycle (RC) is a mature technology for converting waste heat into electricity. Although many energy-intensive industries could significantly benefit from the integration of RC technology, its current adoption rate is limited. An important reason for this is the difficulty for investors and end-users to recognize and ultimately realize the potential energy savings from such implementation. Sintered parts are based on iron powder, which is obtained through the water atomization process and thermal treatment in a hydrogen-reducing atmosphere. After the reduction process, the hydrogen used in the process is burned. There are attempts to capture and purify the hydrogen or use it as a heating agent for the thermal treatment furnace, with the associated risks of using hydrogen (the self-ignition temperature is 560°C at concentrations of 4%-75%). Therefore, in this work (the process is unique in the water-atomized iron powder industry at a theoretical level), the integration of an RC system into a thermochemical treatment furnace for atomized iron powder with water is investigated to recover the heat generated by residual hydrogen after its thermochemical treatment.

Keywords: H2 waste heat recovery, iron powder metalical annealing proses, Rankine cycle.

G.14. DESIGN AND MANUFACTURING OF THE POWER QUALITY MEASURING SYSTEM ARDUVIEW

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Abstract. The perturbation phenomena that affects the quality of electrical energy leads to the undesired interruptions of many sensitive processes and decrease the service life of the equipments, generating additional costs. The quality of electrical energy depends not only on the

supplier, but also on the consumers connected to the distribution grid. The consumers can cause the perturbation phenomena on the supplier's grid, affecting the other grid consumers. The evaluation of the perturbation phenomena can be performed by a set of the power quality indicators, whose values require to meet the standards specifications. Determination of these indicators represents the starting point for the improvement of electrical energy quality. The measurements are usually preformed by specialized instruments as the power quality analyzers that are usually complex and expensive. The purpose of this work is designing and manufacturing of three phase measuring system for 50 Hz – called ARDUVIEW. The aim of the system is to measure the power quality indicators by using a low-cost solution, but to provide enough performances for the further power quality improvement. Design of the ADUVIEW system is based on the integration of the Arduino board (hardware), Arduino IDE Open Source software and LabView programming environment.

Keywords: ARDUVIEW, Arduino, LabView, Power quality measurement.

G.15. APRIORI AND PHYSTECH: NEW SOLUTIONS FOR RESILIENCE ASSESSMENT AND MODELING

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Abstract. First, we will present the regional impact of the implementation of two research projects currently in progress. The NATO SPS MYP APRIORI project (https://aprioriproject.eu, 2023-2026) deals with the enhancement of resilience in critical infrastructures. The resilience is studied as its whole management cycle, including the phases of planning and training, monitoring and threat assessment and modelling and risk analysis. The development of robotic platforms for critical infrastructure inspection and surveillance is one of the main outcomes of the project. Also, the project investigates new technologies for the physical monitoring of the critical infrastructure with specific attention to the radio spectrum monitoring and the protection of wireless communications, the monitoring and protection of the physical layer of cabled communications, robotic solutions for the inspection and surveillance. The PHYSTECH research project (https://ephysimlab.usm.md, 2024-2027) is focused on developing the physical methods of measuring environmental parameters, computational modeling, analysis, and risk forecast in order to increase resilience to biotic and abiotic factors, as well as the development and extending implementation of the eALERT (https://ealert.md) monitoring platform in real time. The proposed methodology is unique and there is no other similar research that combines advanced technologies such as IoT sensors, robotics, and modeling software to improve the efficiency of the monitoring and evaluation process based on a secure online system for data recording, remote access, and control, facilitating the processing and modeling of big data and, at the same time, ensuring their storage and integrity. In addition, research integrates a systemic approach inspired by the interdisciplinary and transdisciplinary character of applications in the field of environmental physics, biology, and archaeology. Current research results include the building of a LiDAR system on the UAV-based platform for the efficient data collection at an affordable acquisition cost. Based on an agreement with State Enterprise “Moldelectrica”, it was shown that the Phoenix RECON-A type is an appropriate equipment for reconnaissance mapping missions such as vegetation encroachment on power lines. It was used for real time point cloud visualization and launched as a fully automated, cloud-based LiDAR post-processing solution to capture topography, inspect utility installations and construction sites, map disaster areas, and conduct research of critical infrastructures. RECON-A maximizes point cloud density by utilizing its multi-pattern laser to pick up even the lowest reflective points. The integrated 24 MP high resolution camera has the same FOV as the LiDAR sensor yielding maximum RGB colorization of the point cloud. The monitoring methods of critical infrastructures are developed

with the focus on radio spectrum monitoring and protection of wireless communications, the monitoring and protection of the physical layer of cabled communications, and robotic solutions for the inspection and surveillance. In addition, modeling and risk analysis of the critical infrastructures aim at creating an evaluation and optimization tool for infrastructure stakeholders for determining resilience thresholds in their infrastructures with consideration of relation among resilience and sustainability aspects. The support provided through grants number NATO SPS MYP G6140 APRIORI and MER 011210 PHYSTECH is gratefully acknowledged.

Keywords: Real-time monitoring, Critical infrastructure, Big data, UAV, LiDAR.

G.16. COMPARATIVE ANALYSIS OF CLASSIFICATION ALGORITHMS FOR ROMANIAN TEXT PROCESSING: SVM, RANDOM FOREST, AND BERT

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Abstract. The increasing availability of Romanian-language textual data necessitates the development of robust automatic classification methods tailored to the specific linguistic features of the language. This study presents a comparative evaluation of three widely adopted classification algorithms—Support Vector Machines (SVM), Random Forest, and Bidirectional Encoder Representations from Transformers (BERT)—applied to text classification tasks in Romanian. Utilizing representative corpora drawn from journalistic and social media sources, the models are assessed based on standard performance metrics, including accuracy, F1-score, and computational efficiency. Particular attention is devoted to the challenges posed by the Romanian language, such as its rich morphological structure and regional linguistic variations. The empirical findings provide insights into the relative strengths and limitations of each approach, offering practical recommendations for the selection and deployment of classification models in Romanian natural language processing (NLP) applications.

Keywords: text classification, Romanian language, SVM, BERT, NLP.

