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# The 16th International Conference of Constructive Design and Technological Optimization in Machine Building Field

# OPROTEH 2021

## Conference Proceedings

# ABSTRACTS

**BACAU**
**MAY 25-27, 2021**

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**IONEL CRINEL RAVEICA**

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**Abstract.** In the global challenge of sustainable development, the circular economy is an important instrument for public and industrial authorities. Recycling is one of the levers that make it possible to achieve the objectives of saving resources and reducing greenhouse gas emissions set by various European and national regulations. In this context, the present study focuses on the evaluation of environmental factors of recycling according to the method of life cycle analysis (LCA), according to a homogeneous methodology. The study is done on PET and HDPE packaging. The two environmental indicators studied are the greenhouse effect and primary energy consumption (from renewable and non-renewable sources). The choice of LCA makes it possible to assess these sectors through several environmental indicators and therefore to develop the most comprehensive profile possible. This report is a first step in a more general project. The number of sectors studied, as well as the number of environmental indicators may gradually change over the next few years. Finally, this report includes the collection of data and the methodological choices applied to serve as a toolkit, an environmental calculator of the impact of recycling. This tool will allow specialists to assess the impact of their own production processes, but also of the competent institutions to repeat this environmental report every year.

**Keywords:** plastic package, life cycle analysis, circular economy.

## A.2. INFLUENCE OF CARBON AMOUNT ON RESIDUAL STRESS DISTRIBUTION IN SURFACE LAYER

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**Abstract.** The residual stresses are generally induced in mechanical components by the manufacturing processes or by different mechanical loadings leading to material deforming, as well as by heating and chemical. The technological operations based on material deformation generate different types of residual stresses that can be beneficial or harmful, critical or insignificant. For example, milling usually induces two types of residual stress: thermal and mechanical. Thermal induced stress occurs as a consequence of the excessive heat developed during machining. Chemical composition of the material, inhomogeneity of the material, low thermal conductivity, intensive flank wear, can affect the distribution of residual stress in the surface layer. The aim of our research is to explore the link between the residual stress distribution generated in surface layers by machining and the materials carbon content. Experiments revealed that an increase of residual stress value in the tensile zone (546 MPa) is connected with a high value of carbon percentage for up to 0.9 % from the

surface layer, while the decrease of residual stress value from approximately 550 to 300 MPa corresponded to a level 0.6 % of carbon. A theoretical investigation based on a finite element model (FEM) was also carried out. Six types of materials containing various amounts of carbon (from 0.4 % C up to 0.96 % C) but with constant content for the other alloying elements were used in the simulations. The cutting parameters were kept constant in order to assess the influence of carbon presence over residual stress. The FEM simulation also revealed a correlation between the materials carbon percentage and the distribution of the residual stresses in its surface layer. A useful geoinformatics utility is presented in this research study for project management of associated infrastructures in green sustainable construction designs; the optimum operation of Health Centres and the protection of Public Health.

**Keywords:** carbon amounts, finite element model, residual stress distribution.

## A.3. A SIMULATION WITH SOLIDWORKS OF A JET EJECTOR FLOW PARAMETERS

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**Abstract.** Jet ejectors are used in refrigeration, air conditioning and heat recovery applications, such as that resulting from solar energy and waste heat from various industrial processes. A jet ejector is designed to transfer kinetic energy from one medium, which moves at a higher speed, to another. An area with low pressure is created inside the ejector, which will take fluid from another inlet, making a heat transfer between them, so that later they are mixed and sent back to the thermal network. A jet ejector is a small but very efficient device that works with a pump. If we talk about water as a working agent, then it is very widespread and cheap, it can also work with steam or various other fluids. The principle of operation of the ejector is based on the Bernoulli principle, if the speed of movement of any fluid is increased, then around it will always form an area with low pressure, obtaining the discharge. The discharge nozzle has a much smaller diameter than the rest of the unit, even a small narrowing will significantly accelerate the incoming water flow. Then the water enters the mixing chamber, which will create a reduced pressure, for then to be forwarded. Water must not enter the unit from a direct source, but through a pump, in order to provide constant kinetic energy to the liquid mass to be lifted. Using a jet ejector together with a pump will save a large amount of electricity, as the station will not operate at the limit. This paper aims at a SolidWorks simulation of the process inside the jet ejector, in order to optimize its geometric parameters, analyzing the variation of the flow parameters of the working fluid inside it.

**Keywords:** jet, ejector, fluid, flow, heat, simulation.

## A.4. MODELLING AND MULTI-OBJECTIVE OPTIMIZATION OF SURFACE ROUGHNESS AND TAPER ANGLE IN ABRASIVE WATER JET MACHINING OF ALUMINUM ALLOY

**IONEL CRINEL RAVEICA, EUGEN HERGHELEGIU**

*"Vasile Alecsandri" University of Bacau, Faculty of Engineering, 157 Calea Marasesti, 600115 Bacau, Romania*

**Abstract.** Abrasive water jet machining is a non-usual method used for cutting purposes. It uses a thin jet of ultra-high-pressure water and abrasive slurry to cut the material and the cutting is mainly by erosion. The purpose of this paper is to investigate the effect of working parameters on the cutting of aluminum and to optimize the process parameters. The process parameters considered for investigation are traverse speed, abrasive flow rate and standoff distance. The subsequent response parameters that have been determined are surface roughness and kerf taper angle. In this paper has been used to factorial analysis in design of experiments. ANOVA is used to decide the influencing process parameters. 3D surface plots are presented for interaction effects of input process parameters. Response models are verified on the basis of estimation capability. Later on, multi-objective optimization using response surface methodology has been used for minimizing surface roughness and kerf taper angle.

**Keywords:** abrasive water jet machining, response surface methodology, surface roughness, kerf taper angle, multi-objective optimization.

## A.5. SOFTWARE INTEGRATION TYPE CAD-CAM-CAE IN PRODUCT LIFECYCLE MANAGEMENT

**IONEL OLARU**

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**Abstract.** The integration of two or more virtual product management systems in an integrated management system has the following advantages: simplification of existing management systems, increasing the benefits of each system, optimizing the consumption of resources used and reducing maintenance costs. With programs such as CAD-CAM-CAE can perform case studies to analyze some industrial loads that can occur in construction, manufacturing and operation of certain components before they are manufactured and operated in normal operating conditions. Software that provides a virtual modeling and analysis thereof, helps to reduce production times and initial, controlling and reviewing industrial products, before performing the physical model. Information obtained by using computer simulations will be thoroughly analyzed, based on their design team setting out the measures to be taken to improve the quality of the product itself. Achieving and maintaining an appropriate level of quality of the industrial products, as well as deteriorating their quality can generate very high costs, so it is necessary to properly manage the objectives in the engineering sector, by detecting and optimizing them systematically. Usually a global design of a sector of industrial activity includes: selection of machine tools with which the product is processed and which meets technological specifications, arrangement of machine tools in the factory according to technological flow, selection and optimization of tools with which it is processed, selection of other resources necessary for the post-processing verification operations, the selection of other resources necessary for the assembly operations and finally the optimization of the parts flows necessary for assembly. Integrating production computer with specialized programs allow more complete analysis of problems occurring in product

realization, being able to correct some problems from the design of the prototype, in other words ever since the virtual prototype.

**Keywords:** management, lifecycle, software, simulation, industry.

## A.6. METHODS OF OPTIMISATION IN MACHINING OF LIGHT METAL ALLOYS

**BOGDAN ALEXANDRU CHIRITA, CATALIN NICOLAE TAMPU, EUGEN HERGHELEGIU, COSMIN CONSTANTIN GRIGORAS**

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**Abstract.** The requirements for higher productivity and efficiency of the manufacuring processes have led to the development of concepts like high speed machining or high efficiency machining. Stricter requirements to lower the environmental impact has led to limitation in using cooling and lubrication liquids and the use of new methods such as dry and near dry cutting or cryogenic machining. Light metal alloys is a general denomination for the alloys of metals such as aluminum, magnesium or titan, These materials have an extended use in machine building, automotive, aeronautics or sport equipment industries. However, machining of such alloys raises problems concerning buld-up edge, thermal influences, machinability and other. The stochastic and complex nature of the phenomena involved in machining require extended research for the optimisation of the process. Usualy the results estimation and the optimisation of the machining processes is based on design of experiments (factorial plans, response surfaces, Taguchi), neural networks, fuzzy logic, genetic algorithms and less on physical models.

**Keywords:** machining, light metal alloys, optimization, modelling.

## A.7. INFLUENCE OF THE WORKING PARAMETERS ON THE QUALITY OF CUT PERFORMED BY ABRASIVE WATER JET CUTTING OF S235 STEEL PLATES

**EUGEN HERGHELEGIU, CAROL SCHNAKOVSZKY, CRINA MARIA RADU, BOGDAN ALEXANDRU CHIRITA, CATALIN NICOLAE TAMPU, VLAD ANDREI CIUBOTARIU, COSMIN CONSTANTIN GRIGORAS**

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**Abstract.** Abrasive water jet cutting (AWJ) is an unconventional technology that can be used to process various materials in different industrial fields such as: automotive industry, mining industry, military industry, aerospace industry, etc. Through this process, different shapes of 2D or even 3D parts can be processed. Importantly, abrasive water jet cutting is an environmentally friendly technology, which does not emit vapors or other compounds that affect the health of the operator and the environment in which the processing is performed. Moreover, abrasive water jet cutting does not thermally affect the processed surfaces because the processing forces are very small compared to other conventional processes, water being a liquid with cooling properties. After cutting no further finishing processes are required such as milling or grinding. Lately, research has been focused on increasing the working pressure and the ability to cut thick materials. The aim of the current paper is to present the influence of the working parameters on the cut quality, expressed in terms of microstructure and surface roughness, when processing S 235 steel plates with abrasive water jet cutting.

**Keywords:** abrasive, water jet, roughness, microstructure.

## A.8. INVESTIGATION OF THE QUALITY OF SURFACES OBTAINED BY DIE-SINKING ELECTRICAL DISCHARGE MACHINING USING THE RAPESEED OIL AS DIELECTRIC FLUID

**CRINA MARIA RADU, CAROL SCHNAKOVSZKY, BOGDAN ALEXANDRU CHIRITA, CATALIN NICOLAE TAMPU, VLAD ANDREI CIUBOTARIU, EUGEN HERGHELEGIU**

*"Vasile Alecsandri" University of Bacau, Faculty of Engineering, 157 Calea Marasesti, 600115 Bacau, Romania*

**Abstract.** Die-sinking electrical discharge machining (ram EDM) is a non-traditional technology for machining difficult-to-cut materials, by using precisely controlled sparks that occur between an electrode and a workpiece, in the presence of a dielectric fluid. Hydrocarbon-based oils, usually used as dielectrics, are neither environmentally nor operator-friendly. For this reason, in recent years different alternatives have been sought. One of the proposed solutions consists in using vegetable oils as a substitute for the conventional dielectrics. The aim of the current paper is to investigate the quality parameters of certain surfaces processed by ram EDM, using the rapeseed oil as a dielectric fluid.

**Keywords:** EDM, quality parameters, vegetable oils.

## A.9. A METHOD OF CORRECT EVALUATION OF LIFE CYCLE COST IN DEVELOPMENT OF CAR MARKET

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**Abstract.**This paper reflects the work carried out aims to develop a generic approach to product development, identifying key aspects of LCC (Life-CycleCosting) that could be easily absorbed into the existing program. In recent years, special attention has been paid to green public procurement (GPP) and energy efficient public procurement (ÉEP). GPP / APEE is a process by which public authorities aim to procure goods, services and works with a low impact on the environment through their life cycle, compared to other goods, services and works with the same primary function. The paper aims to present a tool that can be used to assess two very close values: life cycle costs and related emissions. The tool can be used:- at the auction to compare any number of offers. The tool can also handle offers that include multiple products, works, or services; to assess the current situation and therefore determine the possible financial effects and emissions of innovative alternatives. Purchasing more efficient products can bring direct benefits to buyers and significantly reduce costs for users, even when the initial costs are higher.The concept of the cost of the product based on its life cycle (LLC) consists in "accumulating the costs of activities that occur during the entire life cycle of a product, from its design to its abandonment by the manufacturer and consumer''. In a car market with a varied offer, choosing the right car is a difficult task. In addition to price and appearance considerations, there are several performance indicators that can be deduced from the manufacturer's public offering, parameters that allow easy comparison of different makes and models of vehicles regardless of the type of fuel used. For a better understanding of the problem within the present paper it is exemplified which is mechanism of cost assessment for a product modernization. This paper reflects the work carried out aims to develop a generic approach to product development, identifying key aspects of LCC (Life-CycleCosting) that could be easily absorbed into the existing program. In recent years, special attention has been paid to green public procurement (GPP) and energy efficient public procurement (ÉEP). GPP / APEE is a process by which public authorities aim to

procure goods, services and works with a low impact on the environment through their life cycle, compared to other goods, services and works with the same primary function. The paper aims to present a tool that can be used to assess two very close values: life cycle costs and related emissions. The tool can be used: at the auction to compare any number of offers. The tool can also handle offers that include multiple products, works, or services; to assess the current situation and therefore determine the possible financial effects and emissions of innovative alternatives. Purchasing more efficient products can bring direct benefits to buyers and significantly reduce costs for users, even when the initial costs are higher. The concept of the cost of the product based on its life cycle (LLC) consists in "accumulating the costs of activities that occur during the entire life cycle of a product, from its design to its abandonment by the manufacturer and consumer''. In a car market with a varied offer, choosing the right car is a difficult task. In addition to price and appearance considerations, there are several performance indicators that can be deduced from the manufacturer's public offering, parameters that allow easy comparison of different makes and models of vehicles regardless of the type of fuel used. For a better understanding of the problem within the present paper it is exemplified which is mechanism of cost assessment for a product modernization. This paper reflects the work carried out aims to develop a generic approach to product development, identifying key aspects of LCC (Life-CycleCosting) that could be easily absorbed into the existing program. In recent years, special attention has been paid to green public procurement (GPP) and energy efficient public procurement (ÉEPP). GPP / EEPP is a process by which public authorities aim to procure goods, services and works with a low impact on the environment through their life cycle, compared to other goods, services and works with the same primary function. The paper aims to present a tool that can be used to assess two very close values: life cycle costs and related emissions. The tool can be used: at the auction to compare any number of offers. The tool can also handle offers that include multiple products, works, or services; to assess the current situation and therefore determine the possible financial effects and emissions of innovative alternatives. Purchasing more efficient products can bring direct benefits to buyers and significantly reduce costs for users, even when the initial costs are higher.The concept of the cost of the product based on its life cycle (LLC) consists in "accumulating the costs of activities that occur during the entire life cycle of a product, from its design to its abandonment by the manufacturer and consumer''. In a car market with a varied offer, choosing the right car is a difficult task. In addition to price and appearance considerations, there are several performance indicators that can be deduced from the manufacturer's public offering, parameters that allow easy comparison of different brands and models of vehicles regardless of the type of fuel used. For a better understanding of the problem within the present paper it is exemplified which is mechanism of cost assessment for a product modernization.

**Keywords:** mechanism of cost assessment, car market, life-cycle costs, LCC-CO2 Tool.

## A.10. DESIGN FOR THE RECOVERY/REUSE OF COMPONENTS IN THE AUTOMOTIVE INDUSTRY

**ADRIAN STELIAN GHENADI, IONEL OLARU**

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**Abstract.** According to the results, obtained from modeling of life cycle, it is found that, the end of life stage of battery compared to other stages of life is not the most polluted with major impact on the environment.This paper builds a methodology that is designed to include the decomposition of components in order to reuse them later.Positive effects, but very low has been obtained during the stage of end of life, through components recycling.Any product must be viewed from an environmental perspective, starting with the raw materials used for its generating to final disposal, including going out of use of the product, namely along its

entire life cycle.Life cycle analysis consists of collecting necessary data and information (materials, consumption of energy and natural resources) to obtain the product, resources and consumption recorded during its use, the disassembly of product in components and the analysis of recovery processes, the identify of impacts on the environment which appear after the going out of use of product.After the going out of use of auto batteries it is aimed their recovery in order to capitalize and to recycle its components. The capitalization and recycling of auto battery is made by S.C. Rebat Copsa Mica S.A., which has as activity aim, the extracting of lead and other raw materials, through a complex technological process. Given that approximately 800 of these auto batteries of 12V-52Ah type, produced by S.C. Rombat S.A., are coming monthly from Bacau County and from its surrounding areas, the authors of the paper make a modeling of end-of-life, using specialized software Sima Pro 7. They make also an identification of impacts on environmental that occur during this period and they make recommendations and propose ways to reduce these results of impacts.

**Keywords:** design, automotive, industry, auto, batteries.

## A.11. THE OPPORTUNITY OF USING CLOUD-BASED COMPUTING IN NUMERICAL SIMULATIONS ON STRUCTURAL ANALYSIS - CASE STUDY

**VLAD-ANDREI CIUBOTARIU, COSMIN-CONSTANTIN GRIGORAS, CRINA MARIA RADU, CATALIN NICOLAE TAMPU, VALENTIN ZICHIL**

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**Abstract.** To make the most accurate behavioral assessments of mechanical parts, engineers rely heavily on numerous software solutions. These software solutions are able to solve more or less complex problems with a fairly high degree of accuracy and similarity to physical experiments. The common feature of these software solutions is that they need generous resources from the computer on which they are installed. Can't it be done differently? One possible answer may be the use of cloud-based solutions. The main purpose of this paper is to make a comparison and find the limitations of such a solution relative to the established ones in the field of finite element analysis. Therefore, this paper is a case study in which an industrial component – beam bracket – is subjected to a structural analysis on three different software solutions. The reference systems are: ANSYS, a solution dedicated to finite element analysis and SolidWorks Simulation, a solution often used in industry for the assessment of mechanical structures. The cloud-based solution is SimScale, a software product based on open-source codes: Code_Aster and CalculiX.

**Keywords:** finite element method, cloud-based solver, ANSYS, SolidWorsk, SimScale

## A.12. ANALYSIS FOR INVOLUTE SPUR GEARS, THE BENDINGS AND PITTINGS STRESS ON GEARS

**ADESOLA OLADEJO[1], TAOFIK ORIOLOWO[2]**

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*[2]University of Ibadan, Nigeria*

**Abstract.** The design of gears is highly complicated involving many constraints such as strength, pitting resistance, bending stress, scoring wear, and interference in involutes gears. The concentration is focused on spur gear sets which are used to transmit motion between

parallel shafts. The method of using manual calculations applied by gear designers and manufacturers to determine the bending and pitting stress on gears is time consuming, inefficient and can easily generate errors. This work aims to design gear analytically using AGMA standard, determining the bending and contact stresses on the gear teeth using Computer Aided and Computer Engineering Software to make gear stress calculations. Parameters in the AGMA stress equations were determined numerically, with MATLAB and Visual Studio software which was used to create graphical user interfaces that allows the bending and pitting stress on gears to be easily and accurately calculated. Test results demonstrated higher bending fatigue strength for both the asymmetric tooth form and optimized fillet form compared to baseline designs. Scuffing resistance was significantly increased for the asymmetric tooth form compared to a conventional symmetric involute tooth design. A variety of bending and pitting stresses of spur and helical gears problem can be handled by the created software, which can be useful for the gear designers, educational institutes and likes in gear problems.

**Keywords:** spur gears, bending stress, pitting stress, surface durability, stress calculations.

## A.13. STUDY ON THE ELECTROEROSION PROCESSING WITH FILIFORM ELECTRODE OF METALLIC MATERIALS

**OANA GEORGETA GHIORGHE, CAROL SCHNAKOVSZKY**

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**Abstract.** In the first part of this paper are presented theoretical aspects regarding EDM processing and the current state of research on the process of processing by EDM with filiform electrode. In this part we present a short history of EDM, the principles of operation and the evolution of EDM processing. We also mention the influence of the parameters, the processed materials, the equipment used, the fields of application as well as the optimization of the processing process by electroerosion with filiform electrode. In the second part of this paper we present a case study, based on wire EDM processing of RAMOR 400 and RAMOR 550 materials. Wire electrode erosion process has the ability to process hard and extra hard materials, which cannot be easily processed by other processes such as armored steel (Ramor 550 and Ramor 400).The experimental study aimed to determine the dimensional precision of the machined parts, as well as the hardness of the machined surface by wire EDM. From the analysis of the current stage it was deduced that in this process a very good dimensional accuracy can be obtained, for example, the smallest deviation from the nominal elevation was 0.0045mm. Wire electrode erosion processing has also been an objective always in the attention of researches in the field of processing applied in machine construction, being invatigated many aspects related to the construction of processing equipment, the influence exerted by the values of input factors on the values parameters of technological interest, ways to expand the technological possibilities of processing equipment, raising the performance of processing processes by wire electrode erosion, identifying the optimal conditions for processing.

**Keywords:** electroerosion, filiform electrode, surface roughness, dimensional precision, hardness of the surface, deviation.

## A.14. MANAGING SUPPLY CHAIN RISKS: A FUZZY-FAILURE MODE AND EVALUATION APPROACH FOR RANKING THREATS

**BABATUNDE OMONIYI ODEDAIRO, VICTOR OLUWASINA OLADOKUN, AYODELE OLUWASEGUN OLUWOLE**

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**Abstract.** On the backdrop of lower transportation cost, outsourcing paved the way for borderless production activities and ushered in the era of Supply Chain Management (SCM). For many organisations, achieving the goals of their Supply Chain (SC) is constantly threatened by increased competition and disruption. In this study, the aim is to identify, and rank, SC threats in a developing country using Failure Mode and Effects Analysis (FMEA) with Fuzzy Logic (FL). FMEA parameters were derived for 44 supply chain threats (SCT1 – SCT44) and their Risk Priority Number (RPN) determined. Subsequently, the Mamdani Fuzzy Inference system was utilized to arrive at a Fuzzy-RPN with 125 rules using severity as a determining factor. The rules were ranked to prioritize SC threats. From the conventional FMEA, demand variation (SCT42) and long-distance sourcing (SCT27) had the highest and lowest RPN, respectively. After fuzzification and defuzzification, Fuzzy-RPN identified raw material delay (SCT1), government policy (SCT11), poor transport infrastructure (SCT18) and political instability (SCT19) as threats with the highest Fuzzy-RPN (210) and product recalls (SCT28) with the lowest Fuzzy-RPN (99). Based on these results, it is concluded that a Fuzzy-FMEA approach can identify and rank SC threats with the use of an RPN devoid of sentiments and inaccuracies.

**Keywords:** supply chain, fuzzy-logic, threats, risk priority number, disruption.

## A.15. STRETCH FORMING USING HEATED DIE

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**Abstract.** The stretch forming process implies stretching and drawing into shape a sheet of material onto a die. This method is used, among other sectors, in the construction of aeroplane fuselage, as significant, complex parts can be obtained in one piece. In essence, stretch forming implies working with materials that have medium to high spring back effects, such as aluminium or magnesium alloys. Different approaches are used in manufacturing due to this phenomenon, ranging from incremental processes to multipoint dies. Another critical aspect of this process is to know how the material behaves under severe plastic deformation, as different alloys require different approaches that vary from step by step forming to in-process chemical treatments to manual pounding the metal sheet. However, all these alloys have in common that, when heated, their machinability properties improve. In this experimental study, a heated die approach was taken into consideration. 6x60 mm 100W heating elements along with temperature sensors were fitted into the die. The USB/OC326009 metal sheet is in direct contact with the die, thus assuring the heat transfer, as the temperatures reach 200 °C. The die temperature is software controlled so that maximum temperature and thermal inertia could be controlled with ease. The data indicate that this method offers significantly improved results compared to a normal room-temperature process.