G.17. EVOLUTION OF HUMAN ACTIVITY RECOGNITION ALGORITHMS: TRANSFORMER MODELS, GRAPH NETWORKS, AND SELF-SUPERVISED TECHNIQUES

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Abstract. In the context of the rapid advancement of video artificial intelligence architectures, the recognition and analysis of human activities in video streams have been significantly enhanced by the emergence of large-scale models and novel learning paradigms. This paper presents a critical review of state-of-the-art research, focusing on cutting-edge models such as OpenAI's Sora for video generation and prediction, Vid2Seq for mapping video activities into textual sequences, and MoViNet for efficient real-time inference. Methods based on video transformers (e.g., TimeSformer, ViViT, VideoMAE v2), hybrid CNN-Transformer networks (e.g., SlowFast, X3D), and graph neural network approaches extended to the spatio-temporal

domain (e.g., ST-GCN, Ego-Exo4D) are analyzed. The impact of large-scale datasets such as Kinetics-700+, Ego4D, and the newly released Ego-Exo4D on the training and evaluation of Human Activity Recognition (HAR) systems is also discussed. Emerging trends, including multimodal activity recognition through MultiModal Large Language Models (MM-LLMs), self-supervised learning to reduce reliance on manual annotations, and model compression techniques (e.g., pruning, quantization) for edge device deployment, are critically examined. This work highlights the key challenges facing the field, such as model interpretability, energy efficiency, and dataset biases, and proposes future research directions toward the development of self-adaptive video architectures and robust HAR systems for real-world applications, including autonomous surveillance, collaborative robotics, and augmented reality.

Keywords: Human Activity Recognition (HAR), Video Transformers, Graph Neural Networks (GNNs), Self-Supervised Learning, Multimodal Large Language Models (MM-LLMs), Edge Computing, Video Understanding.

G.18. EFFECT OF INTELLIGENT LIGHTING ON CIRCADIAN RHYTHM

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Abstract. Effect of intelligent lighting on circadian rhythmPeople spend more time indoors than ever before. Typically, we spend 87% of our time indoors. We evolved into our natural surroundings – waking with the sun and going to sleep soon after sunset. Today we are spending the vast majority of our time under artificial lighting. Circadian lighting means that electric light can be used to support human health by minimizing the effect of electric light on our circadian rhythms. This is done by changing the light intensity, color, and correlated color temperature. This lighting variations help our body to receive the natural daytime and nighttime signals.Intensity tuningIn the early morning, color tuned lights are set at a lower intensity, transition to a higher intensity throughout the day, and reduce to a lower intensity in the evening to match the sun's natural path.Color tuningColor tuning is the process of changing light intensity and correlated color temperature (CCT) to mirror the colors of the daytime and nighttime cycle. When the sun is highest, cooler CCTs are used that produce attention. For sunrise and sunset, color tuned lights would cast warmer. Correlated color temperature (CCT)Correlated color temperature refers to the color wavelength of the light, measured in Kelvin and ranging between 1000–10000K. The lower, the warmer and the higher, the cooler. Lighting temperature between 2700–3500K follow the daylight hours when the sun is rising and setting. Cold color temperatures are from 4000–10000K and follow blue-sky daylight.

Keywords: circadian rhythm, intelligent lighting, Correlated color temperature, light intesity, light color.

G.19. DESIGN, SIMULATION AND CONSTRUCTION OF A MOBILE WITH A PNEUMATIC PROPULSION SYSTEM CONTROLLED BY A PROGRAMMABLE CONTROLLER

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Abstract. The paper presents the design, simulation and realization of a light, agile, maneuverable, safe and durable pneumatic vehicle, which can successfully face the current challenges facing sustainable development.The proposed structure, designed in Solid Works,

was subjected to mechanical tests in Siemens NX Nastran, using the finite element method. The pneumatic motor based on a double-acting cylinder powered from a 10 L tank, with a pressure of 10 bar, is controlled by a Bosch Rextoth Indralogic L10 series controller, with a processing time of 300 us. The test results reflect the tests carried out for three working regimes: maneuverability, speed and distance.The improved performance of the machine was achieved by optimizing the transmission system using a ball screw and high-helical nut to reduce friction forces between the mechanical components of the system and by automating the gearbox.

Keywords: energy conversion, pneumatic engine, automatic controller, automatic gearbox.

G20. DEVELOPMENT OF A INTERACTIVE PLATFORM TO STUDYING AND EVALUATING THE PERFORMANCE OF PHOTOVOLTAIC PANELS

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Abstract. The work is developing a stand dedicated to studying and evaluating the performance of photovoltaic panels. The stand will be equipped with specialized instruments and sensors for data collection and will provide an interactive platform for experiments and practical tests. It will also allow students and researchers to conduct practical experiments and analyze the factors that influence the performance of solar panels, being configured to simulate different lighting conditions, allowing users to evaluate the solar energy conversion rate in various scenarios. IOT technologies are also included for monitoring and optimizing solar energy efficiency.

Keywords: photovoltaic panel, efficiency, interactive platform.

G.21. ESTIMATION OF THE POWER CONVERSION CAPACITY OF A SMALL WIND TURBINE SITTING AS A DISTRIBUTED GENERATOR

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Abstract. In this paper we present an evaluation methodology for the wind power conversion on different sites available and suitable for developing small wind systems. Small wind turbines (up to 10 kW) are used to power individual homes and off-grid applications such as water pumping, battery charging stations, or telecom sites. Medium sized turbines (10 kW-500 kW) are often grid connected and are used to provide low voltage distribution system for remote areas, in conjunction with hybrid systems relying on solar or diesel generators. A wind system could produce optimal cost electricity if it is installed on a site that has the best resources. If wind systems are sited well, then wind turbines have small impacts on nature and wildlife; sometimes their effect on the landscape will not be appreciated by everyone. This means the planners of power systems must carry out environmental impact assessments and feasibility studies to find optimal locations for the wind system. The height of the wind system above the ground, the wind potential are important factors for the output power of the wind system. Naturally, the wind is characterized by different time scales of a great variability. To predict wind power production, we must first determine the wind potential of the site. The wind energy that could be produced at a given site can be approximated by a wind speed frequency distribution model commonly

expressed by the Weibull distribution. A site characterized by a high scale factor and a low form factor is a site with exploitable wind potential. We have shown that by applying the root mean square error algorithm for the frequency of wind speeds and its power density, the method of moments is the one that produces the lowest error. The paper developed a power curve model of a wind turbine to calculate the energy available on site, in the situation that this characteristic is not available. For a given site, the optimal and most probable wind speed, the annual variation of wind speed, and the average power density can provide useful information on the wind resource.

Keywords: wind turbine, Weibull distribution, method of moments, wind potential, energy conversion.

G.22. INTELLIGENT SYSTEMS FOR PRECISION AGRICULTURE: A COMPARATIVE STUDY OF MACHINE LEARNING APPROACHES

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Abstract. The growing demand for sustainable agricultural practices highlights the need for intelligent systems capable of enhancing decision-making processes in precision farming. This study presents a comparative evaluation of several machine learning approaches—including Decision Trees, Random Forest, and Convolutional Neural Networks (CNNs)—applied to key precision agriculture tasks such as crop monitoring, soil analysis, and yield prediction. Using datasets comprising satellite imagery, soil sensor readings, and climatic data, the models are assessed based on standard performance metrics, including prediction accuracy, robustness, and computational requirements. Special attention is given to challenges unique to agricultural data, such as spatial heterogeneity and seasonal variability. The findings offer valuable insights into the strengths and limitations of each approach, providing practical recommendations for the deployment of intelligent systems in precision agriculture initiatives.

Keywords: precision agriculture, intelligent systems, machine learning, crop monitoring, yield prediction.

G23. A PEFT-OPTIMIZED LANGUAGE MODEL FOR CURRICULUM ALIGNMENT AND EDUCATIONAL COHERENCE

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Abstract. This paper presents the development and fine-tuning of a lightweight natural language processing (NLP) model, optimized through Parameter-Efficient Fine-Tuning (PEFT) strategies, aimed at enhancing curriculum alignment and educational coherence. Using the LoRA (Low-Rank Adaptation) method, the transformer-based model microsoft/phi-2 was adapted to analyze the consistency between curricular objectives, lecture content, laboratory guides, and final examination items. The project addresses the critical challenge of assessing content coverage and thematic coherence, a difficulty extensively discussed in educational research. The primary objectives were twofold: (i) to evaluate the degree of curricular coverage and logical alignment between teaching and testing materials, and (ii) to develop an AI-based assistant capable of generating curriculum-aware, pedagogically relevant responses to support learners. Romanian and Russian course materials were automatically translated into English using the Helsinki-NLP Opus-MT models, ensuring multilingual training adaptability. Data preparation involved

structuring datasets in JSONL format, advanced tokenization, and adaptation for causal language modeling. To enable efficient deployment on resource-constrained hardware, the final model was quantized to 8-bit precision utilizing the bitsandbytes optimization library. By leveraging PEFT methods such as LoRA, the fine-tuning process achieved substantial reductions in computational resource usage without degrading output quality.Model evaluation, conducted through a multilingual interactive script with real-time translation, confirmed the model's ability to diagnose curriculum gaps, redundancies, and inconsistencies while maintaining high coherence and relevance in response generation. The proposed methodology contributes to educational NLP research by offering a scalable, resource-efficient approach to training specialized AI assistants, directly addressing the need for systematic evaluation frameworks in content coherence analysis.

Keywords: PEFT, LoRA, NLP, multilingual AI, transformer models, curriculum alignment, educational coherence.

G.24. AUTOMATIC VOLTAGE REGULATION OF AN AUTONOMOUS THREE-PHASE SYNCHRONOUS GENERATOR

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Abstract. This paper presents an automatic voltage regulation system at the output terminals of an autonomous three-phase synchronous generator made with the Arduino Uno development board. The experimental stand made in the laboratory of Electrical Machines and Drives of the Faculty of Engineering in Bacau is composed of a three-phase synchronous generator with electromagnetic excitation with a power of 1 kW. The rotor of the synchronous generator is driven by a three-phase asynchronous motor powered by a static frequency converter. The excitation winding is powered from a DC voltage source at a variable voltage in the range (50-100) V.c.c. An EMBSIN 121U voltage transducer was used to measure the voltage at the generator output. The signal from the voltage transducer is acquired by the A0 channel of the Arduino Uno development board. To implement the proportional-integrative type control algorithm, the author developed a program in the Arduino IDE programming language. The signal from the PI regulator output will modify the excitation winding supply voltage so that the voltage from the output of the three-phase synchronous generator remains constant.

Keywords: autonomous three-phase synchronous generator, voltage transducer.

G.25. STUDIES ON THE ANALYSIS OF THE PERFORMANCE OF SMALL PHOTOVOLTAIC PANELS

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Abstract. The article presents the research carried out in order to obtain a system that monitors the operation of photovoltaic panels, by measuring the voltage at its terminals and the intensity of the current generated depending on the lighting conditions and the power absorbed by the consumer. A microcontroller-based system will be used, which will also allow the integration of IoT technologies.

Keywords: photovoltaic panel, IoT, Arduino, sensors.

G.26. PERFORMANCE EVALUATION OF A HYBRID SOLAR ENERGY SYSTEM IMPLEMENTED IN A KINDERGARTEN

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Abstract. The integration of small-scale decentralized solar energy systems is essential for the development of a sustainable energy mix, offering benefits such as reduced pollution, lower transmission losses, and increased system resilience. In this study, a hybrid solar system combining solar thermal (ST), photovoltaic (PV), and photovoltaic-thermal (PVT) panels was implemented at a kindergarten in Bucharest, Romania, to supply domestic hot water. The paper presents the system configuration, technical specifications, and data acquisition methods, followed by an analysis of three months of operational data. Results highlight the energy production patterns, the influence of user behavior on system performance, and the impact of temporary facility closures during the study period. Despite these challenges, the system effectively reduced the kindergarten's energy consumption and serves as a valuable demonstrative and educational resource, providing insights for future decentralized renewable energy applications.

Keywords: decentralized energy, hybrid solar system, photovoltaic-thermal panels, energy efficiency.

G.27. RESEARCH ON ELECTRIC VEHICLES CHARGING STATIONS ANOMALIES

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Abstract. Organising the various anomalies associated with electric vehicles (EVs) charging and the integration of renewable energy is essential for gaining insights into their causes, effects, and practical solutions. The paper presents a suggested classification that considers varied factors, including the nature of the anomalies, the areas they influence, and their temporal dynamics. This paper presents a new vision for the EV charging stations anomalies based on reviews, recap, and investigates the existing anomalies created in EVs grid-connected stations based on Renewable sources, proposing a new classification of them. The paper analyses the impact of each one by finding statistical results. This study also investigates the given solution for each one of those anomalies, and also treats most research papers analysing single anomalies and proposes a new classification of them.