**Keywords:** stretch-forming, heated die, severe plastic deformation, heating elements.

## A.16. MAGNESIUM ALLOY AZ31B FORMING LIMIT CURVE USING THE NAKAZIMA TEST

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**Abstract.** The best-known deformability tests for magnesium alloys are Nakazima and Marciniak. The most important difference between these tests is the shape of the punch that can be spherical or flat. The Nakazima test was chosen for the following experiment due to the simplicity of the procedure. For this test, a mold, a hemispherical punch, a retaining plate, and draw beads were used to prevent the blank from slipping. In the experimental study, metal sheets of magnesium alloy AZ31B were used, with thicknesses of 0.5 mm and 1.0 mm. The settings of the testing equipment have been selected to allow the material to break at different stresses and strains: from uniaxial to biaxial stretches. Different dimensions are required for these tests to generate different stages of deformation. Each specimen represents specific stress in the strain limit diagram. The Aramis optical measuring instruments were used to measure the deformation limit stress. An image overlay system obtained the deformation limit diagram. The geometries of the material and its thicknesses have the same leading role in creating tensions. Compared to the tensile compression test, this test confirms better deformability of sheets with a thickness of 0.5 mm.

**Keywords:** magnesium alloy, forming limit curve, Nakazima test, Aramis optical instruments.

## A.17. ASPECTS REGARDING THE CUTTING CAPACITY OF DIAMOND DISCS USED IN THE FLAT GRINDING OF HARD GRANITE AND BASALT MINERAL MATERIALS

**PETRE VALEA**

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**Abstract.** The paper presents how to determine the partial and global cutting capacity *(CC)* based on technological evaluation criteria (sustainability, specific energy consumption, cutting forces, roughness) and technical economic criteria (grinding productivity and cost). The theoretical-experimental model that allows the determination of the global *CC* for diamond discs takes into account the specific features of these super abrasive tools and the cutting process for flat grinding of hard mineral materials granite and basalt. Also, presented are the characteristics of diamond discs, the experimental stand and the factorial plans used in the experimental part.

**Keywords**: cutting capacity, diamond discs, flat grinding, evaluation criteria, durability, specific energy, cutting forces, roughness, grinding productivity, cost.

# B. OPTIMIZATION OF TECHNOLOGIES AND EQUIPMENT FROM PROCESS INDUSTRIES

## B.1 INFLUENCE POSITION THE ROD-CRANK MECHANISM ON THE MOVEMENT OF AN OSCILLATING SIEVE

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**Abstract**. This article presents a study that aims to visualize the influence exerted by the position of the rod-crank mechanism on the movements performed by the supports, respectively on the movements made by the separating surface for a sieve with oscillating movement. The study was made for a specific case from a constructive point of view and involves changing the position of the connecting rod of the drive mechanism in relation to the horizontal, respectively at the angles 0 - 75 and -45 - 0 degrees, and identifying the variation of the angle described by the free end of the sieve support. From the analysis of the obtained results it was found that for the value of the angle of 12.71 degrees of the connecting rod, in relation to the horizontal, the lowest value of the angle described by the movement of the tie rod between the extreme points was obtained. Also, for the value of the connecting rod angle of approximately 6.5 degrees equal angles described by the extreme positions of the sieve support in relation to the vertical were obtained. It is found that the variation of the connecting rod angle directly influences the variation of the angles described by the connecting rod in relation to the horizontal, the measured value being corresponding to the extreme points P1 and P2.

**Keywords**: oscillating motion, rod-crank mechanism, connecting rod angle variation.

## B.2 VISCOSITY OF AQUEOUS POTASSIUM CARBONATE SOLUTIONS PROMOTED BY AMINO ACID: MEASURING AND CORRELATION

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**Abstract.** Potassium carbonate ($K_2CO_3$) solution is a widely used solvent for $CO_2$ removal due to the low toxicity, low tendency of degradation, less energy requirement, high solubility in carbonate / bicarbonate system and other economic concerns like corrosion problem. For absorption, an aqueous solution of 20 - 40% K2CO3 is used as close as possible to the saturation without the phenomenon of crystallization. Since the rate of $CO_2$ absorption is relatively slow in $K_2CO_3$, the use of various activators has been required. In this work, DL - Alanine was chosen as rate promoter candidate.Prior to the experimental determinations specific to the absorption process, all the physical properties involved must be known: the viscosity and density of the solution, the $CO_2$ diffusion coefficient in the amine solution, as well as the Henry constant for $CO_2$ in the amine solution.The viscosity of the ternary aqueous solutions ($K_2CO_3$ – Alanine - $H_2O$) and ($K_2CO_3$ – $KHCO_3$ – Alanine - $H_2O$) have been measured for a blending 30 wt % potassium carbonate, 5 % potassium bicarbonate and DL - Alanine concentrations between 3 and 5 wt %, at atmospheric pressure and temperatures from 303 K to 353 K. The viscosity was determined with a capillary

Ubbelohde tube. Calibration of the viscometer was based on water value and standard methods accepted by ASTM. For each determination, the temperature was accurately controlled ± 0.1 K using the Viscosimeter Thermostat 655. The accuracy of the determinations is estimated to be ± 1.00%. The experimental data of viscosity were correlated as a function of temperature. The predicted data were estimated from coefficients of correlation equations for all the measured properties, and reported with standard deviation (SD). The experimental data were consistent with the predicted data. The results are useful for the prediction of carbon dioxide diffusion coefficients in such solutions and mass transfer coefficients.

**Keywords:** amino acid, potassium carbonate, promoter, viscosity.

## B.3. THE IMPACT OF THE DRY AGED BEEF PROCESS PARAMETERS ON END PRODUCT QUALITY

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**Abstract.** In recent years, meat tenderized by the "dry aged beef" method is appreciated among customers of the HORECA (Hotel-Restaurant-Cafe) sector in the Republic of Moldova but the product remains to be imported, due to lack of locally implemented manufacturing technology, lack of regulatory documentation for the technological process, which would allow the production of local tender meat by applying "dry aged beef" technology. This paper involves researching the aging process by drying with predetermined parameters (duration, temperature, relative humidity and speed of air circulation), quality indices such as water retention capacity, weight loss, moisture content, protein, collagen, etc. The quality of matured meat is influenced by large groups of factors: 1. The chemical composition of the meat influenced by breed, age, maintenance conditions, type of feed; 2. Aging chamber parameters. The study used Black Angus beef, raised on farm conditions in the Republic of Moldova, matured by drying for 32 days with the following controlled parameters of temperature (0 - 4 °C), relative humidity (75 - 85%) and air circulation speed (0.3-2 m/s) in the maturation chambers. Weight loss increases with increasing dry aging, major losses being observed in the first aging period (7-10 days), this result being influenced by the decrease in humidity throughout aging, while for protein and collagen content no significant changes were found, results presented by other authors. Also, in the first 7 days there is a significant decrease in water retention capacity from 78% to 63%, with subsequent increase to values of 86% at 28 days of dry aging. The dry aging process contributes to the drying of the outer part of the meat, a process that leads to losses in the mass of the meat by about 24%. The parameters of the dry aging process as well as the stable change of humidity positively influence the activity of the natural enzymes of the meat which lead to the solubilization of an important part of proteins and collagen, which leads to the increase of the tenderness of the meat.

**Keywords:** dry aged process, beef, aging parameters.

## B.4 STUDY REGARDING THE ATTITUDE TOWARDS RISK, OF MANAGERS FROM ROMANIA, IN CONTEXT OF THE INTEGRATED APPROACH FOR RISK MANAGEMENT

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**Abstract.** Risk Risk management planning is the process whereby (through which, by which) it is decided how to approach and to plan the risk management activities for a company.Integrated risk management means the integration of all risk categories into a single framework in order to optimize the company's value.Due to the present difficult economic conditions, in many cases, managers do not have the availability to assume all risks, what led, in the end, to stopping of company's activity, many times.This paper presents a study that used like research approach a quantitative methodology. It was based on a questionnaire survey, but there were interviews, observations and study of companies' documents. The utilized research instruments were three original questionnaires, on the following topics: The first questionnaire was focused on the Investigation of risk faced by firms in Romania; The second questionnaire was focused on investigation of various aspects related to risk management in Romanian companies. The third instrument was in order to identify attitude towards risk of managers from Romanian companies. Due to the interdependence of the economy, the effects for the activity of a company can be dangers, risks to others (individuals and legal entities, environment). Considering this aspect, the surveyed managers were asked to specify which are the risks that are created by their company to other entities. Due to the present difficult economic conditions, in many cases, managers do not have the availability to assume all risks, what led, in the end, to stopping of company activity, many times.

**Keywords:** Risk management, questionnaire.

## B.5. PRACTICAL APPLICATION OF IDENTIFICATION AND ASSESSMENT OF RISKS AND DESIGNING OF A RISK MANAGEMENT SYSTEM, AT A COMPANY FOR AGRICULTURE MACHINE BUILDING

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**Abstract.** The Risk management is a process of identifying, analyzing and systematic reporting of risk factors. It involves maximizing of the probability and consequences of positive events and minimizing of the probability and consequences of opposing events for the project objectives. It is estimated that there are risk conditions, when a decision based on incomplete information must be taken. Although information is incomplete, managers can calculate probabilities of events and their results and costs and then selecting the most favorable alternative. Probabilities can be determined objectively from historical data or subjective, based on past experience of the institution [1]. Making decisions based on probabilities, is a feature of the current manager. The existing of risk condition involves a deliberative process. The application consists of three parts: I. Study on risk management to S.C. "Mecanica Ceahlău" S.A.; II. Risks identified through analysis of information regarding the evolution at national level and at sector level, based on questionnaire and on internal sources of information; III. Risks identified by stimulating of the evolution of economic and financial indicators, at S.C. "Mecanica Ceahlău" S.A. S.C. Mecanica Ceahlău S.A. has insurance options of human resources, technical and financial, required

to obtain the best conditions, the advantages of use of an integrated risk management. Depending on the nature of the risks, several approaches are used to quantify them.

**Keywords:** Risk management, risk condition.

## B.6. THE ACTION OF CORROSIVE AGENTS ON THE QUALITY OF METALLIC MATERIALS FROM MACHINE BUILDING INDUSTRY

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**Abstract.** The aim of the study is to analyze some metallic materials used in building industry that was submissive at the corrosive agents. The corrosive agents were selected as chemical agents and microbiological agents. The chemical agents were specified such as saline solution at different concentrations (4%, 7% and 11%) and microbiological agents. The microbiological agents were chosen in order to show the action of microorganisms presented in atmosphere or in metallic processing hall.After the action of corrosive agents, in controlled time, the surface of metallic samples was analyses with atomic force microscope (AFM) in order to point out the corrosive action.The metallic sample that has a better comportment for corrosive agents choses is sheet steel (type USB material) for saline solution corrosion and also for microbiological corrosion.

**Keywords:** Corrosive agents, microbiological, metallic material, AFM.

## B.7. APPLICATION CONTRIBUTIONS TO THE ANALYSIS OF STRESS STATUS AND DEFORMATION GENERATED IN A SANDWICH TYPE COMPOSITE STRUCTURE - CASE STUDY

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**Abstract.** The This paper is part of current research concerns related to advanced sandwich composite structures, as a result of contributions to the development of efficient technical solutions for applications in various fields of the national economic environment. The studied composite structure consisting of two layers of carbon fiber (CF) fabric and a ligno-cellulosic core (OSB), impregnated with a thin film of ultra-adherent BISON type adhesive, is designed for various industrial technical uses. The carbon fiber fabric is highly rigid through the diagonal bond, at which the warp and weft fibers are interwoven in an order and frequency programmed to obtain a diagonal appearance. In the case of this composite structure required by a biaxial field of normal loads and shears, the state of stresses and strains shall be analytically determined to form the basis for decisions of optimal use in the necessary and timely structural applications.

**Keywords:** structure, sandwich, carbon fiber, ligno-cellulose, tension, deformations.

## B.8. SIMULATED BEHAVIOR OF THERMAL COATED LAYERS AT POINT CONTACT STRESS

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**Abstract.** It is well known that one of the most common wear-related cases occurs in rolling parts with point contact - rolling bearings, in which wear is caused by contact fatigue. The surfaces of the two tribo-elements (the ball and the bearing ring surface) are in direct contact with the development of normal and tangential stresses on the surface and in the depth, as well as with local deformation of the surfaces in the contact area. The tension and deformation state in the contact area can be characterized using elastic contact theory (Hertz theory): if there is a contact point or line between two elastic bodies, under the influence of the external forces (normal on the contact area) then normal stresses will appear and the conjugated bodies elastically deform. This study was performed on one type of coating made by thermal spraying, being analyzed the possibility of using it to increase the wear resistance of the rolling surfaces of some axial bearings. The coating was produced by Atmospheric plasma spray (APS) technique, with a maximum thickness of 100μm, on a bearing steel substrate, from a tungsten carbide powder ($WC_{10}Co_4Cr$), used for applications where both wear resistance (abrasion, erosion, fretting) and corrosion is required at a working temperature of up to 500 °C. In order to simulate the contact fatigue behaviour and to compare the real and theoretical aspects, a modelling of the pressure and von Mises stress distribution was performed using a program developed in C ++ and Matlab.

**Keywords:** thermal layers, contact stress.

## B.9. INFLUENCE OF PROCESS PARAMETERS ON THE ABRASION RESISTANCE OF HARD ALLOY DEPOSITS OBTAINED BY ARC SPRAYING PROCESS

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**Abstract.** The The arc thermal spraying is a process used to deposit a variety of materials in order to improve the mechanical or corrosion properties of the substrate. The arc spraying process (ASP) using cored wire feedstock has found large industrial applications in hard surfacing, especially where wear and erosion resistances are important. Cored wires with a ductile metal or alloy envelope containing hard particles have extended the use of ASP to broader fields previously dominated by other processes such as plasma and HVOF spraying. In wire-arc spraying process, an electric arc is created between two consumable conductive wires, continuously advanced, the high temperature of the arc melting the wire tips, while a gas flow propels the molten particles toward the substrate surface to be coated. Each droplet spreads on the substrate upon impact and solidifies forming a splat. The coating results from the layering of the deposited splats and presents lamellar structure with the inclusion of

oxides, pores, cracks, and unmelted particles. Besides the intrinsic properties of sprayed material, the quality and properties of coatings depend strongly on process parameters, of splat/substrate and splat/splat interfaces. The aim of this paper is to determine the influence of the process parameters, namely the electric current intensity, the gas pressure on the mechanical properties, respectively of the abrasion resistance and the deposits adherence of the high alloy steel of NiCrSiB – WC+TiC on a substrate of low - alloy steel of C15 – EN 10083.

**Keywords:** abrasion resistance, alloy deposits, arc spraying process.

## B.10. ANALYTICAL-EXPERIMENTAL METHODS FOR EVALUATION OF LIFE PERIOD OF PRESSURE EQUIPMENT

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**Abstract.** Given the development of process industries, the assessment of the service life of mechanical structures, which are subjected to fatigue, is a matter of major importance. At the same time, taking into account the current economic situation, as well as the fact that most of the equipment in operation are at the upper limit of the service life, provided by the manufacturer, an assessment of their remaining life is required. In this paper it is presented, through a theoretical study, the current state of the methods and techniques of life period evaluation, specific to mechanical structures under pressure, using the concepts of mechanical fracture of materials, and the principle of critical energy. The importance of the approached topic consists in increasing the safety and integrity of the operation of the equipment, and of the technological installations, of the protection of the working personnel, and of the external environment. Also, the development of a unitary and coherent approach to the planning of inspections and maintenance of mechanical structures, both in operation and in the design stage, is a challenge for both owners / users and designers.

**Keywords:** pressure equipment, service life, remaining life, materials behavior, creep.

## B.11. DETERMINATION OF THE PHONO-ABSORBING BEHAVIOR OF STRATIFIED COMPOSITE STRUCTURES

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**Abstract.** The paper analyzes the phono-absorbing behavior, for two layered composite structures, related to two models of acoustic insulating housings (cabins), in order to reduce the overall noise level (model 1: dry wood fiberboard with medium density - MDF / PS / MDF and model 2: folded boards of solid dry beech wood - RWB / PS / RWB, with extruded polystyrene core, PS). Comparatively, the phono-absorbing behavior of the two models is highlighted, by means of the difference of the values recorded for the variation of the noise level, $\Delta L$ [dB]. The obtained results lead to the use of these composite structures, in various applications that require phono-absorbing properties.

**Keywords:** composite, layered, phono-absorbent, noise level.

## B.12. USE OF THE SIX SIGMA METHODOLOGY TO IMPROVE THE QUALITY OF THE MANUFACTURING PROCESSES OF SOME INDUSTRIAL PRODUCTS

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**Abstract.** The paper deals with an example of the application of the statistical approach SIX SIGMA (6 σ), for the analysis of the improvement of the quality characteristic, specific to the manufacturing processes of "airbag cushions", from an industrial enterprise. The non-conformities recorded in the perimeter sewing operations, of the mentioned parts, and the non-compliance of the characteristic evaluated within the specification limits in the quality standards are taken into account. By means of the graphical representation of the normal GAUSS distribution, of the values of the analyzed quality characteristic, measures can be imposed, as the case may be, to improve the quality of the respective manufacturing process.

**Keywords:** Six Sigma, quality, specification, non-conformity, technological flow.

## B.13. STUDY ON THE TECHNICAL EXPERTISE OF GAS-LIQUID FUEL BOILER ROMSTAL THERMOSTAL ENERSAVE ENP 700 - 700 KW, IN ORDER TO EVALUATE THE REMAINING SERVICE LIFE

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**Abstract.** The boiler is an equipment, part of a heating installation, which operates in particularly difficult conditions, being subjected to the cumulative actions of: pressure variations (including during pressure tests), which cause mechanical shocks; large temperature variations, causes thermal shocks, as well as uneven expansions and contractions, due to the different dimensions of the various parts of the boiler (drum, focus tube, pipes, collectors, etc.); high temperatures, above 450 $^{O}$C, which causes creep. The normal duration of operation, represents the duration of use, in which the input value of the fixed assets is recovered, from the fiscal point of view, by way of depreciation. Consequently, the normal service life is shorter than the physical life of that fixed asset. The purpose of technical expertise for pressure installations is to establish the remaining service life, and to extend it. The boiler under study is a Gas-liquid fuel boiler Romstal Thermostahl ENERSAVE ENP 700 - 700 kW and used for heating office buildings. The boiler has been in operation since 2006 (15 years), with an initial service life of 8 years, but at the end of this period it has received a 7-year extension. The paper presents the verifications performed during the technical expertise: visual control of welds (VT), control with magnetic powders (MT), control with penetrating liquids (PT) of the tubular plate, ultrasonic control of thickness (Utg) of the focus tube, tubular plate and mantle boiler, ultrasonic welding control (UTS).

**Keywords:** Remaining Service Life, physical life, technical expertise.

## B.14. STUDY ON THE REDUCTION OF ENERGY CONSUMPTION FOR A SYSTEM WITH THREE DEPILATION ROLLS, BY OPTIMIZING THE MAIN GEOMETRIC AND DYNAMIC ELEMENTS

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**Abstract.** Energy consumption is a matter of primary interest for any industrial equipment. The aim of the paper is to present the results of optimizing of main geometric and dynamic elements of a machines with horizontal flow at depilated pigs. The study was conducted in the context in which it is known that the energy consumption of this type of machine is determined when the load is maximum. The known constructive variants are with two or three rollers. The variation of the couple was analyzed, in relatively high limits, both depending on the geometric dimensions of the rollers and the positioning of the animal carcass, subject to depilation, in relation to them.

**Keywords:** power consummation, optimization, main geometrical and dynamic elements.

## B.15. STUDY REGARDING THE PLACEMENT OF MEASURING AND CONTROL DEVICES AND OF SAFETY DEVICES ON PRESSURE VESSELS

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**Abstract.** The operation of pressure vessels, at the designed parameters, according to the requirements of the technological process, as well as the need to protect the environment and the human factor, involve equipping them with various fittings, measuring and control devices, and safety devices. Among the fittings, we can mention: stamp plate, pressure reducers, feeding and emptying devices. The measuring devices are mandatory manometers and, depending on the technological process, temperature transducers, level indicators, alarm sirens, etc. Their placement on the vessel is not random, but is determined following an optimization, which is done in full accordance with ISCIR requirements. The paper presents some of the conditions that must be met regarding their location on the vessel, both in terms of positioning and how to mount it. Also, in the paper a case study is presented , with all the particularities and variants, regarding the placement of fittings, control devices and safety devices, on a presure vessel type: Gas-liquid fuel boiler Romstal Thermostahl ENERSAVE ENP 700 - 700 kW.

**Keywords:** pressure vessels, fittings, measuring and control devices, safety devices, ISCIR requirements.

## B.16. RESEARCH ON MECHANICAL CHARACTERISTICS OF VENISON MEAT

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**Abstract.** As a result of the changes in the demand for meat, interest in new red meat products such as venison, which claims to be low-fat red meat and particularly suitable for use in convenience-oriented products, has a significant increase in recent years. Venison can be eaten as steaks, roasts, sausages, salami and ground meat. The objective of the research is to investigate the mechanical characteristics of the venison different type of anatomical regions, by compression tests, with respect to the age, gender and hunting season. The results were analyzed by comparison to the compression tests on swine meat, from the same anatomical regions. The tests are performed on samples of raw, chilled and frozen meat (striated and non-striated muscles), from different anatomical areas of wild boars and deers, on Zwick Roell testing machine. The Poisson's ratio and Young's modulus of venison meat are measured for different temperature conditions: 1) no freezing, 2) partial freezing, and 3) freezing. By analysing the results the aim of the research is to improve the processing recipes, leading to an optimum quality of the venison specialties and to optimize the active machine elements design of the processing equipment, the evaluation of the mechanical characteristics being an important factor that is taken into acoount for the rational selection of venison meat mincing machines and tools in the production of venison meat products, minced venison meat, semi-finished and finished products.

**Keywords:** mechanical characteristics, optimum quality, optimization.

## B.17. USING ARTIFICIAL COLD FOR DRYING SUGAR

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**Abstract.**Sugar is a food product that comes out of the final spin process with high humidity. Therefore, in order to be stored, it must undergo a conditioning process that begins with drying. Currently, the drying machines use hot air as a heating medium, which means high energy consumption. As hot air can store more moisture than cold air, one method of drying could be to use dry, cold air. In addition, at high temperatures and in high humidity conditions, a film of syrup may form on the surface of the crystals due to surface dissolution, which leads to softening and agglomeration of the crystals. Drying at low temperatures can avoid this unwanted phenomenon and reduce specific energy consumption.

**Keywords:** drying machines, energy consumption, cold air, sugar.

## B.18. HEART-HEALTH STATUS USING MACHINE LEARNING

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**Abstract.** Heart disease is one of the killer diseases in the world. Early detection of the disease is one of the ways to salvage affected people. The use of machine learning techniques can be used to offer solution to the detection of heart diseases. In this study the accuracy of

prediction of some tools of machine learning has been carried out. As many features/parameters are needed, the accuracy of selected model has been tested using some selected feature sizes from 8 - 14. The results obtained showed that the more the fields used in training, the better the accuracy of heart-health status.