Keywords: anomalies, electric vehicles (EVs), charging stations, renewable energy.

G.28. INNOVATIVE RESEARCH ON TRANSPORTATION USING TRUCKS AND DRONES

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Abstract. In the face of ever-increasing demand for fast and efficient delivery services, this paper introduces a hybrid routing model that combines a truck's primary route with aerial missions of a drone (the Truck and Drone Routing Problem, TDRP). The aim is to leverage the truck's large carrying capacity and the drone's agility to minimize total distance traveled and delivery time, while ensuring the drone's flight range and precise synchronization between the two vehicles. The mathematical model is formulated as a mixed integer linear program in Python, with binary variables encoding the truck's movements between nodes and the drone's flights from launch points to delivery points and back. Constraints ensure that each customer is served exactly once, the drone completes its mission before the truck resumes its route, and the drone's range is not exceeded. The objective function seeks to minimize the combined operational cost, quantified by the total distance traveled by both vehicles. The implementation was carried out in Python using the Gurobi Solver under an Academic license, taking advantage of its advanced presolve capabilities and efficient search strategies. By carefully tuning the solver's parameters, the model enables rapid definition and adjustment of logistical scenarios, providing a flexible and powerful tool for courier companies.The main contribution of this work lies in the development of a clear and easily adaptable MIP modeling framework integrated with Gurobi in Python, which demonstrates how truck drone cooperation can be formally captured and exploited to reduce costs and delivery times in hub and spoke logistics networks. Experiments on real world data illustrate the benefits of this approach and establish a foundation for future extensions in hybrid logistics.

Keywords: TSP, Truck and Drone Delivery, Gurobi Solver, TDRP.

G.29. USING MIXED REALITY TO GUIDE STUDENTS IN LEARNING AUTOMOTIVE ENGINEERING

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Abstract. Currently, the automotive industry is evolving by integrating complex architectures regarding systems and functionalities. Integrating innovations in the field into university curricula is difficult because there is a time gap in terms of the adoption rate. This can be compensated by modeling and creating 3D content to be used with AR/VR glasses. The aim of this paper is to highlight a set of modern teaching options to integrate innovations in the automotive industry into university curricula, options based on teaching content through augmented or virtual reality. The adoption of mixed reality is beneficial from learning as a particular way to make complex automotive architectures almost self-explanatory to students, shortening the time industry news goes to classrooms.

Keywords: automotive, mixed reality, virtual learning.

G.30. IMPLEMENTING MACHINE LEARNING TECHNOLOGIES FOR LEVEL 3 AUTONOMOUS VEHICLES

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Abstract. The objective of this study is to reflect the evolution of software technologies for the development of Level 3 autonomy. Automotive technologies brought into play the large amount of hardware and software devices, with their subsequent software frameworks and programming languages, as well as the adoption of Cloud environments for data storage, management and analysis. The vehicles of nowadays ECUs are nodes in Controller Area Networks, they communicate via CAN busses, by sharing information captured by sensors about the vehicle working environment. Al the data is analyzed by means machine learning technologies.

Keywords: Level 3 Autonomy, Machine Learning.

G.31. ENGINEERING OPTIMIZATION OF PARAMETRIC DIGITAL ASSESSMENT IN MATHEMATICS USING STACK AND SYMBOLIC COMPUTATION

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Abstract. This study presents a novel computational framework for optimizing digital assessment in mathematics using STACK (System for Teaching and Assessment using a Computer algebra Kernel), a Moodle-integrated platform powered by symbolic computation. Bridging the domains of applied computer science, educational systems engineering, and neurodidactic learning design, the proposed solution enables scalable, adaptive, and cognitively aligned testing environments.A quasi-experimental design was conducted in two 8th-grade cohorts (N=58), comparing traditional paper-based testing with parametric, STACK-driven assessments focused on the topic of Linear Functions. The system architecture featured parameterized item generation, stepwise grading via Potential Response Trees, and instant symbolic feedback, structured to mirror expert teacher evaluation.The experimental group demonstrated a 25.6% improvement in learning performance, compared to 8.4% in the control group ($p < 0.01$), while teacher grading time was reduced by over 75%. Additional findings revealed increased student motivation, reduced academic dishonesty due to test randomization, and enhanced feedback precision. These results confirm the platform's capacity to act as a symbolic diagnostic engine and a pedagogical optimization tool.This research contributes to the development of intelligent educational systems by integrating symbolic computation with process automation and cognitive reinforcement strategies. STACK is positioned not only as a technical plugin, but as a didactic infrastructure for future-ready, AI-compatible, and neuroaligned digital education.

Keywords: symbolic computation, STACK, parametric evaluation, digital testing, assessment optimization, Moodle, mathematics education.

G.32. IMPROVING THE OWN TECHNOLOGICAL CONSUMPTION OF A POWER STATION

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Abstract. This paper aims to analyze the efficiency of the own process consumption (OPC) of an electrical substation. An electrical substation is a set of electrical installations and ancillary constructions, for the conversion of electricity and/or the connection of two or more sources of electricity or current paths. In this study, a calculation of the short-circuit currents and electricity losses in the electrical network and the electrical transformers for the studied electrical substation was conducted in several situations in which it can operate. Depending on the values obtained from this calculation, the equipment from the electrical substation was chosen and the main solutions for making the substation more efficient by modernizing it were highlighted. By conducting the proposed modernizations, the electricity losses and the own technological consumption of the power station are reduced, and the reliability indicators of the power station have been improved.

Keywords: own technological consumption, short-circuit currents, efficiency, electricity losses, power station.

G.33. MODELING AND TESTING WIND TURBINES IN MATLAB/SIMULINK

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Abstract. This paper presents the modeling and testing of wind turbines with the help of the Matlab/Simulink program. To meet the conditions imposed by the technical code of the electricity transmission grid, wind turbines are modeled into software applications in various dynamic operating regimes. The specialized software allows the modeling of wind turbines and the simulation of their behavior in power grids without the need for physical exposure of wind turbines, reducing the time and costs of development and implementation. Modeling wind turbines in the Matlab/Simulink environment involves individual modeling of their components: wind speed, transmission system, turbine rotor, electric generator, power and frequency converter, automatic control system, electrical step-up transformer, and power grid. The dynamic modeling of wind turbine generators is done with the help of spatial equations of state. In the case of the study of the stability of wind turbines coupled to the power grid, the two-mass shaft model of the transmission system has an acceptable margin of error. The power and frequency converter keeps the voltage on the DC bridge constant and regulates the flow of active and reactive power with the grid in both normal and fault modes. The aerodynamic model shows that the efficiency of wind turbines is strongly influenced by the variation of the inclination angle of the blades which produces major effects on the power of the wind turbines.

Keywords: wind energy, wind turbines, modeling, testing.

G.34. FEASIBILITY STUDY AND RISK ANALYSIS FOR A 50 MW WIND POWER PLANT IN CONSTANTA VS. BACĂU

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Abstract. This paper presents the feasibility analysis of the development of a wind power plant with a capacity of 50 MW in two locations in Romania, Constanta and Bacau, assessing the risks and benefits of each location, in order to determine which of them would offer the greatest potential for sustainable and profitable development. The paper explores how factors such as geological conditions, existing infrastructure, access to electricity grids, and distance from consumer markets can influence the feasibility of a wind project. The paper also looks at the risks to the wind farm location related to climate change (e.g., changes in wind intensity) and what adaptation measures would be needed. Analyzing the data collected and comparing the relevant factors, we can conclude that, although Constanta is a more expensive choice for first investments, it offers significantly higher wind potential for the development of a sustainable and profitable wind farm. Also, due to the high and constant wind speeds, the energy generated in Constanta will be more efficient, which contributes to long-term profitability.

Keywords: risk analysis, wind potential, feasibility study, wind energy, wind power, wind turbines.

G.35. RESEARCH ON GRID-CONNECTED PHOTOVOLTAIC SYSTEMS

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Abstract. This paper aims to analyze grid-connected photovoltaic systems. Grid-connected photovoltaic systems are one of the most developed renewable energy sources. This paper deals with important fundamental aspects on grid-connected photovoltaic systems, inverters for photovoltaic systems and control systems. Also, the paper addresses the use of the Matlab/Simulink software package in modeling and evaluating the performance of photovoltaic systems about integration into electrical grids. From the analysis of the obtained results and observations, it can be concluded that the research of grid-connected photovoltaic power systems is an important topic in research worldwide with many challenges.

Keywords: electrical networks, modeling, photovoltaic systems, renewable energy sources.

G.36. STUDY ON THE PARALLEL OPERATION OF GDTM TYPE ELECTRIC TRACTION MOTORS ON DIESEL-ELECTRIC LOCOMOTIVES USED ON THE RAILWAY NETWORK IN ROMANIA

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Abstract. The present work aims to study the parallel operation of the GDTM 533 traction electric motors used on diesel-electric locomotives in Romania. More specifically, the parallel

operation of the GDTM 533F traction motor and the GDTM 533H traction motor was studied. Additionally, the wear of the wheels on diesel-electric locomotives equipped with parallel-connected traction electric motors was analyzed, in order to find the best solution for connecting the traction electric machines, such that the wear of the locomotive wheels is minimized, and their operation is efficient. The study was done on a diesel-electric locomotive type 060 EGM of 2100 HP.

Keywords: electric motor, wear, locomotive, wheel.

G.37. SMART HOME SECURE ACCESS

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Abstract. This paper presents the development and implementation of an automated IoT system for easy home access. The project integrates modern technologies like OCR (Optical character recognition, the MQTT protocol, determining the distance using ultrasound, and 3D modelling, utilizing Raspberry Pi, Python and Kotlin. The system monitors vehicle traffic and allows access to authorized vehicles by managing gate opening and recording events. The application enables remote control and monitoring of the gates. This paper details the development stages, from concept to testing, demonstrating the effectiveness of the proposed solution.

Keywords: IoT, OCR, security, ultrasound, 3D modelling.

G.38 THERMODYNAMIC AND ENVIRONMENTAL ASSESSMENT OF HYDROGEN–NATURAL GAS BLENDS IN INDUSTRIAL GAS TURBINE COGENERATION SYSTEMS

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Abstract. The use of hydrogen-enriched fuels in gas turbine systems has gained significant interest in the context of decarbonizing industrial energy and combined heat and power (CHP) systems. Hydrogen's high reactivity, low molecular weight, and zero-carbon nature make it a promising additive or substitute for natural gas in existing turbine infrastructure. However, the integration of hydrogen poses technical challenges such as flame flashback, increased NO_x formation due to higher flame temperatures, and the need for adapted combustion chamber designs. This paper presents a comparative thermodynamic and environmental analysis of a high-efficiency industrial cogeneration system powered by a gas turbine, under two fuel scenarios: pure natural gas (CH_4) and a hydrogen-enriched blend (80% CH_4 + 20% H_2 by volume). The assessment is based on a validated energy model of the Solar Titan 130 turbine, operating at a nominal electrical output of approximately 14 MW. The analysis includes detailed modeling of key operational parameters, such as compressor inlet and outlet temperatures, combustion and turbine exit temperatures, air and fuel mass flow rates, power output (compressor, turbine, and net), and both electrical and total cogeneration efficiencies. Results show that substituting a portion of natural gas with hydrogen leads to improved combustion characteristics and reduced fuel mass flow. The system maintains comparable electrical output while increasing overall cogeneration efficiency. Additionally, the integration of hydrogen significantly lowers CO_2 emissions, demonstrating the potential of hydrogen-enriched fuels as a transitional solution toward decarbonizing industrial CHP systems.

Keywords: gas turbine, hydrogen, cogeneration system, hydrogen enriched blend.

G.39. BEHAVIOR OF WIND POWER PLANTS WITH TYPE 4 WIND TURBINES DURING GRID FAULTS

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Abstract. This paper presents the behavior of wind power plants with type 4 wind turbines under grid faults. The studied 10 MW wind power plant is formed of five 2 MW type 4 wind turbines connected to a 20 kV electric power distribution system which exports electricity to a 110 kV power grid through a 30 km, 20 kV line. A type 4 wind turbine is a variable speed pitch-controlled wind turbine which incorporates a synchronous generator connected to a diode rectifier, a dc-dc insulated-gate bipolar transistor (IGBT)-based pulse-width modulation (PWM) boost converter and a dc/ac power electronic IGBT-based PWM inverter. The studied wind power plant using synchronous generator and full-scale converter (type 4) driven by a wind turbine is simulated under grid faults using Matlab/Simulink to observe its dynamic response and impact of grid faults occurring on the 110-kV system and on the 20-kV feeder. The simulation reveals the turbine power characteristics (turbine power, power coefficient and the tip speed ratio curves depending on wind speed), pitch angle, and generator speed. Moreover, the voltage, current active power and reactive power, dc voltage, and generator speed, are also analyzed. Furthermore, the case studies illustrate when the wind power plants remain in service, recover after removing grid faults, or trips the wind power plants from the electricity grids.