**Keywords:** dataset, machine learning, heart-health

## B.19. PROCESS OPTIMISATION AND SOME MICRONUTRIENT RETENTION IN THE PRODUCTION OF OVEN-DRIED MICRONUTRIENT-RICH ORANGE-FLESHED POTATO FLOUR: A TIME STUDY AND VALUE STREAM MAPPING APPROACH

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**Abstract.** Orange Fleshed Sweet Potato (OFSP) is a highly nutritious tuber, rich in vitamins, and a major source of micronutrients (beta-carotene, ascorbic acid and phenolic acid). The retention of these micronutrients during conversion of OFSP to flour is limited by the choice of the drying methods. There is dearth of information for ascorbic acid and phenolic acid retention levels. Threfore, this study was designed to optimise the OFSP processing methods so that appreciable quantities of the micronutrients are retained in the sweet potato flour. Time study and Value stream mapping methods were used to establish a standard time for each operation and process improvements, respectively. Using the traditional methods, production time for the process was 10hrs: 44mins. For the optimised process, production time was 9hrs:5min, respectively. The processed OFSP flour had the following nutrient densities: beta-carotene (0.00011mg/g), ascorbic acid (1.76120mg/g), and phenolic acid (0.24321mg/g) at optimized conditions. Based on these results, it is concluded that nutrients were retained in good measure for the OFSP (Mother's Delight Variety) through improved drying time and production time.

**Keywords**: orange fleshed sweet potato, nutrient dense flour, micronutrients, time study, value stream mapping, process improvements.

## B.20. COMPARATIVE ANALYTICAL DETERMINATION OF THERMAL PROTECTION BEHAVIOR FOR EXPERIMENTAL MODELS MADE OF STRATIFIED BIOCOMPOSITE BOARDS OF LIGNO-CELLULOSE NATURE

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**Abstract.** The paper addresses the comparative analytical determination of thermal insulation behavior for various experimental models made of stratified and hybrid biocomposites of ligno-cellulose nature. The analytical determination of the thermal resistance and the overall thermal insulation coefficient for each experimental model is performed using the calculation methodology for energy efficiency. The results obtained after the analysis of the thermal insulation behavior for the biocomposite panels highlighted the fact that they have thermal insulation properties with high values for thermal resistance and global thermal insulation coefficients.

**Keywords**: ligno-cellulosic waste, biocomposites, thermal resistance, thermal insulation.

# B.21. ASPECTS REGARDING MULTICAVITY INJECTION FORMS WITH INTERCHANGEABLE CASSETTE FOR INJECTION OF POLYMER MATERIALS

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**Abstract.** This paperwork approaches the theoretical and constructive issues of multi-cavity injection molds within machines and aggregates for injection of test specimens, using specialized equipment. The complex technology of injection molding is one of the most widespread methods of processing plastics through which many products are manufactured, including test tubes made of polymeric materials. An analysis was performed regarding the current typology of multicavity injection forms, being followed at the same time the principle of injection of polymeric materials. Following the analysis of the technological process of injection of plastics and of the equipment that allow their processing, was cataloged as an innovation in the field the form of flexible multicavity injection, with interchangeable cassettes, destined for the injection of standardized test specimens.

**Keywords**: injection molds, polymeric materials, multicavity, interchangeable cassettes.

# C. OPTIMIZATION IN ENVIRONMENTAL ENGINEERING AND ENVIRONMENTAL PROTECTION

## C.1. TECHNOLOGICAL CHALLENGES FOR SHORT ROTATION FORSTRY IN THE HILLY REGION OF NE ROMANIA

**IULIAN-CONSTANTIN DĂNILĂ, MIHAI-LEONARD DUDUMAN, GIANINA LAURA BOURIAUD**

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**Abstract.** The The interest for short rotation forestry (SRF) in significant biomass yields has increased in NE Romania. Short-rotation forestry (SRF) have become an important source of woody biomass around the world, according to environmental policies and economic considerations. Until now, more than 800 ha of short-cycle crops have been installed in this area (*Rădăuți Depression*) by a private investor. Thus, for development of such crops, the investor selected a cultivation technology successfully tested in Italy, which guaranteed after five growing seasons a minimum of 10 $Mg \cdot ha^{-1} \cdot y^{-1}$. Preliminary results didn't confirm the expected results, the production being reduced with approx. 25-35%. In this situation it took a series of research in order to identify the main factors that directly affected the biomass production, so that considering them, technological adjustments are made which then will result in a significant biomass increase. A precise estimate of biomass production is necessary for the sustainable planning of forest resource, using TLS technology brings an important technological leap among indirect (non-destructive) methods. The research results clearly showed that in this region a significant biomass increase can be obtained compared to present cultures if the plant material used (rods) will be planted mechanically at a depth greater than 60 cm (this way reducing the rods loosed by drying) and at a higher density (2000-2600 rods per ha), thus, using more efficiently the production potential of the lands holding the crops. Also, the higher density of the crops will contribute to the earlier closing of the coppice's canopy, leading to fewer interventions regarding soil maintenance and weed removal.

**Keywords:** Above-ground biomass (AGB), Short rotation forestry (SRF), Terrestrial laser scanner (TLS), SRF technology.

## C.2 STUDIES ON THE PHYTOTOXICITY EFFECT GENERATED BY THE VARIATION OF THE VANADIUM AND BERYLLIUM CONTENT OF THE SOIL FOR A MAIZE MONOCULTURE

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**Abstract:** The The main objective of this article is to observe the variation of the vanadium and beryllium content in the soil, respectively the phytotoxicity effect generated on a maize monoculture. In the case of plots cultivated with maize and fertilized with farmyard manure, a marked increase in the content of micronutrients was observed. For both the vanadium micronutrient and the beryllium micronutrient, it was observed that the maximum permissible limit and the alert threshold for chemical elements in the soil, for both working

depths were exceeded, with the highest concentration registered being for the beryllium micronutrient (4.18 mg/kg d.m).

**Keywords:** vanadium, beryllium, maize monoculture.

## C.3. STUDY REGARDING THE HOUSEHOLD WASTE COLLECTION

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**Abstract.** This article presents a study regarding the primary collection of household waste. The study was conducted online between October 2018 - May 2019 on a group of 619 people in different locations in Romania. The main purpose of the study is to identify the way of primary collection of household waste by the population, using different criteria such as: the type of community the respondents live in, the sex of the respondent, his age, level of education. From the online questionnaire, which contains a set of 40 questions, the article presents only one question, respectively "*Waste collection in your household is done in: garbage bags; dumpsters; garbage cans; cardboard boxes or raffia bags*". Following the processing of the obtained data, it was possible to obtain an overview regarding the primary collection of household waste by the population, finding that there are a number of correlations, especially between the level of education and the collection of household waste.

**Keywords:** waste management, level of education, online questionnaire, waste collection.

## C.4 PHYTOTOXIC EFFECTS OF A COMMON LAUNDRY DETERGENT ON GERMINATION AND GROWTH OF LETTUCE (LACTUCA SATIVA L.)

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**Abstract.** Laundry detergents are mixtures of chemical compounds commonly used as cleaning agents for clothes and various objects. Their different degree of decomposition and transformation make wastewater to contain a variable proportion of such contaminants. There is a possibility of contamination of the soil, but also of plant crops with detergents, if these insufficiently treated waters are used in irrigation.The aim of this study is to evaluate the degree of phytotoxicity of lavender powder detergent on lettuce (Lactuca sativa L.).The use of lettuce as a test plant is recommended by OECD 208 and is a species that can be easily handled in pilot conditions but also in the field.The effect of the detergent tested in concentrations of 0.5 g/L; 5.5 g/L and 10.5 g/L was minimally affected on the lettuce germination process with the emergence percentage varying between 89.2% (0.5 g/L) and 100% (10.5 g/L).Visible effects were highlighted in the biometric measurements of hypocotyl-root length with a minimum of 2 mm (0.5 g/L) and a maximum of 6.15 mm (10.5 g/L) and a 4,62 mm (10.5 g/L) minimum and a 19,87 mm (0.5 g/L) maximum plantlet stem length.

**Keywords:** laundry detergent, phytotoxicity, lettuce (*Lactuca sativa L.*).

# C.5. SCREENING OF BRASSICA NAPUS L. RESISTANCE AT DIFFERENT CADMIUM AND LEAD LEVELS IN SOIL

**MIHAELA ROȘCA[1, 2, 3], PETRONELA COZMA[1], MARIANA MINUȚ[1], RALUCA-MARIA HLIHOR[2], CAMELIA BEȚIANU[1], MARIANA DIACONU[1], MARIA GAVRILESCU[1, 3]**

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**Abstract.** Lead and cadmium are some of the most toxic heavy metals whose presence in the environmental components induce negative effects on all Earth's life forms. In soil profiles of some industrial area, in the first 5 cm depth, the concentration of lead can reach 750 mg$Pb^{2+}$/kg, while at 10-25 cm depth, the level could be even 5000 mg$Pb^{2+}$/kg. Naturally, the levels of $Cd^{2+}$ in soil are less than 1 mg$Cd^{2+}$/kg, but in the industrial areas, its concentrations reached even 1000 mg$Cd^{2+}$/kg. In this context, *Brassica napus* L. plants were grown in transparent polycarbonate boxes with 80 g sterile peat soil at concentrations of 200, 750, 1000 and 1500 mg$Pb^{2+}$/kg, respectively at 5, 10, 20 and 50 mg$Cd^{2+}$/kg. Also, experiments with both metals in soil were performed. In each box, 3 seeds were sown and after 8 and 25 days the morphological aspects of plant were evaluated in order to establish the changes that metals may cause to the plants in the first days of growth. All experiments were carried out under laboratory conditions between 15th of June and 10th of July, 2019. The individual and simultaneous presence of cadmium and lead ions in soil does not seem to affect the plants in the first 8 days of growth, but after 25 days, especially $Cd^{2+}$ and $Cd^{2+}$/$Pb^{2+}$ simultaneous presence caused changes in plant morphology. The main changes observed consist in shortening and thinning of the plant stems, as well as the reduction of the leaf surface. Also, to establish the stress caused by heavy metals to plants, after 25 days, the contents of chlorophyll pigments and carotenoids were determined. At maximum levels of metals in soil, the total content of chlorophyll pigments was reduced with 24.44%, 38.21% and 21.39% by $Pb^{2+}$, $Cd^{2+}$, and respectively by $Cd^{2+}$/$Pb^{2+}$, compared to the control sample. These results showed that cadmium is more toxic for plants than lead and the toxic effects of these metals are visible starting with two leaf stage of plant growth and development.

**Keywords:** cadmium, lead, photosynthetic pigments, plant tolerance.

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# C.6. USING RESPONSE SURFACE METHODOLOGY AS A TOOL FOR EVALUATING AND OPTIMIZING THE HEAVY METALS REMOVAL BY BIOREMEDIATION PROCESSES

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**Abstract.** The The performances of bioremediation applied to liquid contaminated effluents are affected by various biotic and abiotic factors, whose variation may produce significant positive or negative impacts. Response surface methodology (RSM) is a statistical and mathematical tool successfully applied in numerous studies and in various fields of activity for designing experiments and optimizing the effects of process variables. RSM is usefully for *"mapping a response surface over a particular region of interest"*, *"optimization of the response*" or/and *"selection of operating conditions to achieve the response required".* In order to evaluate and optimize the biosorption process, the experiments are generally performed according to Central Composite Design (CCD) or Box Behnken design matrices that can allow the determination of individual and/or cumulative effects of different factors. Performing the experiments according to CCD or Box Behnken design and applying the RSM for metal ions biosorption by microorganisms, it was found that the relationship between response (efficiency or metal uptake) and factors is better described by a polynomial quadratic equation than a linear equation. Also, RSM allows the application of the ANOVA to investigate the nature of the influencing factors and identify the factors which significantly affect the response. In this context, the purpose of this paper was to take the benefits of RSM and ANOVA for biosorption of metal ions by microorganisms and find useful information necessary for process scale-up. According to several studies using RSM and ANOVA, pH, initial concentration of ions in solution, temperature at which the process takes place and contact time between metal ions and biosorbent are the most statistically significant factors.

**Keywords:** ANOVA, biosorption process, heavy metals, microorganisms.

**Acknowledgements:** This work was supported by a grant of the Romanian Ministry of Education and Innovation, CNCS - UEFISCDI, project number PN-III-P2-2.1-PED-2019-2430, Contract no. 439/2020, within PNCDI III.

# C.7. GERMINATION AND GROWTH OF LUCERNE (MEDICAGO SATIVA L.) PLANT UNDER THE INFLUENCE OF CU(II) IONS

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**Abstract.** Soil Soil pollution with heavy metals is a matter of interest and a priority for society, by raising both quality of life standards and wareness of environmental issues. Given the major effects on plant, animal and human organisms of these contaminants, it is necessary to develop an ecological, reliable and sustainable method of removing them from the environment. In this context, phytoremediation among the most effective bioremediation techniques that uses living plants to reduce, immobilize and eliminate heavy metals and their effects induced in plants because their phyto-toxicity. A special application of phytoremediation is phytomining, a process that is based on the ability of some plants to (hyper)accumulate metal ions in plant tissues and their subsequent recovery from the residual biomass obtained by different procedures. Selection and testing of plants for their degree of tolerance, bioaccumulation and biomass yield are important steps in phytomining. In this sense, the main objective of the paper is to investigate the ability of lucerne (*Medicaco sativa* L.) plant to remove Cu(II) from the soil. Lucerne seeds were subjected to synthetic $CuCl_2$ contamination in the concentration range of 25-300 mgCu(II)/L (equivalent with 0.39-4.69 mmolCu(II)/L) to determine the degree of germination and the growth rate of plant components. Following the phytotoxicity analysis, it was found that the degree of seed germination was affected by the presence of Cu(II) ions as the concentration increased to 200 mgCu(II)/L (3.125 mmoliCu(II)/L). The length of the stems and roots decreased with any increase in Cu(II) concentration, since the toxic effect depends on the metal concentrations, and the specific parts of the lucerne plant were affected differently. The stems showed a visible inhibition starting from the concentration of 150 mgCu(II)/L (2.34 mmolCu(II)/L), whileroots inhibition started from 100 mgCu(II)/L (1.56 mmolCu(II)/L), because they are the first organs that have contact with the metal ions which can remain located here depending on metal mobility and transport by xylem. Therefore, lucerne (*Medicago sativa* L.) plant can grow on soil contaminated with Cu(II), and can be applied in bioremediation of soils polluted with heavy metals and their recovery from biomass, as a secondary raw material.

**Keywords:** copper, germination, *Medicago sativa L.*, phytomining, phytoremediation.

# C.8. PHYTOMINING OF HEAVY METALS FROM CONTAMINATED SOILS: A GREEN TECHNOLOGY

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**Abstract.** In the last decades, due to excessive industrialization different heavy metals such as nickel, zinc, copper, cadmium, cobalt reached the soil. The presence of heavy metals in soil may affect soil fertility, microbiota, the growth and development of plants, and finally may cause different negative effects on human health such respiratory problems, damage endocrine and nervous systems. Therefore, it is very important to reduce the pollutants from soil. Phytoremediation is a technique which uses the ability of plants to decontaminate polluted soil by bioaccumulation/uptake of various pollutants. An interesting and sustainable application of phytoremediation viewed through its variant – phytoextraction, considering economic and ecological perspectives is phytomining. This process means the accumulation of high concentrations of heavy metals by different plants species (hyperaccumulators) mostly in their shoots, followed by metals recovery from the harvested biomass by physico-chemical, biological, thermal processes. Therefore, phytoextraction/phytoaccumulation of heavy metals using hyperaccumulators plants represent the principal pylon in phytomining process. The plants used in phytomining must possess the ability to tolerate and accumulate high amounts of metals in their tissues, to provide a fast grow and also to develop a branched root system. Also, soil properties, concentrations of pollutant, chelating agents and fertilizer application could influence the phytomining process. Phytomining can be applied for the recovery of the heavy metals with high commercial value such nickel, copper, zinc, cobalt, gold, silver considered as critical metals and contributes both to the remediation of contaminated soils, and for providing additional beneficial resources as secondary raw materials. The main techniques for metal recovery are biomass incineration followed by smelting the ash in order to recover the metal; digestion of biomass followed by different processing techniques depending on the type of metal and anaerobic microbial fermentation. In this context, the main objective of our paper is to analyze the importance of phytomining, the mechanism by which plants remove the metal ions from soil, influencing factors in phytomining and techniques used for the recovery of heavy metals.

**Keywords:** phytomining, hyperaccumulators plants, metal recovery.

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# C.9. INVESTIGATION REGARDING THE INFLUENCE OF DIFFERENT PARAMETERS ON EGGSHELLS ADSORPTION EFFICIENCY

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**Abstract.** Urbanization Urbanization and industrialization activities are constantly growing, playing an essential role in the economic development of any region. In Bacău County, the food industry is very well represented, Agricola International Bacau is a nationally and internationally known group that offers among others chicken eggs for consumption and egg powder for patisserie and confectionary. At the same time, lately, many quail egg farms have been developed in the region because consumer demand for this product has increased. In food processing industries that generate voluminous by-products and wastes, valorization can help offset growing environmental problems and facilitate the sustainable use of available natural resources. Taking into account that one kilogram of egg powder is made from 90 eggs and, the household consumption of quail egg is constantly inscresing, the valorization of chicken and quail eggshells is important both from economically and environmentally points of view. The idea of revaluing eggshell is not new and different alternatives have been proposed: use of eggshell as a biological template for catalysis and antibacterial applications, the production of food additives, soil conditioners, base material for cosmetics, and biomaterial. Eggshells are mainly rich in calcium carbonate and can represent an eco-friendly, low-cost sorbent for the treatment of heavy metals in contaminated soil and water. Currently, heavy metal pollution of the environment is a major problem, and according to the Regional Agency for North-East Environmental Protection, heavy metal pollution has been reported in Bacău County due to industrial polluters, to the intensification of road traffic, etc. Lead (Pb) and zinc (Zn) represents pollutants coming from various industrial sources that reach surface waters and represent a real danger to human health but also to flora and fauna. As a permanent interest of our research team, in our previous study we investigated the accumulation of heavy metals in different species of fish coming from an area influenced by the industrial platform of the city of Bacău situated at the confluence of Bistriţa River and Siret River. Therefore, the present research was carried out in order: to compare the adsorbent capacity of chicken and quail eggshells for the removal of $Pb^{2+}$ and $Zn^{+2}$ from aqueous solutions, without any preliminary modification on the eggshells (calcination or structural changes); to explore the influence of stirring/activation system for the adsorbent solution samples using 4 different types of stirring: classical and orbital stirring, ultrasound and microwave assisted activation system. The chicken eggshells (noted C ES) used in this study were purchased from Agricola International Bacău and the quail eggshells (noted Q ES) from a microfarm from Mărgineni, Bacău. The eggshells were rinsed with distilled water and then dried in an air circulation oven (Memmert Universal, model UFE 500, Germany) at 100 °C for 30 minutes. The dried eggshells were then milled 3 minutes using a household grinder (100 W). The powder obtained was sieved using a 1 mm sieve and was placed in Petri dishes and kept in a desiccator until used. The solutions containing the $Pb^{2+}$ and $Zn^{2+}$ ions (1000 $mg \cdot L^{-1}$) were prepared from $Pb(NO_3)_2$ and $Zn(NO_3)_2 \cdot 6H_2O$, respectively. All chemicals were of analytical purity and purchased from Sigma Aldrich. The preliminary study conducted us to establish: initial metal concentration = 5 $mg \cdot L^{-1}$, contact time = 60 minutes for classical stirring, *p*H optim = 5, amount of biosorbent = 2 $g \cdot L^{-1}$. The experiments were performed at ambient temperature and at 40 °C. The contact time for the orbital stirring and ultrasound activation was 30 minutes, and for microwave activation 3 minutes. Some physicochemically parameters of solutions before and after the bioadsorption process such as: pH, conductivity,

resistivity, total dissolved solids (TDS) and salinity were determined using Thermo Scientific™ Orion™ Versa Star Pro™ *p*H/Conductivity Multiparameter Benchtop Meter (Thermo Fisher Scientific, USA). Heavy metal content after the biosorption process was determined using Atomic Absorption Spectrophotometer AAS ZEEnit 700 (Analytik Jena AG, Germany) in collaboration with Bacău Water Quality Laboratory - Siret Water Basin Administration. The samples were analyzed according to SR ISO 8288: *Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead* - Flame atomic absorption spectrometric methods. The resultats attained after the bioadsorption of lead and zinc ions on the eggshells surface revealed that the concentration of the metal remaining in all solutions decreased significantly. It was observed that chicken eggshells are more effective than quail eggshells for bioadsorption process of both ions.Moreover, better results were obtained when using classical stirring at 40 °C compared with ambient temperature, both for chicken and quail eggshells, also for their mixture. The concentration of the Pb2+ remaining in all solutions after the bioadsoption process at 40 °C is represented in Figure 1, the adsorption percentage efficiency having values between 51-95 %. In the case of lead ions, orbital stirring at room temperature, proves to be suitable for the two types studied eggshells, as well as for their mixture.

**Keywords:** eggshells, adsorption, heavy metals, adsorbents, lead, zinc.

## C.10. STUDY ON URBAN MOBILITY IN BACĂU MUNICIPALITY

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**Abstract.** One of the main challenges facing EU cities is sustainable urban mobility. The road transport structure is one of the main causes of air pollution and greenhouse gas emissions in urban areas. Today, in many cities, road infrastructure is far from the concept of sustainable urban mobility. Mobility patterns are affected by many factors such as demographics, the availability of public transport, the use of vehicles, the local economy. Among the biggest problems facing urban mobility is road traffic congestion. The paper presents the results of a study on road traffic mobility monitoring in Bacău. The monitoring involved conducting manual traffic censuses in 32 sections (in both directions) in Bacau. The results of the study show that 83, 21% of the registered means of transport are cars (with or without trailer) and only 0.27% of the number of means of transport are bicycles. The difference, respectively, 16.61% is represented by motorcycles, scooters, minibuses, buses, tractors, etc.

**Keywords:** mobility, monitoring, rood traffic.

## C.11. COMPARATIVE ANALYSIS OF THE EFFICIENCY OF THE WASTE MANAGEMENT SYSTEM IN SELECTED COUNTIES IN ROMANIA AND IN POLAND

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**Abstract.**In recent years, technology and innovation have also reached the field of waste. They provide an excellent opportunity to improve policies aimed at minimizing waste generation and achieving resource efficiency. However, the degree of introduction of innovative equipment and practices varies significantly from one territory to another. The comparative analysis carried out on within 5 years, showed noticeable changes in the counties in Romania and Poland initiated by the EU and national legislation which indicated an increase in the amount of waste recovered. However, the achieved efficiency of limiting the deposited waste was different at the level of exceeding 70% and higher of 0.10 kg an average indicator of waste accumulation per capita in Bacau County. Two counties mainly difference composition of municipal waste with predominance of biodegradable waste (60%) in Bacau County and glass waste (35%) in Nowy Sącz County with raw material properties. Differences were also noticeable in the case of hygiene fees with exceed of average value 20 EUR in Nowy Sącz County. The gradual increase in the amount of recycled waste and covering all residents with hygiene services should be considered beneficial which indicates an improvement in environmental awareness.

**Keywords:** municipal waste, recycling, storage, disposal.

## C.12. GROUNDWATER AND SURFACE WATER POLLUTION. A REVIEW RELATED TO THE METALS RESULTING FROM MINING ACTIVITIES

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**Abstract.** This paper presents a review of studies on the presence of metal concentrations in surface waters and groundwater near mining areas. Numerous studies have been conducted on the presence of metals in water due to mining activities. The metals are present in the aquatic system due to natural and anthropogenic sources. Those from natural sources depend on local characteristics such as geology and hydrogeology and can be the main cause of the economic problem of the environment Because of these problems, various water quality management strategies have been implemented to protect water from pollution. Pollution of ecosystems with metals is due to mining activities, which can affect small areas but have a significant impact on the environment. The presence of metals in some countries has an adverse effect on human health due to mining activities and cultures in contaminated areas. Mining activities can present potential risks to residents of those areas.