Keywords: electricity grids, grid faults, power electronics, wind power plants, wind turbines.

G.40. MULTI-OBJECTIVE VRP WITH TIME-CONSTRAINED OPTIMIZATION

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Abstract. This paper explores the optimization of routing strategies in large-scale transportation networks, with a particular focus on the Traveling Salesman Problem (TSP) and the Vehicle Routing Problem (VRP) under time-based constraints. The study aims to identify routes and vehicle assignments that minimize total travel time, taking into account factors such as time windows, travel durations, and resource availability. Our contribution centers on the application of Pareto multi-objective optimization to balance conflicting objectives-such as minimizing travel time and adhering to scheduling constraints-thus providing a set of non-dominated solutions from which decision-makers can select according to specific operational priorities. We propose a hybrid approach that integrates dynamic programming and heuristic methods to efficiently solve both TSP and VRP instances under these constraints. The methodology is validated on multiple datasets representing extensive transportation scenarios. Results demonstrate that the proposed solution effectively identifies efficient routes and vehicle schedules with minimal total travel time, offering valuable flexibility for transportation and logistics planning in time-sensitive environments.

Keywords: TSP, VRP, heuristics, Pareto optimization, time window constraints, logistics planning.

G.41. TEMPORAL FAIRNESS IN ADAPTIVE ALGORITHMS CONTEXT

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Abstract. Current fairness frameworks in machine learning - group and individual fairness - evaluate algorithms at a single point in time, ignoring the dynamic nature of real-world systems. This paper argues that adaptive algorithms necessitate a third category of fairness: temporal fairness, which quantifies how disparities evolve over time. We first show how static fairness metrics fail in adaptive contexts due to feedback loops, cultural amplification, and rapid bias propagation. Then, we formalize temporal fairness as a lens to detect and mitigate longitudinal harm, proposing criteria such as disparity velocity and cumulative equity. By analyzing case studies from social media, we demonstrate how temporal fairness captures emergent biases that traditional metrics miss. This work aims to redefine fairness standards for systems that learn, adapt, and influence society continuously.

Keywords: adaptive alghorithms, fairness, bias, machine learning.

H. FRACTURE MECHANICS

H.1. STUDY ON THE INFLUENCE OF CONSTRUCTION PLAN ON THE COMPRESSION BEHAVIOR OF ADDITIVELY MANUFACTURED ASA SPECIMENS

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Abstract. This article presents the results of research on the influence of the construction plan on the compression behavior of additively manufactured ASA specimens. To carry out the study, using the variable printing parameters: layer height deposited per pass Lh = (0.10; 0.15; 0.20) mm and filling density Id = (50; 75; 100)%, a number of 45 compression specimens were additively manufactured in the X-Z plane by thermoplastic extrusion of ASA on the Anycubic 4 Max Pro 2.0 3D printer. All 45 specimens were tested in compression on the Barrus White 20 kN universal testing machine. The results of the study show that the construction plan influences the compressive strength of additively manufactured ASA specimens, the compressive strengths of additively manufactured ASA specimens in the X-Z plane being lower by (3.26 – 29.09) % compared to those manufactured in the X-Y plane.

Keywords: FDM, compression, experimental determinations, ASA, construction plan.

H.2. ELEMENTS ON THE ELASTIC VIBRATION BEHAVIOUR OF A TRAMPOLINE IN GYMNASTICS

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Abstract. The paper presents aspects regarding the elastic behaviour of a trampoline in school gyms after contact with a body falling from a height of 1 m, the body being a basketball (0.500 kg) or a 2 kg gymnastics ball. The results recorded from three accelerometers mounted under the main plate of the trampoline are presented, mainly the vertical displacements after contact, as well as a calculation model for the elasticity constant. The results may be useful to the constructors of such equipment to improve the gymnast's performances.

Keywords: springboard, accelerometers, vertical displacements, vibration behaviour.

H.3. GRAPHIC SIMULATION AND DETERMINATION OF THE FRACTURE STRENGTH OF STEEL PIPES USED IN NATURAL GAS DISTRIBUTION UNDER THE INFLUENCE OF RIGID BODIES INVOLUNTARILY EXISTING IN THE TRENCHES

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Abstract. In the present paper, by means of the Ls-Dyna software, the authors simulated the damage of the steel pipes used in natural gas distribution caused by the influence of solid foreign

bodies involuntarily found in the installation trenches of the distribution networks [1]. The simulation was conducted on a steel pipe insulated with extruded polyethylene laid in a roadway intended for heavy traffic. The rigid body that damaged the pipe was defined as a mandrel whose hardness was greater than that of the pipe. The determinations were conducted using the finite element method and as previously mentioned, the software employed was Ls-Dyna, whereas SolidWorks software was used for building the CAD model.

Keywords: pipes, natural gas distribution, finite element method, SolidWorks, Ls-Dyna, fracture.

H.4. FATIGUE OPTIMIZATION OF AMBULANCE HINGES: MATERIALS AND GEOMETRY

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Abstract. This study explores the fatigue assessment and geometric optimization of key components in the side and rear door hinges of commercial vehicle-type ambulances. It analyses the materials used in the construction of these hinges, focusing on the identification of those most resistant to cyclic loading and corrosion, critical factors in the frequent operation and diverse conditions of ambulances. An innovative approach of the study lies in the adaptation of certain constructive solutions and stress distribution principles encountered in civil engineering and architecture. Structural analogies, such as bridge support systems or architectural element joining principles, are investigated to enhance the durability and fatigue resistance of the hinges. An essential aspect of the research concerns the improvement of the rigidity of these components. Finite element analyses (FEA) are utilized to evaluate stress distribution and displacements, proposing geometric modifications to reduce stress concentration and increase the overall stiffness. Topological optimization is explored as a method to distribute material efficiently, minimizing weight without compromising structural performance. The study results offer some solutions for the design of more reliable hinges with an extended lifespan, contributing to the safety and operational efficiency of ambulances.

Keywords: fatigue, hinges, ambulances, optimization, stiffness.

H.5. EXPERIMENTAL AND NUMERICAL STUDY OF THE TENSILE BEHAVIOR OF PA6-GF30 UNDER VARIOUS ENVIRONMENTAL CONDITIONS

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Abstract. This paper analyzes the tensile behavior of PA6-GF30 composite material exposed to different environments (ambient, distilled water, cooling oil, saline solution, and UV-C radiation). Through experimental tests and numerical simulations using the finite element method (FEM), very good correlations between experimental and simulated results were observed. The study highlights the influence of the environment on the strength, deformation, and elastic modulus of the material, with errors between 0.30% and 2.42%, validating the numerical models for detailed analysis and extended applicability to similar materials.

Keywords: polyamide, glass fiber, PA6-GF30, tensile test, finite element method, distilled water, saline solution, cooling oil, UV-C radiation.

H.6. POSSIBILITIES TO IDENTIFY CRACKS IN STEEL PLATES USING VIBRATION ANALYSIS

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Abstract. Crack detection in steel plates is critical for ensuring the structural integrity and safety of engineering components. Traditional inspection methods, though effective, often require extensive labor and access to the component. Vibration analysis offers a promising alternative by providing a non-invasive and efficient method to detect and locate cracks. This paper explores the principles, methodologies, challenges, and future possibilities of identifying cracks in steel plates using vibration analysis, supported by experimental results and numerical simulations. The detection and monitoring of cracks in steel plates are critical in ensuring the structural integrity of industrial components, especially in sectors such as aerospace, automotive, and manufacturing. Vibration analysis has emerged as a promising non-destructive testing (NDT) technique for detecting cracks in structural materials, including steel plates. Various vibration analysis techniques, including modal analysis, frequency response analysis, and wave propagation methods, are reviewed to assess their effectiveness in identifying cracks in steel plates. The results of recent studies are presented, and future research directions are suggested to improve the accuracy and reliability of this approach for industrial applications.

Keywords: ultrasonic, eddy current, X-ray, natural frequency shift, mode shape distortion, frequency response function, extended FEM, fracture mechanics-based models.

H.7. COMPARATIVE ANALYSIS OF MECHANICAL RESPONSE IN ALUMINUM ALLOYS UNDER TENSILE LOADING: EFFECTS OF SCRATCHES AND FATIGUE PRECONDITIONING

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Abstract. This study investigates the mechanical response of various aluminium alloys under tensile loading, focusing on the influence of surface defects (scratches) and fatigue preconditioning. Using statistical analysis and mathematical modelling, differences in stress, strain, and force characteristics across multiple alloy types were evaluated. The ANOVA analysis confirmed statistically significant variations between groups, highlighting the role of each input parameter on the response. Linear and polynomial regression models were developed to predict mechanical behaviour, indicating that particular alloys (7075-T6) exhibit superior strength compared to others.

Keywords: surface scratches, fatigue loading, mechanical degradation, statistical modelling.

H.8. THE INFLUENCE OF TRIAXIALITY AND LODE ANGLE ON DEFORMATION IN FRACTURE

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Abstract. The study of material failure and fracture is integral to the design and safety of engineering structures. Among the various factors influencing material failure, stress triaxiality

and the Lode angle play pivotal roles in determining the deformation behaviour and the onset of fracture. Stress triaxiality refers to the ratio of hydrostatic stress to deviatoric stress, while the Lode angle characterizes the shape of the stress state. This paper explores the influence of these two factors on deformation and failure in materials. It provides a detailed examination of how varying triaxiality, and Lode angle affect the strain localization, fracture initiation, and material failure. The paper further discusses various material models that incorporate these factors and highlights their importance in predicting failure in both ductile and brittle materials. Understanding these influences is crucial for advancing the prediction of fracture and optimizing material behaviour under different loading conditions.

Keywords: stress triaxiality, Lode angle, ductile fracture, brittle fracture.

H.9. IMPACT ANALYSIS OF THE 20X102 MM FRANGIBLE ARMOUR PIERCING PROJECTILE WITH MULTILAYER ARMOR PLATES

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Abstract. The 20x102 mm frangible armour-piercing projectile is part of the ammunition used by air forces in their fight against other aircraft or against ground targets. It is a relatively new type of projectile, with characteristics of both penetration/ perforation and extended action on the living force, as a result of the fragmentation of the projectile core. Through the research carried out, both numerical and experimental, the projectile's ability to pierce armour made of overlapping, non-solidified plates, in several variants, was highlighted. The paper also contains some results of the authors' research on the numerical modelling of the projectile, very useful in the practice of finite element numerical analysis of the projectile-armour plate impact. The numerical study is carried out on both 2D and 3D numerical models, for the normal impact, so that the experiments in the polygon were practically reproduced. Through the good agreement of the numerical results with the experimental ones, the models, methods and methodologies used are validated.

Keywords: frangible armour-piercing projectile, 3D numerical models, penetration/ perforation.

H.10. IMPACT OF MULTIDIRECTIONAL SCRATCHES AND INDUCED FATIGUE ON THE MECHANICAL RESPONSE OF AEROSPACE-GRADE ALUMINUM ALLOYS

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Abstract. The current research evaluates the mechanical properties (stress and strain) and failure force of six aerospace-grade aluminium alloys (2024-T4, 6061-T4, 6061-T4 uncoated, 6061-T6 uncoated, 7075-T0, and 7075-T6) subjected to multidirectional surface scratching and fatigue loading. A total of 120 specimens were evaluated under two conditions: scratched and tensile tested (S-T) and scratched, fatigued, and tensile tested (S-F-T). Scratches were made with a CNC machine at three angles relative to the loading axis (0°, 45°, and 90°), with surface deterioration differing in both depth and length (as 12.5%, 25% and 50% of the material thickness or available length). Ultimate tensile strength, fracture strain, and maximum force have been recorded for each sample. All alloys subjected to fatigue exhibited reduced ultimate tensile strength and strain values relative to their non-fatigued equivalents. The impact of scratch direction was most

pronounced in 2024-T4 and 7075-T6, with the 0° orientation producing the highest average strength.