**Keywords:** metal concentration, mining activities, surface water, groundwater.

## C.13. FLOOD VULNERABILITY REDUCION. CASE STUDY: TAZLĂU RIVER BASIN, DOWNSTREAM OF ITS CONFLUENCE WITH TAZLĂU SĂRAT

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**Abstract.** In In the last few years, there is a major interest on a global scale concerning the impact of economic development on the environment, precisely the climate change consequences resulting in unprecedented hydrological events.The issue of water management as well as its impact on the community has been both a challenge and a concern of the European Union, which lead to adopting the Directive 2007/60/EC with the purpose of establishing a framework for the assesment and management of flood risks, by which the member states had to identify the areas for which they conclude that potential significant flod risk exist or likely to occur and to develop flood risk management plans and measures to reduce the consequences of flooding.In this respect, following a detailed analysis, the Siret Water Basin Administration hadeclared the area of the Tazlău river, downstream the Tazlău village, as a significant flood risk area(A.P.F.S.R.). The Tazlău River is a left-bank tributary to the Trotuș River, passing through the communes Tazlău, Balcani, Pârjol, Scorțeni, Ardeoani, Berești-Tazlău, Sănduleni, Livezi, Helegiu and partially through the outside the built-up areas of Onești city.The most important flood events were recorded in the years 1991, 2005, 2008, 2010, 2016 and 2018 with a historical peak water flow of 1556 m3/s, measured at Helegiu gauging station, with severe adverse consequences to the communities in the area.Recent studies have shown the benefits of reservoirs and floodplains, as these provide the most effective way to buffer the effect of floods by slowing and spreading the discharge of a river.By restoring and improving an existing lateral floodplain in the Tazlău River basin, downstream of its confluence with Tazlău Sărat River tributary, in order to store part of the floodwaters that cause significant adverse consequences, will reduce the flood vulnerability of its crossings.

**Keywords:** vulnerability, flood, consequences, risk

## C.14. CONTRIBUTIONS REGARDING THE ENERGITICAL VALORIFICATION OF URBAN SLUDGE TREATMENT

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**Abstract.** This paper highlights through the issues addressed, the application aspects regarding the approach of the concept of recovery of sewage sludge from an urban wastewater treatment plant (SEAU), which is in a stage of technological expansion and modernization. Thus, it is considered the need to process the potential of biological mass generated by anaerobic stabilization in the SEAU, with a population of about 10,000 equivalent inhabitants, which requires on one hand, the technological design of activated

sludge basins and on the other hand, the design of a sewage sludge fermentation tank, in order to produce biogas, necessary for its recovery for energy purposes.

**Keywords:** basin, activated sludge, wastewater, purge, ferment.

## C.15. A CASE STUDY ON THE EFFICIENCY OF A WASTEWATER TREATMENT PLANT IN A SMALL RURAL COMMUNITY

**IULIANA-MARLENA PRODEA, CRISTINA VIȘAN**

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**Abstract.** Limited access of rural population to wastewater treatment services poses a significant risk to public health and environmental protection. The choice of sewage management system (centralized or individual solution), in small rural communities, depends on economic, social and geographical factors. This paper describes the structure and technological sizing of a centralized wastewater treatment plant that serves a small rural community. Data (collected in 2 years) on monitoring water quality at the exit of the wastewater treatment plant are also presented. Their analysis shows that the limit values for total nitrogen and detergents have been exceeded at certain times of the year. An investigation into the possible causes of these non-compliance indicates the following: the total nitrogen surplus corresponds to the periods of spring agricultural works; excess detergent is recorded during seasonal economic activities (processing of animal skins), specific to the region. Finally, the paper proposes solutions for additional wastewater treatment during the highlighted periods, to prevent environmental pollution.

**Keywords:** wastewater treatment plant, environmental protection, small rural communities.

## C.16. EVALUATION OF THE NOISE LEVEL IN THE BACAU BUS STATION AREA

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**Abstract.** The The paper evaluates the level of road noise generated by bus traffics (departures - arrivals) made at Bacau Bus Station. Road traffic generates noise by running engines, rubbing asphalt wheels, rubbing moving vehicles with the air mass.The Bacau Bus Station area is a complex area of great importance for the city, due to the role of urban road gate and connection area between territorial transport and local transport, and its location in the northeastern vicinity of the central area (about 2 km from Railway Station and 5.5 km from the Airport), on the main east-west axis of the city.In the Bus Station are many transport companies that run in the villages around Bacau, in other cities or to other countries. The noise monitoring took place between 20.05.2019 - 26.05.2019, during a week, with 6 time intervals and 6 measurement points, the value of the noise level for each monitoring point being the mediated value of several individual measurements. For traffic noise, the limit value for such areas is between 75-85 dB. The highest noise level recorded was 101.7 dB in Point 2 (Entrance /exit Bd Unirii) in the time interval 14:30-15:00 and in Point 6 (Entrance in the Bus station building) in the time interval 14:30-15:00, and the lowest noise level was 55.5 dB in Point 4 (Peron Bus Station - Lidl) between 07:30-08:00.It was observed that the noise level was higher when the traffic is more intense, exceedances over 100 dB were

observed when a car with audible warning, two-wheeled vehicles, or when the horn of the vehicles is activated, passes in the area.

**Keywords:** noise level, monitoring, bus traffic, noise city.

## C.17. MUNICIPAL SLUDGE TREATMENT BY USING ORGANIC FLOCCULANTS. LABORATORY APPLICATIONS

**NARCIS BARSAN[1], MARIANA TURCU[2], VALENTIN NEDEFF[1], DANA CHITIMUS[1], DAN IANCULESCU[3], MIRELA PANAINTE-LEHADUS[1], EMILIAN MOSNEGUTU[1]**

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**Abstract.** The problems of wastewater management and treatment are very actual in the complex context of water scarcity and new circular economy. Even if in general the main process is concentrated to the wastewater treatment technics, to obtain a proper effluent for discharge or reuse, some important resources must be oriented to the treatment of the sludge generated. Also, the sludge quantities and complex composition determine some real problems related to the treatment, use and/or eliminate process. Before all industrial real plications of the sludge treatment processes, it is very important to establish some work directions by implementing some laboratory technics to evidence the most predictive and efficient products, technics, processes etc. The aim of the present work was to apply some organic flocculants in the municipal sludge treatment. In this sense a series of 6 organic flocculant's were used in the sludge dewatering laboratory process. The flocculation's process was evidenced by using some filtration and some parameters evaluated were the volume of the separated liquid phase, TSS and CCO.

**Keywords:** municipal sludge, flocculant's, dewatering.

## C.18. ADVANCEMENT IN MODELING AND MATHEMATICAL OPTIMIZATION OF AN ADSORPTION-BASED TREATMENT PROCESS

**ALIONA GHENDOV-MOSANU**

*Technical University of Moldova*

**Abstract.** Nowaday, Nowaday, for removal of dissolved substances from waters and wastewaters, the *biological conversion* and certain *physical-chemical processes* are always in use. A special attention is accorded to *adsorption*, especially to the adsorption onto ,low cost' adsorbent which is considered as an emerging wastewater treatment technology.The models for the adsorption-based treatment of various wastewaters can be *mechanistic* (*i.e.* adsorption isotherms, kinetic models, thermodynamic design) or *empirical* (*i.e.* relationships between experimental data and graphical representations or sorption capacity or treatment efficiency) equations, revealing the complexity of adsorption processes. In the present work, some modeling and optimization data designed for one-single adsorption treatment step of a textile wastewater onto 'low cost' adsorbents (pine sawdust, coal ash, peat) are described using an empirical active central compositional rotatable design of $2^3$ or $2^4$ order and also some *mechanistic models* (i.e. corresponding adsorption isotherm models, kinetic adsorption

models in static or dynamic regime, thermodynamic design). In all experimental findings, the batch‘ adsorptive treatment onto natural or industrial ‚low cost‘ wasted materials applied for the textile wastewater represents a viable alternative for removal of polluting species. The proposed models were found adequate for the adsorption-based treatment of studied textile wastewater, and the optimal operational conditions for highest treatment efficiency were proposed for each type of tested absorbent for reducing of polluting load of textile wastewater.

**Keywords:** adsorption isotherm, advanced textile wastewater treatment, experimental planning, kinetic and thermodynamic issues, mathematical optimization, mechanistic and empiric models, treatment degree.

## C.19. OVERVIEW OF RESEARCH ON THE CONTINUOUS REMOVAL OF HEAVY METALS FROM WASTEWATERS USING MICROORGANISMS

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**Abstract.** Heavy metals are priority pollutants with significant environmental and human health impact, as well as difficulty of removal. Conventional methods used for the treatment of heavy metals from wastewaters are often expensive, complex and cause secondary pollution. The application of microorganisms has thus emerged as a strong alternative for the remediation of metal-loaded wastewaters. Microbial-based sorbents have been extensively researched in the last years owing to their advantageous properties and studies carried out so far confirming their high capacity for metal removal in both batch and column studies. The results obtained in continuous system are very important for the implementation of the microbial-based remediation processes at industrial scale. Thus, in order to support a sustainable development of the large-scale application of microbials in wastewater remediation, the present research analyses and synthesizes the operating conditions applied in these studies, as well as the obtained performances. There are various types of immobilization techniques that have been used and that are presented in the current review. Regeneration of the immobilized microbial biomass is also considered as this process prolongs the biosorbent's life before it becomes a waste and reduces the wastewater treatment costs. Therefore, the aim of this work is to highlight the main results in the application of microorganisms in continuous systems and to identify the elements that require more attention from the scientific community, as well as ways in which this can be fulfilled.

**Keywords:** wastewater treatment, microorganisms, biosorption, bioaccumulation, continuous systems.

# C.20. MEDICAGO SATIVA DEVELOPMENT AND STRESS IN ZINC CONTAMINATED ENVIRONMENT

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**Abstract.** Environmental pollution with heavy metals is a serious problem of the 21st century because of its harmful implications. It is well known that some heavy metals are essential for plant growth (e.g. Zn, Cu, Co, Cr, Fe, Mn) and are also found in the human body as necessary for growth. However, in high concentrations, these metals represent a threat to the environment, animals and also to human health. Heavy metals can be easily absorbed by the root or foliar systems, and thus may affect normal biological processes of plant, their growth and productivity. The purpose of this paper is to examine the results of a preliminary study by quantifying the effects of zinc chloride ($ZnCl_2$) on this species, which germinates and grows in aqueous medium. Given that alfalfa (*Medicago sativa*) is a fodder plant, its heavy metal contamination has implications for human health because the pollutants enters the food chain. Therefore, it is necessary to study experimentally how the plant is contaminated with heavy metals, the effects on plant growth and its tolerance to the toxicity of heavy metals. To achieve the goal of the paper, all experiments were performed in triplicate in laboratory conditions. Experiments were performed under controlled conditions by alternating light / dark conditions, at 22° C as follows: a number of ten seeds of *M. sativa* were used for each sample and then moistened with 3 ml $ZnCl_2$ of concentrations ranging from 25 mg Zn (II) / L to 300 mg Zn (II)/ L, and allowed to grow for 7 days. In the control samples seeds were moistened with distilled water. At the end of the germination stage, the seeds were counted and the radicles, hypocotyls and leaves were measured in order to evaluate the degree of germination, toxicity index and tolerance index. The experiments also allowed the detection of normal and abnormal germs developed due to zinc stress. SPC Software for Excel was used for statistical analysis of the data. Compared to the control sample, root necrosis was visible starting with the concentration of 200 mg Zn (II)/L. An increased toxicity index was found at metal concentration of 300 mg Zn (II)/L shows, when the plants are unable to grow normally. High concentrations of zinc chloride in solution determined an increased toxicity in *M. sativa* and slow down the normal development, causing root necrosis.
Future studies will focus on the development of *M. sativa* in vegetation vessels containing soils contaminated with different concentrations of zinc chloride.

**Keywords:** heavy metal stress, Medicago sativa, pollution, zinc chloride.

## C.21. CONSIDERATIONS ON SOME PROPERTIES OF LINIC AND EKRANIC TECHNOSOLS FROM URBAN AREAS

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**Abstract.** In recent periods, urban soils have been extensively studied. These studies contribute to better understanding of the soil cover diversity in the urban area, identification of changes and threats resulting from expansion of urbanization and industrialization. The aim of our study is to identify to correctly define some urban soils, such as technogenic soils, that are recently introduced in the soil classification and are constantly updated and completed. Technosols are defined as soils containing more than 20% artefacts within 100 cm of the surface of the soil or technical hard material or a cemented or hardened layer or slowly permeable to the constructed impermeable membrane of any thickness starting from ≤ 100 cm from the surface soil. The studied sites are located in the urban areas from northeastern part of Romania. In our studies we made several soil profiles within the studied location. The studied soils have been diagnosed according to the Romanian System of Soil Taxonomy and World Reference Base for Soil Resource. Characterization of soil profiles was done following the instructions from guidelines for soil and land descriptions. The urban soils from the studied area are characterized by a strong spatial heterogeneity resulting from various input of exogenous materials and mixing of material from different soil horizons or even with lithological material on which the soil was formed. Some urban soils such as Technosols, have strongly modified properties and perform only part of the specific functions that allow only low biological activity and root growth of some plant species. Case studies conducted in several locations of urban areas showed that ekranic and linic Technosols keeps some undisturbed properties such as particle size, mineralogical composition and allows some plants roots to develop their roots. The new residential areas are also covered with soils that are often only partially technogenically transformed with still visible deeper soil horizons, which until recently were mostly natural, or agriculturally transformed. We believe that the results obtained during the investigations in the field and laboratory will facilitate easier identification in the field of urban soils such as Linic and Ekranic Technosols and the establishment of appropriate management.

**Keywords:** residential area, urban soil, linic, ekranic technosols.

## C.22. MEMBRANE FILTRATION TECHNIQUES. A SHORT REVIEW RELATED TO THE MOST USED MEMBRANES IN WASTEWATER TREATMENT

**ANDREI ZAHARIA, VALENTIN NEDEFF, NARCIS BARSAN, MIRELA PANAINTE-LEHADUS, EMILIAN MOSNEGUTU, CAROLINA UNTILA**

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**Abstract**.In wastewater treatment processes are using various methods and technologies. Among them we can mention: use of biological filters, denitrification basins, biological membranes, use granular mass filters, stabilization ponds, membrane separation processes. Studies have shown that the technology of separation membranes is an effective solution for water purification, regardless of the pollutants present in the wastewater. This is primarily due to the retention capacity of small compounds. The most widely used advanced membrane processes are: microfiltration, ultrafiltration, nanofiltration, reverse osmosis, electrodialysis, electroosmosis, membrane reactors, etc. Therefore, the process of ultrafiltration with the help of membranes, is a technology often used lately, especially in the field of industrial

wastewater purification, due to its efficiency and financial benefits which it has. The membrane is a synthetic, semipermeable material that acts as a selective barrier between two similar or different phases. In other words, it has the role of retaining, depending on the size of the membrane pores, small particles, colloidal, dissolved or suspended, present in the mass of a fluid. This study aims perform an analysis of the main treatment methods by membrane filtration techniques of wastewater. An attempt was made to highlight the main characteristics of the membranes and to identify the particularities of their application for the treatment of different types of wastewater.

**Keywords**: membrane, wastewater, filtration techniques.

## C.23. APPLICATIONS OF THE GIS AND REMOTE SENSING METHODS IN THE LAND USE AND COVER MAPS. CASE STUDY: ROMAN CITY AND THE SURROUNDINGS OF THE NORTH SIDE AREA

**PETRUT LIVIU BOGDAN, VALENTIN NEDEFF, NARCIS BARSAN, MIRELA PANAINTE-LEHADUS, EMILIAN MOSNEGUTU, DANA CHITIMUS**

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**Abstract.** Land Use and Land cover represent the most important tool used in research like land use planning, management and other activities, agriculture and natural resources. The main purpose of this research is to create a map of land use and land cover of the Roman city and the nearest counties on the North, using methods of GIS and remote sensing. Classification process and analysis of the different LULC classes were made using image covering Landsat 8 OLI/TIRS. The Landsat images were acquired for the date of 2020.09.06 from United States Geological (USGS) Earth Explorer. The image with a total surface of 17,571.71 ha, was classified in to 6 classes Agriculture (8811.96 ha), Low vegetation (4078.35 ha), Build up area (2570.80 ha), Bare land (1425.97 ha), Water body (363.75 ha) and High vegetation (320.88 ha). Agriculture was the class with the biggest percentage (50.15%) being dominant for the study area. The study had an overall classification accuracy of 88.3% and overall kappa coefficient of 0.85 for the classified image, which was found good for further research in different organizational management activity of the area.

**Keywords**: Land use, Land Cover, remote sensing GIS, LANDSAT 8, image classification, accuracy assessment, Kappa coefficient.

## C.24. EMERGENCY MANAGEMENT AT THE LEVEL OF THE BACAU FIRE BRIGADE

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**Abstract.** The emergency situation is primarily an undesirable, unusual, non-military event that endangers the life, health of humans, animals, the environment, cultural and material values, and to restore normalcy are necessary the implementation of urgent measures,

allocation of material resources and a unitary management of the intervening forces and means.The nature of emergencies is very diverse, as well as the factors that can determine them, so to improve the management of emergency response processes, it is necessary to solve the problems of keeping up-to-date operational monitoring data, characteristics of territories, facilities, infrastructure, as well as records of rescue units, equipment and available resources. The Bacau Fire Brigade, as an intervention structure of the Inspectorate for Emergency Situations "Major Constantin Ene" of Bacau County, has an intervention district with an area of approximately 2,200 km2, serves a municipality, a city and 43 communes, with a number of about 150,000 households and about 400,000 inhabitants.The detachment consists of nearly 150 firefighters with the mission of alert notification, search, evacuation, release, first aid, firefighting, N.B.C. protection, decontamination and sanitation of ammunition left unexploded during military conflicts.The paper presents an analysis of the emergencies in 2019, following which a number of 60 people were rescued, of which 53 adults and 7 children, compared to 2018 in which 33 people were rescued.

**Keywords:** emergency, management, firefighter, fire, SMURD.

## C.25. APPLICATION OF THE CIRCULAR ECONOMY CONCEPT IN THE FOOD INDUSTRY WASTEWATER REUSE POSSIBILITIES

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**Abstract.** The water limited resources involves serious problems in actual context of water scarcity, even we refer to population supply or industry. The concept of circular economy involves the importance of the economy needs applied to all scales, for large and small businesses, organizations, and individuals, globally and locally. In all industrial activities, it is very important to evaluate the water management and that involves some typical particularities specific in circular economy. It is now that food industry is a high water consuming so, the identification of some possibilities to reuse the wastewater can represent a solution to a better water management even if must be respected very restrictive regulations from domain. The present study tried to identify some possibilities to treat and reuse wastewater from food industry and to supply different other activities with the treated water. The most important physical, chemical and biological parameters were evaluated in different treatment stage s to improve the working conditions and to obtain the regulation limits specific for water uses.

**Keywords:** circular economy, food industry, water reuse.

# C.26. MICROBIOLOGICAL QUALITY EVALUATION OF MINERAL WATERS. CASESTUDY: SLANIC MOLDOVA WATER STORED IN REUSABLE BOTTLES

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**Abstract.** The mineral waters that come from the springs in the area of mountain resort Slănic Moldova, heterogeneous from a physical-chemical point of view, are used for external or internal therapeutic purposes. The internal use of these waters is also conditioned by their microbiological quality. The norms that regulate the evaluation of the microbiological quality of mineral waters, aim at determining the total number of mesophilic bacteria (SR EN ISO 6222/2004, SR EN ISO 8199/2008) and their load with fecal-domestic pollution bacteria of the type: total coliforms (SR EN ISO 9308 / 1-2004, SR EN ISO 8199/2008), fecal coliforms (ISO 9308 / 2-1990, SR EN ISO 8199/2008), fecal streptococci (STAS 3001-1991, SR EN ISO 8199/2008), bacteria sulfur-reducing anaerobes (Clostridium perfringens) (SR EN 26461-2 / 2002, ASTM D 5916/1996) and Pseudomonas aeruginosa (SR EN 12780-03, SR EN ISO 8199/2008). This paper presents the results of the seasonal evaluation of the microbiological quality of mineral waters collected from 7 springs in Slănic Moldova and the results of monitoring the microbiological quality of water samples stored in different conditions in two categories of reusable containers (glass and plastic), from the mentioned sources. The seasonal analyzes of the mineral water microbiota from Slănic Moldova performed in an interval of 360 days, revealed a diverse total microbiota with a higher abundance in the summer season. The values for the total number of germs (TNG) determined at 22 °C fall within the reference values 20/mL, at source and 100/mL, after bottling for springs 1bis, 5, 10, 14 and 15 and Sonda 2. The exception is the source Sf. Spiridon with source TNG values between 13 CFU/mL in the winter season reaching up to 67 CFU/mL in the summer season. The total number of germs determined at 37 °C is within the normal values for the sources studied, 5/mL, at source and 20/mL, after bottling, except the source Sonda 2 which does not comply with the maximum permitted limit in the summer season and Sf. Spiridon spring which shows increases above normal values at source in all seasons as well as in samples kept at room temperature (22 °C) or at 4 °C (refrigerator). Experimental data show that storing them in glass or plastic containers, in different conditions, does not significantly alter their bacterial load during storage.

**Keywords:** bacteria, mineral water, microbiological analysis, monitoring, standards.

# D. MECHATRONICS & ROBOTICS

## D.1. TREATMENT TECHNOLOGIES TO OBTAIN METALLIC AND NONMETALLIC CARBON FIBER COMPOSITE MATERIALS

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**Abstract.**When When designing any composite material, the compatibility between the component elements must be taken into account, a compatibility that can be seen from a physical and chemical point of view. Chemical compatibility refers to the non-existence or development to a small extent of reactions between components. Thus, at high temperatures, the diffusion processes intensify and fragile compounds can form, which cancel the direct connection between the components, resulting in a significant decrease in the mechanical strength of the composite material. A successful process of manufacturing carbon fiber-reinforced composites requires that the fiber be protected, usually with a coating, during their manufacture and use.

**Keywords:** composite materials, matrix, carbon fiber, friction coefficient.

## D.2. ANALYSIS OF THE CHEMICAL DEPOSITION PROCESS IN VAPOR STATE FOR COATING CARBON FIBERS IN THE STRUCTURE OF METAL AND NON-METAL MATERIAL COMPOSITES

**RADU CALIMAN**

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**Abstract.** In order to keep the fibers intact during processing and to produce the desired surface properties, the process by which the composite material is manufactured, almost always comprises a process by which the fiber is coated. The coating protects the fiber during the operation in which the fiber is combined with the matrix. Simultaneously, the wetting and binding of the fiber with the matrix is favored; in some cases, the coating is a sacrificial layer, which is destroyed during processing. In general, the structure, composition and morphology of the coating affect the strength of the composite after manufacture. Thus, the Chemical Vapor Deposition (CVD) process and its variants are used for fiber coating. The reaction products diffuse to the surface, producing surface reactions, which lead to the formation of a deposit on the surface of the fiber. The limiting factor in the deposition process may be the reaction kinetics or the diffusion of vapor species to the surface.

**Keywords:** composite materials, matrix, carbon fiber, chemical process.

## D.3. OPTIMIZATION OF THE GUIDANCE SYSTEM FOR A CNC MILLING MACHINE

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**Abstract.** An important role for obtaining surfaces processed by cutting of the highest quality, is played by the guidance system of CNC machine tools. The guide system ensures the movement of the mobile element in the two planes, directional and load-bearing. At the same time, the guide system must ensure a sledge-guide friction coefficient as low as possible, but at the same time it must ensure an increased rigidity. By observing these conditions that are imposed on the guides of CNC machine tools, good results can be obtained on the positioning accuracy of the mobile element. The paper presents a method to increase the positioning accuracy of the mobile element, by optimizing the guidance system. In this sense, it is necessary that from the design phase of the guides, they must contain rolling elements, rollers or seals, which have the ability to withstand large preload forces. The preloading forces of the directional guide must be optimal in relation to the actuating forces. For this reason it is necessary to have adjusting elements for pretensioning the directional guide when we increase its rigidity.