Keywords: scratch-fatigue interaction, percentage loss analysis, mechanical properties loss.

H.11. ANALYTICAL, NUMERICAL AND EXPERIMENTAL OF COMPOSITE MATERIALS USED TO REPAIR PIPELINE

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Abstract. Composite materials are specifically designed from two or more constituent materials, providing excellent strength-to-weight ratios, resistance to corrosion, and enhanced durability. Analytical methods employ mathematical models to forecast behaviours and performance attributes. Numerical analysis, often employing techniques like finite element analysis (FEA), allows for the simulation of stress, strain, and potential failure under diverse conditions. Experimental analysis entails physical testing of composite materials to assess their mechanical properties and effectiveness in repair scenarios. Case studies showcase successful applications of composite repairs across sectors such as aerospace, automotive, and manufacturing, revealing enhancements in operational efficiency and cost savings. Together, these analyses highlight the practicality of composite materials as a means to restore and strengthen industrial equipment. Specifically, fiber-reinforced polymers (FRPs), including glass fiber-reinforced polymer (GFRP) and carbon fiber-reinforced polymer (CFRP), are increasingly employed to repair pipeline defects. These advanced materials boast significant tensile strength, resistance to corrosion, and lightweight characteristics, making them suitable for reinforcing damaged or deteriorating pipelines. Successful case studies demonstrate how these composite repairs can restore structural integrity, improve pressure ratings, and prolong service life, all while minimizing downtime and maintenance costs in crucial industries such as oil and gas, water supply, and petrochemicals.

Keywords: GFRP, pipeline, mechanical properties, yield strength, FEA.

H.12. APPLICATION OF CRACK INITIATION AND PROPAGATION MODELS USING THE FINITE ELEMENT METHOD TO EVALUATE THE FRACTURE TOUGHNESS OF THE CANDU PRESSURE TUBE

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Abstract. The paper presents the analyses of crack initiation and propagation in a Compact-Tension (CT) sample using the finite element method, performed with the FEA Crack fracture mechanics software. Three models/options were discussed and used for the analysis, namely: The "Cell Crack Mesh for Element Extinction Crack Growth" option (Gurson-Tvergaard-Needleman model); The "Cell Crack Mesh for Cohesive Element Crack Growth" option (Cohesive element model); The "Cell Crack Mesh for Node Release Crack Growth" option (Node release model). In order to use the results of the paper in subsequent studies, for each option selected in the FEA Crack software, the parameters used in the construction of the finite element discretization of the CT sample and implicitly of the crack tip area were investigated. In the three analyses, the requirements stipulated in the ASTM E1820 standard for mechanical stress and sizing of CT samples were taken into account. At the same time, the calculation method of the J integral was also taken into account, which for a crack growth of 2 mm gives the fracture mechanics parameter JIC. In order to evaluate the performance of each crack initiation and propagation model, a comparison of the values obtained with the finite element method was

made, in each of the mentioned options for the J integral with the values obtained in the experimental works. It should be noted that the material properties for the Zr-2.5%Nb alloy comply with the Canadian standard CAN/CSA N285.8-21, and for the constitutive equation the Ramberg – Osgood form was used, whose parameters were previously determined. The results of the work are of interest for structural integrity analyses that are performed on pressure tubes after in-service inspections of CANDU fuel channels.

Keywords: finite element analysis, crack initiation, J integral, fracture toughness.

H.13. EVALUATION OF THE IMPACT OF DEFECTS ON THE FAILURE OF PE100 POLYETHYLENE PIPES

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Abstract. Among the factors influencing the values of stresses and displacements developed in a PE100 polyethylene pipe, we can list, along with the loads acting on the pipe tubing, factors related to the type of defect (layout, geometry). The evaluation of the impact of defects on the failure of PE100 polyethylene pipes can be performed by numerical and experimental methods. Both numerical and experimental simulations can be performed for different types of defects: dent-gouge, crack-like flaw and scratch-type defect. Evaluation methods used are also the Remaining Strength Factor (RSF), the Failure Assessment Diagram (FAD), and the critical depth of the defect (a_{crit}).

Keywords: polyethylene, defect, dent/ indentation, crack-like, scratch.

H.14. EVALUATION OF THE EFFECT OF ACCIDENTAL DEFECTS ON THE MECHANICAL CHARACTERISTICS OF PE100 POLYETHYLENE PIPES

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Abstract. Among the factors that influence the values of stresses and displacements developed in a PE100 polyethylene pipe, one can list, in addition to the loads acting on the pipe tubing, factors related to the type of defect (layout, geometry). Assessment of the impact of defects on the rupture of PE100 polyethylene pipes can be carried out by numerical and experimental methods. Both numerical and experimental simulations can be performed for different types of defects: combination of dent/indentation and gouge/dent-gouge, crack-like flaw, and scratch. Evaluation methods used are also the Remaining Strength Factor (RSF), the Failure Assessment Diagram (FAD) and critical depth of the defect.

Keywords: polyethylene, defect/ flaw, dent-gouge, crack-like flaw, scratch.

H.15. EFFECTS OF CORROSION ON THE TENSILE PROPERTIES OF ALUMINUM ALLOYS 6061-T4 AND 7075-T0

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Abstract. This experimental study investigates the decrease in tensile properties (yield strength, ultimate tensile strength and elongation) of aluminium alloys 6061-T4 and 7075-T0 in saline and microbiological conditions during a 30-day duration. The 6061-T4 aluminium alloy has improved corrosion resistance, compared to the 7075-T0 alloy. Both alloys had initial similar ultimate tensile strength values; however, their strength-ductility balance varied changed during the experiment. The results indicate that 6061-T4 is appropriate for corrosive situations necessitating ductility, while 7075-T0 is ideal for applications demanding rigidity and high strength.

Keywords: stress-strain behaviour, mechanical integrity, ultimate tensile strength.

LAST MINUTE PAPER

G.42. 2->A2, A HACK FOR ARDUINO EXAMPLES (WHEN HW-262 IS USED)

DAN POPA

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Abstract. In this paper we discuss the cost reduction using the HW-262 Multifunction Shield when teaching Arduino programming using just the 2.x version of the IDE and the default examples. The goal is to make the examples compatible with this specific hardware. A hack was applied. As a result, the cost of teaching the first three chapters decreased.

Keywords: HW-262 Multifunction Shield, Arduino programming, hacking the examples.

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