**Keywords:** CNC machine tools, guidance system, positioning accuracy, guide preloading, guide rigidity.

## D.4. THE INFLUENCE OF FAST ADVANCE SPEED ON POSITIONING ACCURACY ON CNC MACHINE TOOLS

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**Abstract.** In recent years, there has been real progress in the CNC machine tool manufacturing industry in terms of machine tool performance. Current requirements require CNC machines to have a high productivity and at the same time an increased accuracy of ±0.005 mm. For this reason, the production of machined parts cannot be carried out without numerically controlled fast machines. This paper investigates the use of fast forward speeds on a CNC machine tool with three linear axes (X, Y and Z). In order to be able to achieve fast forward speeds of 50-60 m/min and at the same time have an increased positioning accuracy, it is necessary to use in the construction of forward kinematic chains, ball screws with increased pitch, and the axle guides must contain rolling elements. This aspect can only be possible by optimizing the components of the machine tool kinematic feed chain structure, so as not to create imbalances that can cause unwanted problems.

**Keywords:** CNC machine tools, positioning accuracy, fast advance speed, feed chain, ball screw, guides.

## D.5. CASE STUDY ON MECHATRONIC DESIGN FOR THE AUTOMATION OF AN IRRIGATION SYSTEM

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**Abstract.** The incorporation of communication and remote control technologies in different local systems in households facilitates and simplifies people's lives. Automated irrigation systems are the easiest way to keep the soil in optimal conditions in terms of humidity. They also save time and effort. With the installation of an automated irrigation system, it is no longer necessary to assess whether or not we have applied a sufficient amount of water and we no longer have to worry about watering the lawn or farmland while we are away from home. These automations of irrigation systems increase the service life of irrigation systems, eliminating the long-term malfunction of certain parts of the installation. Also, the physical presence of man during irrigation is not required. The paper presents a case study of improving efficiency of an irrigation system, which, in conjunction with the use of wastewater, brings a special contribution to saving the planet's water resources, in a situation where water shortages are increasing. The presented system, in addition to the advantages of more efficient irrigation, with the elimination of unnecessary water losses, with the elimination of erosion or soil puddles and implicitly the increase of agricultural production, also has the advantage of freeing man from the worries of these activities, thus giving him a higher freedom degree and a lower degree of daily stress.

**Keywords**: automated irrigation system, remote control technologies, higher freedom degree.

## D.6. COMPARATIVE STUDY BETWEEN FINITE ELEMENT METHOD AND PHOTOELASTICIMETRY, REGARDING STRESSES AND ISOSTATIC CURVES

**COSMIN GRIGORAS, VALENTIN ZICHIL, VLAD CIUBOTARIU, CATALIN DROB,**

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**Abstract.** The great diversity of problems that the engineer must solve to efficiently design a structure is reflected in the multitude of currently used methods. These methods have developed gradually, at the same time with the accumulation of theoretical and technological knowledge, being divided into analytical methods (exact methods) and approximate calculation methods. To match the reality, all these methods must be based on experimental determinations. The most commonly used methods for determining stresses and strains are photoelasticimetry by transparency and reflection, Digital Image Correlation, Moire fringe method, resistive electrical tensiometry, interferometry, etc. In engineering practice, the analysis of stress level developed into the tested parts has special importance, especially for verification calculus. Photoelasticimetry is an experimental method of determining the state of tension in parts, which is based on the birefringence property of a material when it is subjected to the action of external loads. In the case of using the technique by transparency, the structure to be studied is made to a certain scale, from active optical material (photoelastic material). The structure is tested as in real scale with reduced loads, and the stress state will be highlighted by analyzing the model in a polariscope. The finite element method (M.E.F.) is currently the most common process for numerically solving engineering problems. F.E.M., supposes to discretize the structure into finite-sized subdomains bounded by rectilinear or curvilinear boundaries. Through this operation, the real body is replaced by a network of so-called finite elements. The desired level of accuracy is guaranteed by a higher performance

of computing technology. Both photoelasticimetry and the finite element method provide information about the stress state into a whole part or model. Among these, the analysis of isostatic curves, which represent the geometric location of the points where the main normal stresses occur, presents a major practical interest. In this paper, the authors aim to highlight the ease of use, the quality of information and especially how to interpret the results obtained by using those two methods: F.E.M. and photoelasticimetry.

**Keywords:** two-dimensional elements, isostatic curves, polarimeter, von Mises stress.

## D.7. AUTOMATIC HIDRAULIC CAR STARTING SYSTEM

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**Abstract.** Driving large vehicles using the power steering is a common factor, commonly encountered, even in medium-sized vehicles. In the paper there is presented an automatic hydraulic steering system which provides characteristics superior to those known. The new automatic system is built into the closed loop and amplification stage, providing a very low tracking error. The modular and compact structure offers the possibility that this solution can be applied in various conjunctural situations.

**Keywords:** power steering, automatic system, hydraulic drive, closed loop.

## D.8. CROSSING BALANCE SYSTEM FOR CNC PORTAL MILLING MACHINES

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**Abstract.** Every year we witness worldwide in the construction of machine tools the emergence of quality improved products with technical performance and ever-increasing productivity. The present paper touches on the rather narrow range of vertical mobile subassembly balancing systems in the structure of feed kinematic chains. The purpose of balancing is to reduce the cutting force and decrease the mechanical play when changing the direction of movement of the moving element. On the vertical mobile cross member is the sliding slide that moves horizontally, thus causing the change of the application point of the weight of the mobile cross member. The balancing system in the work ensures the hydraulic balancing of the vertical vertical crossmember with two cylinders, located at the ends of the crossmember, and whose pressure is achieved by means of two pressure regulators that receive the command from the position transducer of the tool slide.

**Keywords:** CNC portal milling machines, balancing system, pressure regulator, encoder.

## D.9. DEAD RACE REDUCTION MECHANISM FOR CINEMATIC ADVANCE CHAINS FROM CNC MACHINE

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**Abstract.** For large strokes of CNC machine tools, the pinion-rack transmission system is used, which, in relation to the ball screws, ensures a high and constant rigidity on the entire stroke. The classic dead-end take-up system with two kinematic branches is known, which has the disadvantage of reducing the efficiency of the transmission system. The new system for reducing the dead stroke in the work, has in its composition two engines, each with a pinion that engages with the same rack. Principle of operation: when moving the moving element in one direction, one of the two motors is active, the other motor being "upside down", and at the same time it ensures a sufficient torque to eliminate the dead stroke. When changing the direction of travel, the role of the two motors is reversed, so the movement begins without any trace of play. The control of one or the other of the motors, as well as the realization of the remaining torque, is made on the basis of a controller.

**Keywords:** CNC machine tools, kinematic chain, pinion-rack transmission, dead race, controller.

## D.10. TRENDS OF THE NEW GENERATIONS OF EQUIPMENT AND CONTROL TECHNIQUES, FOR MACHINE TOOLS WITH NUMERICAL CONTROL

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**Abstract.** Nowadays, we can see wider demands, for new solutions to improve the quality of the parts, regardless of the degree of complexity. Due to these trends, the national and international manufacturers of the tools, devices, verifiers (TDVs) are looking for solutions to help companies in the field of cutting, whatever the types of equipment. The aim of the paper is to make a brief overview of the current trends in the field of equipment and control techniques for numerically controlled machines. The paper presents technological progress and its role in the field of machining. The impact that innovation has on improving the quality of parts and increasing the complexity of products; 3. The professional development opportunities that the new generations of engineers have; 4. Their desire to transcend the boundaries of imagination.

**Keywords**: numerically controlled machine, SDV, control techniques.

## D.11. STABILITY CONTROL MODELLING UNDER DYNAMIC MOTION SCENARIO OF A DIFFERENTIAL DRIVE ROBOT

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**Abstract.** Intelligence incorporated in many devices makes it easier to achieve self-balancing and autonomous driving in differential drive robot. Basically, the system describes an unstable, nonlinear system related to an inverted pendulum. The research attempts to harness the parameters obtained from a computer-aided design tool (Solid works) to model

the system for complete stability control and dynamic motion of the system within a planned trajectory. A linearized dynamic equation is obtained for the overall system design of a mobile robot, and the linear quadratic regulator concept is adopted to obtain an optimum state feedback gain. The simulation results are obtained on MATLAB software interfaced with an Arduino board with deployable sensor technologies. Scenarios of disturbance would be simulated to ascertain the stability conditions of the system at static position or dynamic position. Signal analysis and computer vision techniques serve as leverage to make the design achievable. Localization and navigation referred to as tracking a planned trajectory or moving through paths filled with obstacles in a given space are also included.

**Keywords:** differential drive robots, autonomous, self-balancing, CAD, MATLAB, Simulink.

## D.12. OPTIMIZING THE RESPONSE TIME TO ROTARY TABLES FROM CNC MACHINE TOOLS

**IONUT TANASE**

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**Abstract.** The positioning accuracy of the feed kinematic chains, which includes rotary tables, are influenced by a series of constructive, thermal and rigidity factors. The response time has the influence on the error of the trajectory, the tool when processing by circular interpolation. Interpolations can be made by the participation of two linear axes but also in the case of the participation of a linear axis together with the axis of rotation from the rotary tables. The factors that participate in obtaining the response time are: the load (materialized by the weight of the table and the part), the actuating actuator, the motion transmission system. At the same time, another secondary factor that determines the size of the response time is the size of the speed of the moving element. In the paper are analyzed and determined the share of the degree of influence of the factors specified above, in order to optimize the response time. That said, we are trying to optimize the influencing factors in order to reduce the response time.

**Keywords:** Positioning accuracy, feed kinematic chain, rotary tables, response time, circular interpolation.

## D.13. THE FUNCTIONALITY OF CARTRIDGE VALVES

**LILIANA TOPLICEANU, RADU CALIMAN, COSMIN GRIGORAS**

*"Vasile Alecsandri" University of Bacau, Calea Marasesti 156, Bacau, 600115, Romania*

**Abstract.** The hydraulic systems have large industrial applications. The control of the fluid parameters determined the development of many interesting component with versatile role and operation. This is the case of cartridge valves which can be utilized in some different situations to accomplish different functions. The paper analyzes the characteristics of the cartridge valve and presents some of the mounting possibilities with the benefits for the correct functioning of the hydraulic systems.

**Keywords:** hydraulic system, cartridge valve, simulation.

## D.14. SOME MECHANICAL PROPERTIES OF ARBOBLEND V2

**DORIN VĂIDEANU[1], TUDOR CRISTIAN PETRESCU[2]**

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**Abstract.** The Arboblend V2 biopolymer composite with a matrix based on lignin behaves like a synthetic thermo-injectable polymer, so its use in various sectors does not involve additional costs for obtaining various objects, landmarks using installations injection, extrusion being used in case of synthetic polymers: polyethylene, polypropylene, etc. Compared to plastics obtained from finite sources (oil, natural gas etc.) this material has several specific properties that make it a viable replacement of plastics: it is obtained from renewable raw materials, it is biodegradable in various conditions and, if reinforced with other substances (eg. Kevlar 3%), becomes fireproof. Through the current paper, we determined the behavior of Arboblend V2 as a force of traction and a force shock. The results will lead to finding the best solutions for using Arboblend V2 and its specific properties that sets it apart from other materials.

**Keywords:** arboblend, matrix, plastic, biocomposite, Young.

## D.15. A COMPARATIVE STUDY OF THE PROPERTIES OF DIFFERENT "LICHID WOOD" PRESENTATION FORMS

**DORIN VĂIDEANU[1], TUDOR CRISTIAN PETRESCU[2]**

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**Abstract.** The existence of many forms of "liquid wood", even in the same subgroup, is explained by the fact that the main matrix is made of lignin and lignin can be found in nature in over 60 presentation forms. The lignin molecule is a complex macro – molecule made of three molecules which link together in various shapes. At the same time, structurally speaking, the lignin molecule is dependent on the type of plant species from which it is sourced. It results that the type and the structure of the lignin molecule – and implicitly the "liquid wood" biocomposite matrix – has a major role in the forming and the structuring of every type of liquid wood". In the current article, a comparative study of the properties of "liquid wood" pertaining to all three subgroups is presented. The chosen types are: Arboform F45, Arbofill Fichte and Arboblend V2 (which is the subject of the entire study).

**Keywords:** Arboblend, Arbofill, Arboform, thermodinamic, structural.

# E. ECONOMIC ENGINEERING

## E.1. RESEARCH ON BUSINESS OPPORTUNITIES OF SMES IN NORH-EAST ROMANIA

**NICOLETA CIUCESCU, OVIDIU-LEONARD TURCU, COSTEL CEOCEA, ANDREEA FERARU**

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**Abstract.** The present paper focuses on the business opportunities of the SMEs in North - East Romania in the context of the Covid-19 pandemic. The research based on the quantitative method. The main purpose of the survey was the identification by the entrepreneurs of the main business opportunities which produced their economic performance during the period from June to December 2020. The achieved results revealed various business opportunities such as: the increasing demand on the internal market, the achievement of a business partnership, the use of new technologies, the assimilation of new products, the digital transformation of the business.

**Keywords:** the Covid-19 pandemic, partnerships, new technologies, SMEs.

## E.2. EVALUATION OF ENTREPRENEURIAL VIEWS ON CONTEXTUAL ELEMENTS WHICH HAVE BEEN NEGATIVELY AFFECTED THE ACTIVITY OF SMES IN NORTH- EAST ROMANIA

**NICOLETA CIUCESCU, COSTEL CEOCEA, OVIDIU-LEONARD TURCU, ANDREEA FERARU**

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**Abstract.** The economic environment of the North -East Romania was negatively affected by the various contextual elements in 2020. This paper used the quantitative research and analysed some SMEs, which were grouped according to their age, size and branch of activity. Covid- 19 pandemic, the excessive bureaucracy, the evolution of the global economy, the unpredictability of the economic environment, corruption, the limited ability of authorities to manage economical problems, the evolution of legal framework, the restricted acces to bank credits, the economic evolution of European states were the main results of the analysis.

**Keywords:** Covid-19 pandemic, partnerships, new technologies, SMEs.

## E.3. RECENT EVOLUTION AND PERSPECTIVES OF THE FOREIGN DIRECT INVESTMENT IN ROMANIA

**CATALIN DROB**

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**Abstract.** This study aims to present the evolution, the perspectives and the main characteristic of the foreign direct investment at the national level. After an increasing evolution in recent years, in 2020 it was a significant reduction in the level of foreign direct investment in Romania due to the uncertainties generated by the COVID-19 pandemic. Moreover, in January 2021, foreign direct investment in Romania was more than 3 times lower than in January 2020. In 2021, foreign direct investment flows are expected to remain

low due to the uncertain evolution of the COVID-19 pandemic. However, in the medium and long term, foreign direct investment in Romania will resume its upward trend, given to the rating of Standard & Poor's agency that is recently changed for Romania from negative to stable.

**Keywords:** foreign direct investment, investment flows, emerging market

## E.4. RECENT EVOLUTION OF FOREIGN DIRECT INVESTMENT IN THE DEVELOPED COUNTRIES

**CATALIN DROB, VALENTIN ZICHIL**

*"Vasile Alecsandri" University of Bacau, Calea Marasesti 156, Bacau, 600115, Romania*

**Abstract.** This study aims it's to present the the evolution, perspectives and the main characteristic of the foreign direct investment on the national level. After the increasing evolution in recent years, in 2020 there was a significant reduction in the level of foreign direct investment in Romania due to the uncertainties generated by the COVID pandemic. Moreover, in January 2021, foreign direct investment in Romania was more than 3 times lower than in January 2020. In 2021, foreign direct investment flows are expected to remain low due to the uncertain evolution of the the COVID pandemic. However, in the medium and long term, foreign direct investment in Romania will resume its upward trend, given that the rating agency Standard & Poor'a recently changed the rating for Romania from negative to stable.

**Keywords:** foreign direct investment (FDI), technology, healthcare

## E.5. IMPLEMENTATION OF THE CIRCULAR ECONOMY IN ROMANIA

**LILIANA TOPLICEANU, CATALIN DROB, PETRU GABRIEL PUIU**

*"Vasile Alecsandri" University of Bacau, Calea Marasesti 156, Bacau, 600115, Romania*

**Abstract.** The official introduction of the circular economy concept in the European policy dates from 2015. The evaluation of the implementation of the circular economy in the Member States is performed through predefined indicators which measure the use of the raw material for industrial production, the quantity of waste generated, the use of the secondary raw materials, the recycling rate, naming only a part of them. The article realizes an analysis of the implementation of the concept of circular economy in Romania and makes a comparison between the level of indicators at national and European scale. The conclusions obtained permit to identify the ways to improve the application of the principles of circular economy and to develop new business models more sustainable and nature friendly.

**Keywords:** circular economy, indicators, secondary raw materials

## E.6. THE EVOLUTION OF THE CAPITAL MARKET IN ROMANIA IN THE CONTEXT OF THE COVID-19 PANDEMIC

**CATALIN DROB, VALENTIN ZICHIL, COSMIN GRIGORAS, VLAD CIUBOTARIU**

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**Abstract.** The purpose of this study is to emphasize the main aspects regarding the evolution of the capital market in Romania in the context of the COVID-19 pandemic. This study tries to present the main aspects which marked the evolution of the national capital market in the last period. The domestic capital market went through a delicate period during 2020, due to the fact that in times of crisis, the stock markets react emotionally and thus, are recorded relatively important fluctuations. Although the COVID-19 pandemic created a lot of uncertainty in the capital market, but the end of 2020 brought back optimism among investors. The capital market in Romania has a great potential of development. The status of emerging market, obtained in 2020 by the Bucharest Stock Exchange, represents a real development opportunity in the perspective of future years.

**Keywords:** capital market, investment, emerging market

## E.7. THE IMPACT PRODUCED BY THE SARS COV-2 VIRUS ON TOURISM IN BACAU

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**Abstract.** The tourism industry, will be extremely severely affected both in terms of measures restricting free movement and the fears of the population to travel. This is in fact the hypothesis that underlies the entire scientific approach. The paper proposes an analysis of how the Sars COV-2 pandemic has changed the vision and expectations of holiday tourists, as well as how hoteliers will be able to restore confidence to the population to travel and restart an entire industry. The test of managerial skills to which hoteliers are subjected during this period, puts them to the very test of their capacity for innovation and creativity. However, the power of the Government, which, if applied effectively, will help tourism to recover, must not be ignored.

**Keywords**: the tourism industry, the post-pandemic economic crisis, managerial skills.

## E.8. STUDY ON THE RELATIONSHIP BETWEEN EMOTIONAL INTELLIGENCE AND LEADERSHIP STYLE

**ANDREEA FERARU, OVIDIU-LEONARD TURCU, COSTEL CEOCEA, NICOLETA CIUCESCU**

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**Abstract.** Companies in any branch of business need skilled leaders with vision and certainty of action. Leaders who put in place effective methods, implement strong social relationships and identify, cultivate and improve emotional intelligence, all this is a label of primary competence used in solving the problems faced by the vast majority of organizations. Thus, this paper aims to address the importance of emotional intelligence in leadership, the connection between it and leadership and the way in which emotional intelligence leads to effective leadership.

**Keywords:** leadership, intellectual skills, employees, organizational performance.

# F. CHEMICAL & FOOD ENGINEERING

## F.1. EQUILIBRIUM AND KINETICS STUDIES OF ACID BLUE 193 REMOVAL ONTO AMBERLITE XAD7HP RESIN

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**Abstract.** In this study, efficient removal of Acid Blue 193 azo dye AB 193 from synthetic solutions onto Amberlite XAD7HP resin was evaluated. Batch method for adsorption studies was employed. The effects of initial concentrations and contact time were taken into account when the adsorption capacity of the XAD7HP was evaluated. The results obtained at equilibrium by Langmuir, Freundlich, Dubinin-Radushkevich and Temkin isotherm models were assessed. In this respect, the results obtained predict that the Freundlich model fits very well the equilibrium results. Moreover, the value of 1/n was less than 1, which reflects the favorable adsorption of AB 193 onto XAD7HP over the whole concentrations range studied in the experiment. The value of E(KJ/mol) used to estimate the adsorption type was less than 8 KJ/mol and indicated a physical adsorption given by van der Walls forces. Also, the rate adsorption of AB 193 onto XAD7HP mass by Pseudo first order, Elovich, Morris-Weber and Pseudo-second order kinetic models were investigated. Regression results suggested that the Pseudo-second order was the best accurately kinetic model which described the adsorption of AB 193 onto XAD7HP. Consequently, the obtained results showed that the XAD7HP is applicable for AB 193 separation from water samples.

**Keywords:** adsorption, azo dye, synthetic solutions, batch, experimental model

## F.2. HONEY – A POTENTIAL SOURCE OF FUNCTIONAL FOODS

**IRINA-CLAUDIA ALEXA, ELENA-MIRELA SUCEVEANU, LUMINIȚA GROSU, OANA-IRINA PATRICIU, IRINA-LOREDANA IFRIM, ADRIANA-LUMINIȚA FÎNARU**

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**Abstract.** Consumer's Consumer's growing interest in natural products has encouraged many studies for finding new ingredients applications for functional foods. Functional foods are characterized by offering various health benefits, as well as nutritional values due to their composition. Among the functional foods are those that can be obtained by enrichment, fortification or fermentation. Recently, functional foods have gained popularity, representing one of the most intensively investigated and widely promoted areas in the food and nutrition sciences. Honey is a complex product that can itself be considered a functional food. The most well-known functional properties of honey are its antioxidant and antimicrobial activities. Also, honey can represent a very important source for obtaining remarkable functional foods or beverages. In the recent years, Romania has increased its honey production, becoming one the European Union's major producer. A new report from Food and Agriculture Organization Corporate Statistical database (FAOSTAT) shows that Romania productions as high as 25,000 tonnes have been obtained in certain years. In this context, the Romanian honey producers can focus on different possibilities of honey valorisation. The present study was carried out in order to explore the honey potential for preparing functional foods and beverages with health benefits.Studying the literature, we

noticed that the consumption of mead has begun to gain popularity. However, this fermented beverage is not so well known among the Romanian consumers, even if it is considered among the oldest in the world. Mead, also known as honey wine or hydromel is considered a heath tonic due to the presence of its natural and high-quality compounds and can be served as an excellent aperitif or dessert wine. Therefore, for the present study, one of the approaches for the honey valorization was to obtain several varieties of mead using different types of honey from local producers (linden honey, acacia honey, polyfloral honey, raspberry honey, wild forest honey). It is well-known that the type of honey plays a significant role in the sensorial evaluation of mead. On the other hand, for the present research, another approaches for the honey valorization was the preparation of an innovative product based on acacia honey and grape pomace powder in different proportion. It is known that grape pomace may have applications as food additives with nutritional benefits. Honey fortification with grape pomace may impact the sensory characteristics of products, such as flavour, colour, and texture. All samples prepared in the present study were physicochemically characterized and then, organoleptically analyzed by a multisensory approach using the scoring method with a 20 and 30 points scale, respectively. The results revealed that the artisanal meads and the fortified innovative honey with grape pomace are well accepted by the Romanian consumers.

**Keywords:** honey, valorisation, mead, grape pomace, sensorial evaluation

## F.3. PREPARATION OF WHITE BREAD WITH HEN EGGSHELL POWDER

**NICOLETA PLATON, VASILICA-ALISA ARUȘ, ANA-MARIA GEORGESCU, ILEANA DENISA NISTOR**

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**Abstract.** This This paper presents the preparation of white bread with hen eggshell powder additions. The aim of this paper ist o resolve at least two important aspects: the waste recovery from food industry and fortification of white bread with calcium. Main components of the eggshell are carbonates, phosphates and sulphates of calcium and magnesium and organic matter, the percentage of calcium carbonate being of about 90%. In Traces of Na, K, Mn, Fe, Cu, and Sr metals are also present in the protective layer. Eggshell have cca. 60% proteins, i.e., collagen (35%), glucosamine (10%), chondroitin (9%) and hyaluronic acid (5%), and small amounts of inorganic components e.g. Ca, Mg, Si, Zn. Study of eggshell structure has been a fascinating area of research in the recent years. In our study, we could explain the aging process by the addition of eggshell powder. The eggshell powder is interposed by the water adsorbed between starch and gluten either in the baking process or after the bread baking. In the aged crumb of bread without eggshell, the water drops to half, causing the concentrating of aqueous phase and decreasing of elasticity. In our research an increasing in elasticity can be observed, so we could say that the aging process with the characteristic consequences is delayed. The using of eggshell in bakery industry brings several advantages: waste recycling in food industry, nutritionally enriching with Ca, increasing of bread preserving. The final product obtained has pleasant taste and smell, but also better developed and the interaction of Ca from eggshell powder determines the freshness of bread.

**Keywords:** bread, eggshell, preserving, fortification, calcium

## F.4. INVESTIGATION OF OBTAINING VINEGAR USING CONCENTRATED JUICE

**ALINA BOIȘTEAN**

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**Abstract**. Currently, a wide range of vinegars is produced in the world from various raw materials, including from fruits and their waste. Within the framework of this study, the technology of obtaining vinegar from grape and apple concentrates was analyzed in order to unify production. Optimal conditions have been created for alcoholic and acetic fermentation of concentrates. The concentrated juice for the first stage of alcoholic fermentation was diluted to a sugar concentration of 25%, the temperature during alcoholic fermentation was 25 ± 1 ℃, isolated from UV rays and without oxygen. For the second stage of acetic acid fermentation, wine / cider obtained from the first stage of fermentation, with an alcohol concentration below 12%, and organic vinegar with quality parameters: TTA (total titratable acidity) = 6%, residual alcohol - 0,93%, pH = 3.33, ρ = 1.070 kg / $m^3$. The temperature during fermentation was 28 ± 1 ℃ with oxygen, but isolated from UV rays. The influence of nutrients and salts on the fermentation process has also been studied. In this study, the parameters for obtaining vinegar from concentrates were established and the effect of nutrients and salts on the rate of obtaining high-quality vinegar was shown.

**Keywords:** fermentation, vinegar, grape concentrate, apple concentrate, acetic acid, ethyl alcohol

## F.5. THE IMPACT OF HAWTHORN (CRATAEGUS) LIPOPHILIC EXTRACT ON THE OXIDATIVE STABILITY OF VEGETABLE OILS

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**Abstract.** A permanent concern of the modern food industry is to ensure an optimal self-life for food products. Vegetable oil has an important place in human nutrition, consumed as salads dressing, in cooking or frying. Lipid peroxidation leads to the formation of lipid peroxidation products that leads to undesirable changes in sensory, chemical and nutritional characteristics of oils. Oxidative stability of oils is the resistance to oxidation during processing and storage and is an important indicator to determine oil quality. One of the easiest way to reduce lipid peroxidation is to use antioxidants. Local berries, herbs and spices are among the numerous sources of natural antioxidants. In this study were analyzed the antioxidant capacity of hawthorn berries which are rich in polyphenols, bioflavonoids, antioxidants, vitamins, tannins and organic acids etc. Hawthorn fruits were dried and ground into a thin powder before extraction. Powdered samples were extracted by shaking using deodorized sunflower oil and they were filtered. The high antioxidant capacity of the hawthorn lipophilic extracts was confirmed by the evaluation of the amount of bioactive compounds namely: lycopene 9.47 mg/L; Zeaxanthin 8.24 mg/L; β-carotene 10.55 mg/L. In order to evaluate the oxidative stability, samples of vegetable oils were enriched with hawthorn lipophilic extracts and the main quality parameters were measured weekly for a period of 3 months. The acid value for enriched samples varied in time between 0.02…0.5 mg KOH/g, the results being lower compared to the blank samples (0.04…0.7 mg KOH/g) which indicate the decrease of the oxidative degradation. The peroxide value results for the enriched samples varied in time between 3.3…6.0 mechiv $O_2$/kg. In comparison with the

peroxide values of blank samples (3.7…7.0 mechiv $O_2$/kg) it is demonstrated the antioxidant capacity of the hawthorn lipophilic extracts which slow down the peroxidation process of vegetable oils. This research demonstrates the possibility to use hawthorn lipophilic extracts in the high lipid content food products production. An important fact is the possibility to use natural antioxidants obtained from local berries in order to substitute the synthetic additives. Food products enriched with natural additives will ensure consumption of safe and healthy products with longer shelf life.

**Keywords:** hawthorn, antioxidants, oxidative stability, oxidation

## F.6. PRELIMINARY CHARACTERIZATION OF OIL/WATER EMULSIONS FOR ADDED-VALUE TO TEXTILE FABRICS

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**Abstract.** This paper presents the data from a few preliminary analyses used for characterization of different series of vegetal essential oil (mint, lavender, rosemary and thyme)/water (O/W) emulsions prepared by varying the concentrations of essential oil and beeswax matrix. The preliminary analyses of emulsions consisted in determination of a few physical-chemical quality indicators, i.e., pH, normalized density, acidity index, peroxide index, content of conjugated dienes and trines, total content of polyphenols and flavonoids, total fatty acids as well as the creaming index and sensory analysis. The stability in-time of (O/W) emulsions have a key role in its storage and also manufacturing of added-value textile materials through (O/W) emulsion impregnation onto textile fabrics, and the results on emulsion stability at room temperature within more than 8 months were reported accordingly. The most stable O/W emulsions were recommended for use by the textile materials manufacturer to add value to its textile products, especially due to the potential antibacterial action of impregnated textile materials and also well-being effects and skin care benefits. This research work underlines clearly that the most recommendable emulsion must have relative good in-time stability till the separation of organic and aqueous phases as well as a satisfactory polyphenols and flavonoids content, as main responsible of antibacterial activity on impregnated textiles (cotton fabrics).

**Keywords:** added-value textile materials, beeswax, O/W emulsion characterization, essential oil, 'in-time' stability, vegetal plant

## F.7. BENEFITS, PHYSICAL-CHEMICAL AND FUNCTIONAL PROPERTIES OF CHIA SEEDS - SALVIA HISPANICA L. (LAMIACEAE)

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**Abstract.** Nowadays, consumers increasingly seek after foods that have a high nutritional value and offer additional health benefits by incorporating new ingredients and natural products whose composition has protective effects against certain diseases; Many studies show that diets play a significant role in preventing many chronic diseases, providing more nutritional and non-nutritional compounds useful for maintaining a good health beyond the required energy intake. Given the growing popularity of seeds, specialists inform us about; nutritional potential and how to include them in our diet. Many seeds are edible and we should eat them raw. After being exposed to heat, they often produce toxic substances and

vitamins, minerals and essential oils are denatured. That is why it is very important to know information about each one, namely the physical-chemical changes to the culinary treatment There are several types of seeds to choose from and they are easy to add to a wide variety of dishes, adding extra flavor, nutrition and health. Nowadays, virtually all diets include flax, sesame, sunflower, pumpkin, hemp, etc. Many sources talk about the benefits but few know the origin and functional properties of these seeds. Chia seeds (*Salvia hispanica L.*) come from a biennial plant crop that belongs to the mint family (*Labiatae*) and is considered a pseudo cereal, the seeds have a high oil content, they contain between 25% and 40% fat and are among the sources of plants with the highest content of omega-3 alpha-linolenic acid (68% alpha-linolenic acid). By using functional foods rich in polyphenols and omega-3 fatty acids would improve health. There is no information or evidence of adverse effects or allergies caused by the consumption of chia seeds (whole or ground), so their use in food would be a major benefit, and research shows the possibility of capitalizing on them by incorporating them into various food matrices (confectionery, pastries, culinary preparations).

**Keywords:** Chia - *Salvia hispanica L.* (*Lamiaceae*), nutrition, functional properties, functional foods

## F.8. THREE-STEP STRATEGY FOR OBTAINING OF BIOLOGICALY ACTIVE SUBSTANCES AND FUNCTIONAL BIOPOLYMERS FROM OILSEED POMACES

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**Abstract.** The purpose of this work is to develop a universal and optimal strategy for the complete extraction of valuable compounds from oil cakes. Freshly squeezed oilseed cakes obtained from oilseeds (walnuts, flaxseed) after cold pressing, are the sources of valuable biologically active substances (BAS). Among these are polyphenols, naphthoquinones, carotenoids and biopolymers (cellulose, arabinoxylan) with pronounced functional properties BAS stability in oilcakes is low during pressing process, due to destruction of cell membranes. Reaction of cells and intercellular substance leads to an accelerated oxidation of the oilcake immediately after pressing. In order to avoid oxidation, we recommend removing these active substances, or at least preserving them in reasonable ways before cold pressing. The second stage should include the smart processing of the oilcake pomace, obtained by pressing. It shall include the extraction of hydrophilic and / or hydrophobic biologically active substances from the cake. Finally, the third stage is optimal to obtain the biopolymers and dietary fibers. We recommend isolation of these components, valuable for a healthy diet, in a dry powder form. Using this three-step approach, we improved technology of extraction of biologically active components from walnut kernels and of mucilaginous from flaxseeds.

**Keywords:** Walnuts (*Juglans Regia*), Flax (*Linum Usitatissimum*), BAS, naphtoquinones, arabinoxylan

## F.9. SMART TECHNOLOGY FOR OBTAINING OF NATURAL YELLOW FOOD COLORANTS FROM SAFFLOWER

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**Abstract.**This work deals with obtaining of natural yellow food colorant from petals of Safflower (*Carthamus Tinctorius L.*). Our goal is to improve safety and biological value of protein-reach foods using natural yellow colorants, of high interest but relatively unknown. Yellow pigment from Safflower contains at least three basic chalcone glucosides: Safflower Yellow A, Safflower Yellow B and Precarthamin, with high similarity in their functional groups, spatial structure and polarity. They are hydrophilic and have similarly retention times in case of reverse-phase HPLC analysis. An important property of these substances is their remarkable thermic stability under the food-processing conditions. Results of HPLC, IR, UV-Vis and other investigative methods demonstrate, that separation of these colorants and their obtaining in pure form have no economic reasons. Optimal solution for the food technology is to obtain their powdered mixture, containing food-additives only as secondary components.

**Keywords:** Food colorants, chalcone glucosides, reverse-phase HPLC, IR, UV-spectra

## F.10. IDENTIFICATION OF THE POLYPHENOLIC LEVEL OF YOUNG WHITE WINES BY TREATMENT WITH VARIOUS INORGANIC AND ORGANIC MATERIALS

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**Abstract.** Wine is a bio-organic product, which has in its composition a complex variety such as: mono- and poly-hydroxyl acids, alcohols, polyphenolic substances, minerals, aldehydes, vitamins, sugars. Among those listed, polyphenolic compounds play a significant role from an organoleptic point of view in the biochemical composition of white wine. Also, white wine contains a wide variety of protein substances that can lead to damage to the finished product of the protein scrap type. The same problem is the polyphenols of non-flavonoid wine (cinnamic acid and its derivatives) but also various biopolymers (procyanidins and anthocyanins) which, in the presence of oxygen, leads to the biochemical denaturation of the wine. The purpose of this paper is to determine the way of colloidal stabilization and decrease the oxidation level of young white wine, keeping its fresh character. Thus, for research, the Sauvignon Blanc and Chardonnay wines obtained through technological processes specific to white wine were taken as reference. In order to verify the level of protein stability of the selected wines but also the degree of oxidability, it was used as inorganic materials: cationic clay modified by the ion exchange process on fractions, and as organic material: β-cyclodextrin. It is already reported in the literature that these materials

have a deproteinizing effect, and act as an anti-browning agent. Very few studies have been performed on the effect of β-cyclodextrin in wine, that of inhibiting the browning process of wine but also its effect on certain compounds specific to white wine. To classify the mechanism by which β-cyclodextrin polyphenolic compounds was determined using methods such as protein stability by heat, but also that of polyphenolic oxidation by POM-test. The results obtained show that for protein stability, the ion-exchanged bentonite sample, first fraction indicated the best results. In the case of β-cyclodextrin, major changes are observed on several compounds from the tested white wine samples.

**Keywords:** polyphenolic compounds, proteins, β-cyclodextrin, cationic clays, fractions

## F.11. THE IMPACT OF THE TOXIC METALS ACCUMULATION ON THE CHAMOMILE MEDICINAL PLANT IN A LABORATORY STUDY

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**Abstract.** The chamomile plant (*Matricaria Chamomilla L.*) belongs to the *Asteraceae*/*Compositae* family of flowering plants, having anti-inflammatory, antioxidant, antimicrobial, analgesic, antiseptic, antispasmodic and sedative properties. Some medicinal plants can absorb and accumulate metal contaminants in the component parts (roots, stem, leaves or inflorescences), so they can be used in phytoremediation of contaminated soils. This study aimed to evaluate the behaviour of chamomile under the influence of arsenic, either as the only contaminant, or in the mixture with cadmium, nickel and lead. In addition, the study followed the influence and transfer of metals from soil to plants, compared to a control sample (M 0). The metals content both in soil and in plant, respectively, was determined using the ICP-EOS technique (AVIO 500 Perkin Elmer). The concentrations tested were of 20 mg/kg As (E1), 20 mg/kg As + 6 mg/kg Cd (E2), 20 mg/kg As + 6 mg/kg Cd + 165 mg/kg Ni (E3), respectively 20 mg/kg As + 6 mg/kg Cd + 165 mg/kg Ni + 105 mg/kg Pb (E4). The experiments were performed over a period of three months (April - July), following the evolution of plants in terms of metal and chlorophyll content. The chamomile seeds were planted in soil-enriched with nutrients, watered with tap water with metals content in order to obtain the expected metal concentrations in soil and then, until the end of the experiments, the plants were watered with aerated tap water. The conditions for the beginning of the experiments were identical (amount of soil, seeds, watering regime, temperature, luminosity), differing only mixture of toxic metals added. It was observed that in the experiments in which a mixture of metals was used, the seeds germinated less than in one in which a single element was used (E1), the germination improving after the interruption of watering with metal mixtures. Chamomile plants accumulated as only in the E1 test, the transfer coefficients from the soil to the plant indicating values of 1.1, without highlighting phytotoxic effects (the value of As in the plant being 3.6 mg/kg, below the phytotoxic value of 5 mg/kg). Total chlorophyll indicated that the toxicity in the single metal experiment is higher than in the metal mixtures, where the plants germinate, though in smaller numbers, were more vigorous. Stimulation of the photosynthesis process under the action of metal mixtures (in high concentrations) can be caused by the activation of adaptive and compensatory mechanisms with the role of maintaining normal assimilation processes.

**Keywords:** *Matricaria Chamomilla*, As, Cd, Ni, Pb, bioaccumulation, transfer index.

**Acknowledgments:** The authors acknowledge the financial support offered by The National Research Program Nucleu through contract no 20N/2019, Project code PN 19 04 01 01.

## F.12. GERMINATION AND BIOACCUMULATION OF LEAD IN CULTURE MUSTARD IN A LABORATORY STUDY

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**Abstract.** Lead is one of the most persistent metal, so it has an estimated soil retention time of 150-5000 years. Thus, in the present study we followed the effect of lead on the process of germination and development of white mustard *Sinapis alba*, compared to a control sample. In three laboratory experiments, 33 mustard seeds were planted in soil enriched with nutrients. Subsequently, in two of the experiments, Pb was added at 40 mg/kg (Pb I) level and 80 mg/kg (Pb II), concentrations above the normal value, respectively above the alert threshold for sensitive land according to Romanian Legislation. The results were compared with a control test, performed in the same conditions in terms of amount of soil, watering regime, temperature, luminosity, but without lead contamination. The soil contamination was achieved by watering the seeds, respectively the seedlings until reaching the interest concentrations, and then the plants were watered with aerated tap water until the end of the experiments. After 60 days of plant development, the plant matter was air dried, separating the parts in the root, stem and leaves. The Pb content was determined using ICP-EOS technique. In addition, other metals of interest representing micronutrients necessary for the germination and development of the plants (Zn, Ca, Mg, Cu, Ni, Fe, Mn) were determinate, in order to estimate the attenuation impact of the stress generated by the toxic metal. Excess of Pb concentrations in the soil leads to decreased germination. While in the control sample, the germination percentage was 84.8%, in Pb I experiment about 78.8% of the seeds germinated, and in the case of the Pb II experiment the percentage was around 60.6%. The results of the study showed that Pb does not accumulate in the aerial parts of the plant, remaining in the root, both in the control sample and in the intoxicated samples. The analysis of the concentration of chlorophyll (chlorophyll a, chlorophyll b) showed a very small variation in the experiments polluted with Pb compared to the control sample, which allows us to appreciate that the photosynthesis process was not significantly influenced.

**Keywords:** Sinapis alba, contamination, Pb, germination, bioaccumulation.

**Acknowledgments:** The authors acknowledge the financial support offered by The National Research Program Nucleu through contract no 20N/2019, Project code PN 19 04 01 01.

## F.13. CHEMICAL MODIFICATIONS OF CORN STARCH FOR NEW NANOMATERIALS USED IN AGRO-ALIMENTARY WASTES VALORIZATION

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**Abstract.** The objective of the research is to achieve chemical modification of a polysaccharide such as corn starch. This bioresource is mainly used in the food industry,

while it is very little developed in the environmental field. Our research is based on the use of this biomatrix in agro-alimentary wastes valorization. The research is concentrated on chemical modification of corn starch with succinic anhydride and the complexing of this biomatrix with other polysaccharides extracts from agro-alimentary wastes. This complex matrix has the capacity to encapsulate other compounds from agro-alimentary products. Vegetable oils are important in the complexion of this biomatrix and it is used in the depollution domain. The most important results obtained are for corn starch modification with a solubilization temperature of 95 °C in DMSO, used as a solvent, and a reaction time of 72 hours, for alkylating agent. The obtained starches are characterized by 1H NMR technique in order to verify the alkylation procedure. Complexion with vegetable oil and other polysaccharides extracted from agro-alimentary wastes are also characterized by 1H NMR technique and microscopic images. All these new nanomaterials are used in different domains as wastes valorization and environmental depollution.

**Keywords:** nanomaterials, corn starch, agro-alimentary wastes, vegetable oil, biomatrix.

## F.14. ANALYSIS OF THE FORCED OXIDABILITY OF GRAPE SEED, WALNUT AND CORN OILS

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**Abstract.** Lipid oxidation is one of the major causes of decreased nutritional value of foods, limiting their shelf life. This phenomenon leads to the formation of oxidative degradation products, which essentially change the nutritional and organoleptic qualities of the products. However, even worse is the fact that the consumption of metabolites of oxidative degradation of lipids is the cause of oxidative stress of the human body and, respectively, causes multiple morbid conditions of the human health. A study on the process of forced oxidation of grape seed oils, walnuts and corn in the presence of hydrogen peroxide and Cu (II) ions was realized. The thermo-oxidation of the oil caused a significant decrease in the saponification index, which indicates a significant degree of polymerization and leads to an increase in the viscosity of the studied sunflower oil. To highlight the impact of heat treatments, the analysis was performed by IR spectroscopy and the possible mechanisms of forced oxidation of unsaturated fatty acids under the influence of heat factor were analyzed. It was established that the applied treatment favored both the formation of carbonyl secondary compounds and the simultaneous formation of hydroperoxides and triglycerides containing hydroxylated groups. The accumulation of hydroperoxides and triacylglycerides that have hydroxyl functions have facilitated the course of polymerization reactions, which are to increase the viscosity of the studied thermo-oxidized sunflower oil. Analogous to the forced oxidation of sunflower oil, the formation during oxidation of trans-isomers of polyunsaturated acids was attested. The study investigated and identified the minimum concentrations of antioxidants needed to reduce the oxidation of the analysed oils.

**Keywords:** vegetable oil, thermal oxidation, IR spectroscopy, peroxide index, acidity index, epoxides, trans- and cis- fatty acid isomers, antioxidants.

**Acknowledgements:** The research was funded in the framework of State Project 20.80009.500727 Physico-chemical mechanisms of redox processes with electron transfer involved in vital, technological and environmental systems.

## F.15. LACTIC ACID FERMENTATION IN THE PRESENCE OF LAYERED DOUBLE HYDROXIDES AND ULTRASOUND FIELD: STATISTICAL MODELLING AND OPTIMIZATION

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**Abstract.** Statistical modelling and optimization of the process of lactic acid fermentation of milk inoculated with lactic bacteria, in the presence of layered double hydroxides and under ultrasonic operation conditions were studied. A $3^3$ factorial experiment was selected in order to correlate the lactic acid concentration in the fermentation medium (process response) to process factors, i.e., fermentation temperature (38-48 °C), layered double hydroxides / milk ratio (1-8 g/L), and fermentation time (2-4 h). 27 experimental runs were conducted under ultrasonic operation conditions, at three values of operation temperature, layered double hydroxides / milk ratio and final fermentation time. The factorial statistical model consisted of a second order polynomial regression correlation between process response and factors. The regression relationship was applied to optimize the fermentation process. Optimal values of factors are close to the middle level of temperature (43 °C), high level of layered double hydroxides/milk ratio (8 g/L), and low level of fermentation time (2 h).

**Keywords:** layered double hydroxides, lactic acid fermentation, statistical modelling, factorial experiment, optimization, ultrasound.

## F.16. THE IMPACT OF SOME NUTRITIONAL FACTS AND PHYSICO-CHEMICAL INDICES ON THE GOAT'S MILK YOGURT TEXTURE

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**Abstract.** Goat milk and derived dairy products occupy a significant place in the human rational diet due to their high chemical composition and the assimilation easiest way of the most accessible animal proteins and fat. The problem imposed by this research is to identify the impact of some physico-chemical indices on the formation of the texture of goat milk yogurt resulting from the fact that it forms a weaker lactic gel compared to cow milk yogurt. In this paper, goat milk yogurt and cow milk yogurt are analyzed, both samples being made by the classic thermostat method. Thermostat method is an effective method for the appreciation of the formed curd firmness, an important aspect of the acidic dairy products quality. The quality of the formed gel was analyzed in terms of texture indices which for goat milk yogurt showed lower values (gumminess (H·A2/A1) - 15.0±0.02, firmness (g) - 19±0.03, adhesiveness (N·s) - 20.1±0.01, stickiness - 11.1±0.03) compared to cow milk yogurt, due to the different composition of casein fractions, in milk prevailing the amount of α-casein, which contributes to the formation of a firm gel, and goat milk have a higher β-casein content, more calcium and phosphorus. This is why the coagulum is softer and digested more easily, because in the acidic environment of the gastrointestinal tract it forms smaller and softer clusters than cow milk, also the kind and quality of starter culture, dry matter content, product acidity. The dry matter content depends on the content of proteins,

minerals, fats. Dry matter for cow milk yogurt was 15,5% in comparation with goat milk yogurt - 14%, results that coincide with higher content in proteins, minerals, fats for cow milk yogurt. Titratable acidity of cow milk yogurt sample is 100 ˚T and for sample of goat milk yogurt is lower 80 ˚T. There are studies that indicate that fat content influences the acidity value of the yogurt, namely that increasing milk fat content, increased the initial pH of the samples and the rate of decreasing pH during incubation of high fat samples was lower than others. The fat content of cow milk yogurt is 4,1% and for goat milk yogurt sample - 3,7%. The results obtained for the analyzed indices support the conclusion that goat milk yogurt forms a weaker but finer gel compared to the gel formed by cow milk yogurt being influenced by the content of some components such as proteins and fat (total dry matter) as well as the evolution of acidity.

**Keywords:** goat milk, cow milk, yogurt, texture.

## F.17. EFFECT OF CALCIUM GLUCONATE ON ACRYLAMIDE LEVEL AND BREAD QUALITY

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**Abstract.** Acrylamide is a chemical process contaminant that may be formed during the baking of bread making. Bread is one of the most consumed products in the world. In Romania, according to data from the National Institute of Statistics, the average monthly consumption of a person in 2020 in the category of products bread and bakery products was 7.819 kg, this category being on the 1st place in the daily shopping cart. Due to possible neurotoxic, genotoxic, carcinogenic effects of AA on the human body, the interest of it reduction in bread is nowadays of a great interest. One of the methods to reduce the acrylamide in bakery products is to use cations in especially the calcium ones in bread recipe. The aim of this study was to analyze the effect of calcium ions addition in wheat flour at the level of 100, 150 and 200 mg/100g from gluconate salt on acrylamide level and bread quality. The bread quality samples were analyzed from its physico-chemical (loaf volume, porosity, elasticity), textural attributes (springiness, cohesiveness, resilience, firmness, gumminess, chewiness) and sensory characteristics (appearance, colour, taste, smell, texture, flavor, overall acceptability). According to the data obtained the highest loaf volume, porosity and elasticity were recorded for the sample with 150 mg/100g calcium ions additions. From the textural point of view, the cohesiveness and chewiness values decreases to low levels and increases to high levels. From the sensory point of view, the best appreciated samples were to a level of 100-150/100g mg calcium ions on wheat flour addition. Acrylamide level decreased with almost five times for all the bread samples in which calcium gluconate were added in wheat flour.

**Keywords:** wheat flour, calcium gluconate, bread quality, acrylamide level.

## F.18. COMPARATIVE EVALUATION OF THE PHYSICO-CHEMICAL CHARACTERISTICS OF SPENT GRAIN FROM BREWING AND MALT WHISKY

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**Abstract.** Worldwide is a major crisis of energetic and materials resources context in which the food crisis has the first place. That is why is impose as a necessary major the complete

valorisation of useful substances present in by-products obtained from the industrial processing of raw material with the propose of obtaining food products. At the same time the use of by-products brings benefits to both reducing environmental pollution and to industry. Turning by-products into value-added components reduces food production costs and quantifies their nutritional value. Spent grain is a little-used by-product from brewing or from malt whisky due to its high moisture content, which makes it difficult to transport and store and makes it an unstable product, conducive to microbial growth. In conventional brewing, which employs a lauter tun, the spent grain plays an important role as it forms the bed through which the mash is filtered to separate the wort obtained after the saccharification of the malted cereal grains. The main by-product resulting from the production of malt whisky is spent grain or draff, the starch-depleted waste grains that remain after the mashing process. The two by-products were collected from two local factories. Spent grain samples were exposed to drying, then analyzed the main physico-chemical characteristics: moisture, protein content, lipids, ash, fiber, polyphenol content. The obtained results were compared from the point of view of the origin of the raw material and of the technological processing, but also with the data from the specialized literature.

**Keywords:** by-product, brewing, malt whisky, spent grain, valorisation.

## F.19. BUCKWHEAT MALT AS RAW MATERIAL FOR BREWING

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**Abstract.** Beer is most commonly obtained from barley malt and wheat malt, but lately other raw materials are also used, such as other cereals (malt, sorghum, millet, rice, teff, etc.) and pseudo-cereals (buckwheat, amaranth, quinoa, chia). The process of replacing barley or wheat malt in beer industry is increasing nowadays; several factors have contributed to this: rebirth of craft beer, demand interest for functional beer, development of gluten-free brewing, consumer demand for unique experiences, authentic products, high quality, distinctive taste and aroma, etc. Buckwheat grain has attracted attention as a new raw material for gluten free beer. Compared with other gluten-free raw material such as rice, buckwheat has shown to be excellent for the elaboration of gluten-free beer. The paper dealt with the evaluation of the quality of buckwheat malt obtained in laboratory conditions and the comparison of the results obtained with barley malt, the conventional raw material for brewing. Malting of buckwheat grains consisted in steeping, germination and the kilning process leading to some physiological changes of cereal grain. Evaluating the quality of the malt obtained through the experimental malting versions was done via a physico-chemical analysis of beer wort were prepared similarly to the method of handling barley malt (by the Kongress program), using the following methods: humidity - oven drying method; yield in extract - method Congress; colour - iodometric method; pH - potentiometric method; Hartong index - Congress method; Kolbach index - Windisch-Kolbach method. The results obtained were compared with the quality indices of a sample of barley malt currently used of the industrial brewing of beer.

**Keywords:** by-product, brewing, malt whisky, spent grain, valorisation.

## F.20. THE EFFECT OF GERMINATED BEANS ON WHEAT DOUGH RHEOLOGY

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**Abstract.** Beans are a type of legume consumed worldwide, have a sensory profile appreciated by nutritionists and bring benefits to consumer health, as outlined in the literature. The germination process is of interest due to the fact that it leads to a decrease in the amount of antinutritive factors in the grains (decreases the amount of phytic acid that binds to minerals and results in phytates). Also, following the germination process, the bioavailability of some nutrient compounds increases because the active enzymes splits the reserve substances from the embryo and endospermin order to be easier to use in the germ development process. At the same time, specific enzymes are activated during the germination process, which is an advantage for the flour from germinated grains to be used successfully to replace the addition of exogenous enzymes in the wheat. The aim of this study was to highlight the changes on the rheological characteristics of white wheat flour dough as a result of the addition of germinated bean flour in various levels 5%, 10%, 15%, 20% and 25% in wheat flour. The fundamental dough rheological properties were analyzed using a Haakerheometer whereas the empirical dough rheological properties using an Alveo-Consistograph Chopin. The alpha-amylase activity was determined using a Falling Number device. According to the data obtained the loss modulus (G") presents lower values than the storage modulus (G') for all the samples with germinated bean flour addition in the whole range of frequencies, suggesting a solid elastic-like behavior of the dough samples. With the increase level of germinated bean flour the dough tenacity increases and the baking strength and falling number values decreases.

**Keywords:** wheat flour, germinated bean, mixing, extension, dynamic rheology, falling number.

**Acknowledgment:** This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS-UEFISCDI, project number PN-III-P1-1.1-TE-2019-0892, within PNCDI III.

## F.21. INFLUENCE OF TEMPERATURE ON THE EXTRACTION OF FAT-SOLUBLE COMPLEX FROM SEA BUCKTHORN AND ROSEHIP FRUITS

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**Abstract.** Sea buckthorn and rosehip fruits have a promising source of lipophilic bioactive compounds, which include carotenoid pigments, which are soluble in organic solvents such as acetone, ethyl ether, hexane, etc. But these solvents cannot be used in the food industry because of their toxicity. Refined deodorized sunflower oil may be recommended as a solvent for carotenoid extraction for functional food formulation. Lipophilic bioactive compounds in sea buckthorn and rosehip fruits are characterized by increased antimicrobial activity against pathogenic microorganisms, which cause food poisoning. The aim of the research was to determine the influence of temperature on carotenoids extraction yield and antioxidant activity in fat-soluble extracts of sea buckthorn and rosehip fruits. Native dried berries were used for the research. Extraction of fat-soluble bioactive compounds was performed at temperatures of 30 ºC, 45 ºC and 65 ºC. The physico-chemical quality indices

(acidity index, peroxide index, conjugated diene and triene contents, p-anisidine index) of the fat-soluble extracts of sea buckthorn and rosehip fruits obtained at different extraction temperatures were compared with those of sunflower oil, used as a solvent. It is attested that these physico-chemical indices of sea buckthorn and rosehip extracts based on sunflower vegetable oil vary insignificantly and correspond to the rules established for refined deodorized sunflower oil. It was found that the temperature variation from 30 to 65 ºC changed the yield of carotenoids in the fat-soluble extracts of sea buckthorn and rosehip fruits, showing that the highest rate of pigments was reached at 45 ºC and then decreased at 65 ºC. In berry extracts, zeaxanthin and lycopene had the highest yield: for sea buckthorn - 9.55 and 9.40 mg/100g d.w. and for rosehip - 14.62 and 14.41 mg/100g d.w. respectively. Heat treatment reduced the extraction efficiency of carotenoids by forming different of cis -isomers and reducing the content of trans-isomers. In addition, carotenoids have different ability to form cis -isomers. It is attested that carotenoid pigments are responsible for antioxidant activity in the oily extracts of sea buckthorn and rosehip fruits. The high values of antioxidant activity, determined by the DPPH test correspond to the extraction efficiency of carotenoids at 45 ºC. Thus, in sea buckthorn extracts the maximum value of antioxidant activity was 86.81% free radicals inhibited, and for rosehip - 91.54% free radicals inhibited. Probably, the increased antioxidant activity of the oily extracts was due to the synergistic interaction between the carotenoids in the berries and the tocopherols, which were present in the sunflower oil. The cis -isomers of carotenoids, which have lower antioxidant properties than trans-isomers, contributed to the decrease of the values of antioxidant activity at a temperature of 65 ºC. It was shown that in the oily extracts of sea buckthorn and rosehip fruits, the correlation between the total carotenoid content and the antioxidant activity is very good, the coefficient of determination $R^2$ being 0.99 and 0.98 respectively.

**Keywords:** fat-soluble bioactive compounds, carotenoids, extraction, temperature, antioxidant activity.

**Acknowledgments:** The authors would like to thank the Project AUF-MECR 20-21 Reduire les risques de contamination chimique et microbiologique des aliments, running at Technical University of Moldova.

## F.22. INFLUENCE OF EXTRACTION CONDITIONS ON BIOLOGICALLY ACTIVE COMPOUNDS AND ANTIOXIDANT ACTIVITY IN GRAPE MARC EXTRACTS

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**Abstract.** Grapes are one of the main crops in the Republic of Moldova and in Romania, which are processed and consumed fresh. It is estimated that 10-13 million tonnes of marc are produced worldwide when grapes are processed. Grape marc consists of bunch, seeds and skin, constituting approx. 23% by mass of grapes processed for wine. At present, special attention is paid to the recovery of grape marc, as most of the waste is stored or incinerated, posing significant risks to the environment - pollution of water, soil and atmosphere. After processing grapes, about 70% of polyphenols remain into residues. Polyphenols are bioactive components with antimicrobial and antioxidant actions and can be used in food formulations. The aim of this research was to determine the influence of solvent composition and extraction temperature on the yield of phenolic compounds and antioxidant activity in grape marc extracts. Isabella red grapes marc was used for the research, which was dried at a temperature of 65 ºC to a humidity of 7.3±0.1% and crushed to a granularity of 70±10 μm.

To study the kinetics of the extraction process in solid-liquid system and to determine the optimal conditions for extraction, hydromodules from 4 to 20 were used, where distilled water was used as solvent. To investigate the yield of biologically active compounds, hydroalcoholic extracts of marc were obtained at concentrations of ethanol 0% (water), 40%, 60%, 80%, 96% (v/v), at temperatures of 30 ºC, 45 ºC and 65 ºC, under mechanical stirring at 60 $min^{-1}$, extraction duration 90 min. The extracts obtained were filtered and stored at 4±1ºC. The total content of polyphenols, flavonoids, tannins, anthocyanins and the antioxidant activity by DPPH were analyzed in extracts. Under optimal extraction conditions, the individual profile of polyphenols and anthocyanins was identified and quantified by HPLC method. It was found that when the extraction temperature is increased from 30 to 65 ºC, the content of phenolic compounds and antioxidant activity increases with the variation of the concentration of ethanolic solution up to 60% (v/v) and then decreases to 96 % (v/v). Thus, at 65 ºC, the maximum values of phenolic compounds content and antioxidant activity were attested for hydroalcoholic solutions of 60% (v/v): total content of polyphenols - 11.02 mg GAE/g d.w., total content of flavonoids - 7.76 mg GAE/g d.w., tannins - 1.37 mg TAE/g d.w., total anthocyanin content - 0.97 mg ME/g d.w. and antioxidant activity - 91.55% free radicals inhibited. The composition of individual polyphenols and anthocyanins in grape marc extracts was determined by the HPLC method. The results of the research showed that the use of by-products derived from the wine industry would allow to reduce to a minimum the amount of residues and to obtain valuable extracts of bioactive compounds, with multiple fields of application.

**Keywords:** Grape marc, extraction conditions, biologically active compounds, antioxidant activity.

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## F.23. ULTRASOUND-ASSISTED EXTRACTION OF BIOACTIVE COMPOUNDS FROM IVY LEAVES

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**Abstract.** *Hedera helix L.*, commonly known as ivy, belongs to the *Araliaceae Juss.* family and is native to North America, Asia, and Western, Central and Southern Europe. The most important constituent which is responsible for the ivy plant medical use are triterpene saponins. Besides these, *Hedera helix* contains other valuable constituents, such as flavonoids, phenolic acids, coumarins, organic acids, amino acids, vitamins etc. The first step for using the bioactive compounds from ivy plant in nutritional supplements or food ingredients is represented by their extraction. The conventional methods require long extraction times, high temperatures, relatively high solvent and energy consumptions, which could lead to the bioactive compound degradation. The aim of this work was to study the influence of different ultrasound equipment (Vibracell VCX750 with a titanium probe and Hielscher UP 200St US with a glass probe) on the extraction efficiency of saponins from ivy leaves. The extractions were carried out at different ultrasound power, extraction time and temperature. To highlight the efficiency of the ultrasound-assisted extraction, experiments using conventional methods were also performed. Compared with conventional extraction, a higher extraction yield in a shorter time was achieved. The total saponin content was analyzed in order to determine the extraction yield. The highest saponin-rich extracts were

obtained by ethanol and ultrasound-assisted extraction is shown as an efficient method for obtaining extracts with imonostimulatory properties.

**Keywords:** Ivy leaves, ultrasound, saponins, immunostimulatory.

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## F.24. COMPARATIVE ANALYSIS OF VEGETABLE ACTIVATED CARBONS WITH COMMERCIAL ONES OF GRANUCOL SERIES

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**Abstract.** Activated carbons have great applicability in the conditioning of wines: discoloration, removal of foreign taste and smell, correction of organoleptic parameters, etc. Nowadays, the most used activated carbons in the winemaking industry are the activated carbons of Granucol series (BI, GE, FA), which are of vegetable origin granulated with the aid of bentonite. The purpose of this work was to compare the structural and sorption characteristics of local vegetal active carbons obtained from apricot stones and nutshells (AC-C and AC-C2, Republic of Moldova) with that of commercial activated carbons (Granucol BI/GE/FA, Germany). The standard methods were used in order to determine the physico-chemical characteristics of activated carbons: the specific surface area, pore size distribution, pore sorption volume, humidity, ash content, bulk density, pH value of suspension and type of surface functional groups. The adsorption capacity of the studied activated carbons was evaluated using methylene blue dye as a reference substance. Equilibrium adsorption data of methylene blue on activated carbons were fitted by using three isotherm models: Langmuir, Freundlich and Sips. In order to analyze the obtained kinetic data three kinetic models: pseudo-first order model, pseudo-second order model, and intraparticle diffusion model were used. According to the obtained results, the local vegetal active carbon (AC-C) has proven to be comparatively effective with commercial ones (Granucol series) in removing methylene blue dye from solutions.
Acknowledgments. This work was carried out within the Moldovan State Program (2020-2023) Project “Reducing the impact of toxic chemicals on the environment and health through the use of adsorbents and catalysts obtained from local raw materials”, Project no.: 20.80009.7007.21.

**Keywords:** activated carbons, adsorption, isotherms, kinetic models, methylene blue, Langmuir, Freundlich, Sips.

## F.25. STUDY ON THE CURRENT STATE OF PREPARATION METHODS FOR HYDROTALCIITE (ANIONIC CLAYS)

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**Abstract.** Hydrotalcites, also called anionic clays, are mixed hydroxides, double layered [LDHs] natural or synthetic with exchange anions between layers and water molecules. This layered structure allows the intercalation of organic or inorganic anions and may result in multifunctional nanocomposite structures. Hydrotalcites are materials of scientific interest due to the properties of ion exchange, adsorption, desorption, memory effect and relatively simple preparation. These materials are affordable and inexpensive. Among the most important applications of LDHs is the absorption of pollutants from the environment. Hydrotalcites can be used as adsorbents for metals Cu (II), Cd (II), Pb (II) or Zn (II) in aqueous medium, LDH intercalated with L-cysteine, Cys-LDH used as an adsorbent for ion removal U (VI) from aqueous solution with adsorption capacity = 211.58 $mg \cdot g^{-1}$, modification of LDHs with ethylene diamine tetra acetic acid (EDTA) and study of Cr (VI) ion uptake from wastewater or soil. Double-layered hydroxides are also used to remove toxic dyes from aqueous solutions such as congo red, sunset yellow or indigo carmine. Their intercalation with other materials of organic or inorganic nature favors the diversity of studies and results. Therefore, the aim is to apply the best synthesis method with the most satisfactory results in the shortest possible time and with low costs, therefore based on the analysis of the literature, as a method of preparation of hydrotalcites is indicated the method of coprecipitation at low supersaturation, at constant pH. The conclusion of this study is that anionic clays can be used successfully in applications characteristic of food industry and environmental depollution.

**Keywords:** hydrotalcites, LDHs, preparation, applications of LDHs.

## F.26. POSSIBILITIES OF USING CLAY-BASED MATERIALS IN THE SERVICE OF PUBLIC HEALTH AND INDUSTRY, ESPECIALLY IN THE FOOD INDUSTRY

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**Abstract.**In this study, we wanted to show some possibilities of using clay-based materials in the care shown for public health, but also in different industries, especially in the food industry. First of all, we focused on the preparation of materials capable of retaining various inorganic and organic pollutants. Their existence in water could have detrimental effects on the human health and implicitly on the food industry, where water can be a raw material. There are well-known techniques and technologies for removing large amounts of pollutants. The challenge we address is to remove pollutants in small quantities and even traces. In this paper we started from the characterization of two sources of raw material based on clay, from Orașul Nou and Valea Chioarului. Then, chemically modified materials were prepared by pillaring and by adding of β-cyclodextrin. These materials were characterized by X-ray

diffraction analysis, by Fourier transform infrared spectroscopy and by BET method. Following these analyzes, it was highlighted that the prepared materials can retain various pollutants even if they are found in very small concentrations. The encouraging results lead us to finally think of a polluted water filtration device, a device that will support the health of population and the food industry, which has an important role in human health.

**Keywords:** montmorillonite, food-industry, public health.

## F.27. EVALUATION OF SENSORIAL AND ANTIOXIDANT EFFECTS OF BASIL (OCIMUM BASILICUM L.) EXTRACT ON COTTAGE CHEESE

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**Abstract.** Cottage cheese is a soft, rindless cheese. The body has a near white colour and a granular texture consisting of discrete individual soft curd granules of relatively uniform size, from approximately 3-12 mm and possibly covered with a creamy mixture. This study is intended to prepare cottage cheese by adding different ratios of basil (*Ocimum basilicum*, var. *Cress)* extract (0.15, 0.20, 0.25, 0.30, 0.35 and 0.40 g/100 g cheese). The results of the sensory analysis showed that there are differences in the aroma scores between the treated and control samples. Adding extract of *Ocimum basilicum* to cottage cheese samples gave it a pleasant and refreshing flavor. Cheese samples with basil extract (0.30 and 0.35 g/100 g) were highly appreciated. Flavored components in basil extract that had been used, led to an improvement in the sensory properties of the cheese. The same trend was observed by Sturza et al. in the cream cheese with berry powders, by Abbas et al. in the ultra-filtrated soft cheese supplemented with basil essential oil land and by El-Fataah Mohamed et al. in the cream cheese with *Moringa oleifera* leaves extract. Increasing the concentration of the extract from 0.15-0.40 g/100 g cheese gradually increased the inhibition percent from 30.97±0,04 - 79.24±0,12%, respectively. The IC 50 value of the extract was 0,3 g/100g. The DPPH scavenging ability of basil (*Ocimum basilicum* var. *Cress*) can be attributed to the presence of phenolic acids and flavonoids that have antioxidant activity: methyl-rosmarinate (17.98±0,08 mg/g), rosmarinic acid (14.53±0,02 mg/g), rosmadial (6.78±0,14 mg/g), carnosol (5.03±0,09 mg/g), dehydrodiferulic acid (3.26±0,03 mg/g), chicoric acid (1.36±0,02 mg/g), luteolin-glucoside (0.90±0,10 mg/g) querectin-rutinoside (0.79±0,05 mg/g) and epigallocatechin (0.76±0,08 mg/g). *Ocimum basilicum*'s components (rosmarinic acid, quercetin, carnasol, luteolin, chlorogenic acid, rutin and apigenin-glycoside) are well known for their antioxidant activity. Consequently, extract of *Ocimum basilicum* had excellent antioxidant properties which may be used as natural antioxidant and flavoring agent for cottage cheese. It can extend the shelf-life of products which normally have a short storage time. The inclusion of this natural compound would satisfy the current food manufacturers and consumers demands for healthier food.

**Keywords:** cottage cheese, extract of *Ocimum basilicum*, natural materials, antioxidant activity, sensory analysis.

**Acknowledgments:** This work was benefited from support through the 18.51.07.01A/PS State project "Decreasing raw material and food products contamination with pathogenic microorganisms", funded by the Government Republic of Moldova.

## F.28. MATERIALS WITH ADDED VALUE BY VALORIZATION OF INDUSTRIAL BY-PRODUCTS: BIOSORBENTS BASED ON RESIDUAL INDUSTRIAL BIOMASS IMOBILIZED

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**Abstract.** Obtaining materials with added value by valorization of industrial by-products is grounded on the new EU documents, the national reports and statistics and also on the new international scientific research studies that underlined the fact that nowadays, the environmental protection and preserve the human life quality is becoming a problem of certain necessity. In this context it was studied the obtained the new bioproducts capitalizing on industrial by-products (microbial residual biomass - RMB) by immobilizing RMB and studying the possibility of implementation as biosorbent in biosorption processes to retain some chemical pollutant from waste waters. The paper prersent the structural characteristics of the biosorbents obtained by immobilizing the residual biomass of *Bacillus subtilis sp.* and *Lactobacuillus* and the optimal values of the operational parameters (in static conditions) necessary to design biotechnological processes for the treatment of industrial effluents loaded with persistent organic pollutants (ie dyes: Brilliant Red HE-3B, Orange 16). Biosorption equilibrium were studied using classical models for adsorption isotherms (Freundlich, Langmuir and Dubinin-Radushchevic) and some characteristic quantitative parameters were calculated: maximum biosorption capacity, energy of the biosorption process. The thermodynamic study allowed the appreciation of the influence of temperature and spontaneity of the process, and the kinetic study allowed the elucidation of the process mechanism and the establishment of the determining speed stage.

**Keywords:** biosorption, residual biomass, immobilization, dyes, aqueous media.

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## F.29. CHEMICAL MODIFICATION OF CELLULOSE IN ORDER TO OBTAIN BIOMATRIX USED IN WATER DEPOLUTION FROM FOOD INDUSTRY

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**Abstract.** The aim of this research is to chemical modified a polysaccharide such as cellulose. This bioresource is mainly used in the food industry, while it is very little developed in the environmental field. Our research is based on the chemical modification of cellulose with substance such as esters or ethers. Derivate obtains are used in cosmetic and food industry, but also in environmental field. The matrixes obtained are characterized with Fourier Transformed InfraRed Spectroscopy (FTIR) and the degree of substitution. The

results obtained from their chemical characterization show the chemical modification of cellulose and its possibility to be used in water depollution from food industry.

**Keywords:** cellulose, biomatrix, depollution, food industry.

## F.30. DIMETHYL N-CYANODITHIOIMINOCARBONATE AND TRIPHENYLPHOSPHINE OXIDE METAL HALIDE COMPLEXES: MOLECULAR CRYSTAL ELUCIDATION

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**Abstract.** Two MX2 (M = Ni, Zn; X = Cl, Br) dimethyl N-cyanodithioiminocarbonate compounds and one $CrCl_2$ triphenylphosphine oxide complex were isolated and structurally characterized by single crystal X-ray crystallography. The compound $NiCl_2[(CH_3S)_2C{=}NC{\equiv}N]_2$ (1), crystallizes in the triclinic space group P-1 with Z = 2. The compound 1 features inversion-related hydrogen bonded dimers linked into chains interacting through C – H ··· Cl growing layers along [110] whose junction into a 3D structure is enabled by H-bonds. Though the dimethyl N-cyanodithioiminocarbonate family compounds is a little bit undiscoverable, this compound 1 is the first example of MX2 dimethyl N-cyanodithioiminocarbonate compound with a 3D structure. The compound $ZnBr_2[(CH_3S)_2C{=}NC{\equiv}N]_2$ (2), crystallizes in the triclinic space group P-1 with Z = 2. The compound 2 also exhibits inversion-related H-bonded dimers. In contrast with 1, the structure of 2 comprises chains along [110], connected via C - H ··· Br and C - H ··· S into a 2D layer along [-110]. The complex $CrCl_2(OPPh_3)_2$ (3), crystallizes in the orthorhombic space group $Fdd_2$ with Z = 8. This compound's obtaining undergone redox processes, oxidizing $[CH_3C(O)CH_2PPh_3]^+$ to form $PPh_3PO$, and reducing Cr center from $Cr^{VI}$ to $Cr^{II}$. In the structure, each molecule is linked to height neighbors through H-bonds affording a 3D network. The compound 3 is the first example of $CrCl_2(PPh_3PO)_2$ describing weak H-bonds giving rise a 3D framework.

**Keywords:** Crystal, dimethyl N-cyanodithioiminocarbonate, Ni(II), Zn(II), Cr(II), redox process, 2D-structure, 3D-structure.

# F.31. DEVELOPMENT OF NEW BIOSORBENTS BASED ON MICROBIAL BIOMASS IMMOBILIZED ON NATURAL POLYMERS

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**Abstract.** Persistent organic pollutants such as pharmaceuticals and dyes are a very important part of the non-biodegradable or hard biodegradable substances present in wastewater and effluents of wastewater treatment plants. They have been detected in many environmental matrices around the world (e.g., in water, wastewater, sediment and sludge). According to current legislation the presence of these contaminants in the water represents a significant risk, and some of them have already been declared as priority substances in water protection policies. Therefore, the development of advanced, environmentally friendly, low-cost and high-efficiency strategies for water treatment is one of the actual main global concerns. This paper aimed to obtain biosorbents by immobilization of microbial biomass on natural polymers and to evaluate their biosorption capacities for the removal of persistent organic pollutants from aqueous solutions. Two types of biosorbents were synthetized, using Saccharomyces cerevisiae and residual biomass of Bacillus subtilis as microbial biomass that was immobilized on calcium alginate beads. To evaluate the biosorption efficiency of the obtained biosorbents different persistent organic pollutants were tested. Promising results were obtained in the case of dyes (i.e. Orange II) and drugs residues (cephalexin, carbamazepine, diclofenac). This fact is supported by data recorded for the removal efficiency which reached values higher than 90% for dyes and between 36 and 60 % for drug residues. The findings of this study indicate that the obtained biosorbents are easy to handle and separable from the water, stable, and have the potential to be applied in the removal of dyes and drug residues from aqueous matrix.

**Keywords:** biosorbents, immobilized biomass, *Saccharomyces cerevisiae*, *Bacillus subtilis*, drug residues, dyes.

**Acknowledgments:** This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P2-2.1-PED-2019-1063, within PNCDI III.

## F.32. OPTIMIZATION OF SOME PHYSICAL AND FUNCTIONAL PROPERTIES OF EXTRUDED SOYBEAN CRUD RESIDUE-BASE FLOATING FISH FEED

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**Abstract.** Effect of some extrusion factors on soybean crud residue-based floating fish feed was investigated. Extrusion was conducted at 20%, 25% and 30% moisture content level, die size of 2 mm, 4 mm and 6 mm and screw speed of 150 rpm, 200 rpm and 250 rpm. Optimized value of extrusion factors was 30%, 6 mm and 150 rpm respectively and optimized result of responses, expansion rate (ER) floatation rate (FR) sinking velocity (SV) specific mechanical energy (SME) swelling capacity (SC) water absorption index (WAI) water solubility index (WSI) hydration capacity (HC) and hydration index (HI) are 32.73%, 95.87%, 0.024 $ms^{-1}$, 16.97 KJ/kg, 1.73, 1.61, 2.76, 0.51, and 0.67 respectively. Feed moisture content and die size has the most significant effect on the physical and functional properties of extrudate. Coefficient of determination $R^2$ ranges from 0.65 to 0.96, lack of fit not-significant, desirability in optimization of 0.806, suggesting adequacy of research. This extruded produce can be used for both domestic and industrial scale of catfish production.

**Keywords:** extrudate, soybean, expansion, floatation, desirability.

## F.33. RETENTION OF ANTHRACENE ON FUNCTIONALIZED ANIONIC CLAYS-LAYERED DOUBLE HYDROXYDES IN TREATMENT PROCESSES FOR WASTEWATER

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**Abstract.** In this work, we studied the retention of anthracene on anionic clays hydrotacites. Anthracene is a pollutant that can result from different industries (the plastics industry, adhesives, insecticides and others). For this work I have prepared different anions of anionic clays (Mg-Al-Fe in different ratios, Mg-Al-Fe-Cyclodextrins) MgAlFeLDH, hydrotalcite - like anionic clay, denoted as LDH, is obtained by the co-precipitation method at constant pH, and I studied their behavior concerning the retention of pollutants. Lamellar double hydroxides (LDH), also called anionic clays, are positively charged layered materials containing divalent and trivalent cations. The electro-neutrality of the material is ensured by the presence of inter-foliar anions, solvated by water molecules. These materials have an exceptionally flexible composition, which gives them exchange, intercalation, conduction and other properties, opening up wide areas of application because of their wonderful characteristics in terms of economy, polyvalence and easy preparation methods, high surfaces, uniform compositions of sharp criticality, lamellar structures, high ion exchange capacities and memory effects. These materials have an exceptionally flexible composition, which gives them exchange, intercalation, conduction and other properties, opening up wide areas of application because of their characteristics. According to a new procedure, several types of Mg-Al-FeHDL materials were obtained starting from different amounts of aluminum, magnesium or iron nitrates/chlorides/sulphates, by co-precipitation at constant pH with sodium hydroxide. In addition, the cyclodextrin that has functionalized the material brings an increase concerning the adsorption capacity of these materials. In this study, Mg-

Al-Fe anionic clays, functionalized with β-cyclodextrin, were used. To control the efficiency of anthracene retention, we monitored the anthracene concentration by spectrophotometric analysis at a wavelength of 252 nm. In the studies concern the retention of anthracene, we have worked with different quantities of adsorbent material and respect the other working conditions: dynamic regime; constant temperature; constant pH; time interval: by 0 up to 120 minutes. Contact time is an important parameter for the study of anthracene retention in both clay samples. This determination does give information regarding the optimal time to contact our adsorbent material with the polluted solution. Also, the hybrid material obtained (LDH with β-CD) develops a higher potential concerns the retention capacity of the pollutant, almost double. We can conclude that the obtaining hybrid organic-inorganic materials increases the properties of the original materials. Using this material, adsorption isotherms were determined as a function of agitation rate and temperature. The conclusion of this work was that we obtained favorable results concerning the retention of this pollutant on this clay-based material, prepared in our laboratories.

**Keywords:** anthracene removal, adsorption, nanomaterials, environmental protection, layered double hydroxide.

## F.34. UTILIZATION OF MATHEMATICAL MODELLING AND OPTIMIZATION BY RESPONSE SURFACE METHODOLOGY FOR ALUMINUM PILLARING PROCESS

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**Abstract.** Bentonite is a clay mineral easy to modify by the introduction of metallic cations fact that conducts to attractive and versatile products suitable for various applications going from gas separation to pollutants removal or excipients for food industry. This study was focused on the mathematical modelling and optimization of bentonite pillaring process by the intercalation of aluminum cations. The raw material and the aluminum pillared bentonite were analyzed by X-ray diffraction, nitrogen adsorption-desorption technique, ammonia-temperature programmed desorption and scanning electronic microscopy. Response Surface Methodology (RSM) using variations of two parameters, namely ratio aluminum cations-amount of bentonite (5 mmol/g, 12.5 mmol/g, 20 mmol/g) and calcination temperatures (300 ºC, 400 ºC, 500 ºC) was used for the evaluation of three main response functions: interlamellar distance, specific surface area and surface acidity. A ratio of 12.5 mmol/g aluminum cations-bentonite amount and a calcination temperature of 400 ºC were found as appropriate for the pillaring process. In these conditions, an interlamellar distance of 1.79 nm, a specific surface area of 146.3 $m^2/g$ and a surface acidity of 0.430 mmol $H^+/g$ were obtained. The high degree of accuracy recorded for the second order polynomial equations established as mathematical models for the output parameters suggest a good agreement with the experimental values indicating in the same time that the three-dimensional microporous materials obtained based on the experimental program possess properties useful in pollutants removal activities.

**Keywords:** bentonite, aluminum, pillaring, Response Surface Methodology.

## F.35. VALORISATION OF VINE BRANCHES BY SLOW PYROLYSIS

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**Abstract.** Vegetal residues are abundant, inexpensive, renewable, and carbon neutral resources, that can be valorised using various thermo-chemical technologies, e.g., combustion, pyrolysis, gasification. Among them, pyrolysis is the only technique leading to solid, liquid, and gas products, which are valuable sources of energy and materials. Biomass pyrolysis consists in thermal decomposition of organic matrix in an oxygen depleted atmosphere, obtaining a porous carbonaceous solid (biochar) and volatiles. The volatiles are further condensed resulting in a non-condensable fraction (pyrolytic gas) and a pyrolytic liquid (oil) containing cca. 15-35% water. The pyrolysis is usually conducted in the presence of a carrier gas which can be inert ($N_2$, Ar) or oxidant ($CO_2$, steam). Depending on the heating rate, β, the process can be slow (β≤60 K/min), rapid, or flash (β≥60000 K/min). Slow pyrolysis of chopped vine branches was performed in a fixed bed reactor, in the presence of CO2 as a carrier gas. The distribution of pyrolysis products, i.e., biochar, pyrolytic oil, and non-condensable gases, was dependent on variations in heat flux (5777-9549 W/m$^2$), CO$^2$ superficial velocity (0.004-0.008 m/s) and particle size (0.015-0.033 m). Correlations between these factors and process performances in terms of biochar and oil yields, expressed as ratio between the final mass of pyrolysis product and initial mass of vegetal material, were established using a 23 factorial plan. Kinetic models, whose specific parameters were regressed from experimental data, were selected to describe the process dynamics. The results obtained may provide useful data for the design, scaling-up, operation, and optimization of fixed bed pyrolysis reactors.

**Keywords:** factorial experiment, kinetic model, pyrolysis, vine branches.

**Acknowledgement:** This work was supported by a grant of UEFISCDI Romania, project code: PN-III-P2-2.1-PED-2019-4917, contract number: 372PED/2020, UPB T CH 45-20-03.

## F.36. EFFECTS OF HIGH-POWER ULTRASOUND ON THE QUALITY OF RED WINES

**MĂRGEAN ALINA, LUPU MIRABELA IOANA, PĂDUREANU CRISTINA, PĂDUREANU VASILE**

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**Abstract.**The production of quality red wines requires a period of aging, and this process takes even many years. Recent research emphasized the possibility of using high-power ultrasound as emerging technology to accelerate the aging process of red wines. After one month in bottle, red wine samples to which ultrasound treatment has been applied were significantly different compared to blank sample in terms of total phenolic content, color intensity and shade, alcoholic concentration and total acidity. Thereby, the application of high-power ultrasound might enhance the quality of red wines and shorten the aging period.

**Keywords:** red wine, aging, ultrasound.

# F.37. DEVELOPMENT OF CAROB (*CERATONIA SILIQUA*) PODS FUNCTIONAL PASTRY SAUCE WITH NO ADDED SUGAR

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**Abstract.** Unbalanced diet and sedentary lifestyle are two major risk factors for a large number of health problems, including: overweight and obesity, nutritional deficiencies, cardiovascular disease, type 2 diabetes, liver disease, nephropathy, hormonal imbalances, cancer and neurodegenerative diseases. The global prevalence of these diseases is increasing, and preventive measures are not sufficient or well implemented to significantly reduce these "pandemics". By applying all the principles of modern nutrition, we provide the body with the necessary support to regenerate and slow down the aging process. Personalized nutrition involves the highest degree of personalization of nutrition, namely: detailed diet on days and meals according to recommended foods and personal preferences. Currently, in order to create promising functional products, the possibility of using local plant additives, widespread in the region, is being studied. At the same time, plant additives are sources of biologically active substances, which once included in human nutrition, are potentially capable of manifesting curative-prophylactic effects. Personalized nutrition allows the reduction of environmental risk factors, the multifunctional approach to physiological needs and as a result brings essential changes in life. The research is devoted to create new functional products using bioactive compounds extracted from local plant materials. The technology of a pastry sauce based on Carob pods with no added sugar has been developed. Carob pods of local origin were used in. Carob pods contains three major carbohydrates: sucrose, glucose and fructose. Are also rich in protein (5-8 g protein per 100 g dry weight), vitamins A and B and several important minerals, such as K, P, Ca, and Mg, as major minerals and Fe, Mn, Zn, and Cu as trace minerals. It is also necessary to mention that Carob is hypoallergenic and in comparison with cocoa does not contain such substances as caffeine, fat or oxalic acid, which decreases the Ca absorption. It has been established that local Carob pods it is an important source of polyphenols, which show a high antioxidant activity. It was proved that pastry sauce based on Carob pods can be obtained without added sugar. The energy value of the elaborated functional carob-based sauce decreased by 60%, the fiber content increased 2.9 times, but Ca and Fe content increased in 2.9 and 5.08 times respectively. Increased antioxidant activity has been inregistrated, the significant level of polyphenols, flavonoids and flavanols. The evaluation of the organoleptic indices of functional carob-based pastry sauce showed that it has a fine and homogeneous consistency, a pleasant taste and smell characteristic of the basic ingredients: Carob pods with a specific dark chocolate smell and taste. The projected functional product - the confectionery sauce based on local Carob pods - will improve the nutritional coverage of different segments of the vulnerable population, such as people with diabetes, allergies, but also for groups of healthy people, but overweight or obese, will reduce the risk of nutritional diseases, will increase food security and life quality.

**Keywords:** functional food products, Carob, *Ceratonia siliqua*, low energy value, high biological value, fiber, antioxidant activity, no sugar.

# F.38. BIOACTIVE SUBSTANCES IMPACT PROFILE OF HEMP SEEDS (*CANNABIS SATIVA L.*) ON HUMMUS FUNCTIONAL PROPERTIES

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**Abstract.** Functional foods have gained popularity within health and wellness circles. The development of these products is quite complex, expensive, and risky because they must meet high and clear requirements especially for some special categories of consumers. The solution to the problem lies in the area of creating new functional products using bioactive compounds extracted from local plant materials. The technology of functional hummus has been developed using refined hemp (*Cannabis sativa L.*) seeds of local origin. The Republic of Moldova is a favorable country for growing hemp. Consequently, the development of technologies for obtaining functional products based on hemp seeds could become a key direction for the development of the national economy. The high nutritional value and potential functionality of this local raw material were proved by the presence of a significant amount of polyphenols (295±7 $\mu g \cdot ml^{-1}$) and tannins (4.25±0.54%) in it. UV/VIS spectra analysis showed that the seeds contain various groups of flavones and flavonoids, the antioxidant activity being more than 88%. *Cannabis sativa L.* seeds stand out from other species in the low content of sugar (5.71±0.01%), high protein potential (25.33±0.13%), and a good mineral composition: 438 $mg \cdot 100\ g^{-1}$ magnesium, 918 $mg \cdot 100\ g^{-1}$ potassium, 949 $mg \cdot 100\ g^{-1}$ phosphorus, and 7.82 $mg \cdot 100\ g^{-1}$ manganese. As a consequence, the technology of obtaining hummus based on hemp seeds determines its high functional potential. Hummus experimental samples demonstrated the increase of more than 2 times of protein content, comparing with control samples (classical recipe), from 6 to 13%, respectively. The dry matter content raised to 27%, the sugar level remained practically unchanged. The tannins amount increased almost 40 times and the total polyphenols content by 30%. Particular attention should be paid to the vitamin and mineral potential of hemp seed hummus, which content of vitamins B2 and B6 increased 1.5 times, nicotinic acid - 3 times, potassium - 70, phosphorus - by 175%, magnesium - by almost 215%, copper - 1.5 times, zinc - 2 times, manganese – 2.5 times. It is also should be noted the remarkable amount of essential fatty acids that raised 2 and 19 times for ω-6 and ω-3, respectively. Appearance, color, taste, and flavor parameters of functional hummus received the highest points in comparison with control samples within the organoleptic examination.

**Keywords:** Functional food products, hemp, *Cannabis sativa L.*, antioxidant activity, poliphenols, tannins, high protein content.

# F.39. COMPARISON BETWEEN ELECTROCOAGULATION AND COPRECIPITATION FOR THE TREATMENTOF OLIVE OIL MILL WASTEWATER

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**Abstract.** Olive oil mill wastewater is hazardous to the environment, not only because it contains recalcitrant and toxic compounds, but also due to its high organic load and turbidity. In this study, the aim was to make a comparative study on the treatment of olive oil mill wastewater by phase breaking methods which are co-precipitation with $CaCl_2$ and electrocoagulation (EC) with iron electrode. The removal efficiencies of COD and phenolic compounds are improved when electrocoagulation process is applied. Olive oil mill wastewater (OMW) is a dark red to black effluent produced during olive oil extraction. It is estimated that around 30 million $m^3$ of OMW are discarded annually in the Mediterranean area, which constitutes a significant source of environmental pollution due to high concentration of several organic compounds, such as long-chain fatty acids and phenolic compounds. In order to reduce the organic charge of the OMW, we chose two treatment methods: electrocoagulation (EC) based on the fact that the stability of colloids and suspensions is influenced by electrical charges, and co-precipitation using non-toxic materials which consist in the entrainment by a precipitate of substances normally soluble under the conditions used. Two different treatment processes were applied, electrocoagulation treatment (EC) with iron electrode and co-precipitation (COP) treatment with $CaCl_2$. The experimental set-up of EC consisted of a glass electrolytic cell and two iron electrodes spaced 2 cm apart and immersed during each experiment in 400 mL of liquid effluent. For COP, 40 mL of OMW were introduced in a glass beaker with added $CaCl_2$ (1g/L); the suspension was stirred at room temperature. In order to determine the removal yield of chemical oxygen demand (COD) and polyphenolic compounds (PC) after EC and COP, the recovered filtrates were analyzed. PC were quantified by the Folin-Ciocalteu colorimetric method using gallic acid as a standard, and COD was determined by the dichromate method as described by La Para et al and using an DR/890 HACH colorimeter. Accordingly, the comparison between COD and PC removal yield versus time displayed similar trends, but the evolution of PC seemed to level off more rapidly. Also, were obtained that EC out performs COP because of the in-situ formation of the coagulant as long as the sacrificial anode corrodes due to an applied current, while the simultaneous evolution of hydrogen at the cathode allows pollutant removal by flotation. In EC, three main processes operate synergistically to remove pollutants: coprecipitation, the electric field, and mixing conditions. In comparisonn, in COP, only the screening of electrostatic repulsion coupled to slow settling process is involved. However, energy requirements are clearly higher in EC. This study demonstrates that the removal yield of COD and PC by EC can reach almost 70% and 95%, respectively, whereas, the maximum removal yields using COP are 40% for COD and 65% and for PC. Thus, an EC process using iron exhibits a higher potential to treat Olive Oil Mill Waste water than COP with $CaCl_2$, but an economic assessment of the EC process is still necessary. EC has also the advantage of removing the smallest colloidal particles and producing a relatively low amount of residue also compare to COP large amount of sludge produced. For integral valorization approach of OWM, the residue of EC can be used as a complementary substrate for anaerobic digestion for the production of bio$CH_4$.

**Keywords:** olive oil mill wastewater, coprecipitation, electrocoagulation.

## F.40. THE INFLUENCE OF THE FUNGUS *BOTRYTIS CINEREA* ON THE PRODUCTION OF SWEET WINES

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**Abstract.** Everyone knows about cheeses with mold, but few people know that there are wines that are made from moldy grapes. The fungus *Botrytis cinerea* attacks grape berries with the so-called "noble rot". After the rot attacks the grapes, it begins to dry gradually out. By the time, the harvesters come for them. They have turned into shriveled balls covered in fluffy mold. This fungus naturally changes the ratio of water to sugar in the berry, making it an ideal base for creating sweet wines. The process of drying out the berry and increasing its juice concentration changes the metabolism of *Botrytis* mold and stabilizes its development. During the process, several antibiotics are released, including botricin, which prevents other bacteria and fungi from interfering with the formation of flavor and forming unpleasant phenolic tones. *Botrytis*, which feeds on acid and sugar, makes chemical changes in the grapes, creating new elements that change the bouquet of the wine. Since the mold consumes more acid than sugar, the acidity of the wines decreases. Besides, the *Botrytis* mold produces a special substance that prevents alcoholic fermentation. In the word obtained from partially dried berries, whose chemical composition remains unchanged, alcohol-resistant yeast bacteria can ferment sugar into alcohol up to 18-20 ºC. Nevertheless, due to the influence of mold, fermentation will stop earlier, and the wine will contain from 13.5º to 14º alcohol. If the harvested grapes contain even more sugar, the fermentation will stop even faster, and the wine will turn out sweeter, with low alcohol content. The wine becomes not only fruity and to some extent floral, but also acquires characteristic notes of liqueur, toast, ginger, and honey. Factors predisposing host tissue to infection by *Botrytis cinerea* included biotic (insects, invertebrates, and humans) and abiotic (nutrition, chemical, and cultural practices). Controlling insects (grape berry moth), modifying microclimate (leaf removal, special pruning), and reducing substrate availability for this mold have significant impacts on *Botrytis cinerea* survival and epidemic development.

**Keywords:** acidity, *Botrytis cinerea*, bouquet, grapes and sweet wines.

**Acknowledgments:** The research was funded by State Project 20.80009.5107.09 "Improving food quality and safety through biotechnology and food engineering", running at Technical University of Moldova and conducted at the Department of Oenology and Chemistry, Micro-winemaking Center.

## F.41. SENSORY ASPECTS OF WINE DISTILLATES MATURED BY DIFFERENT TECHNOLOGICAL PROCESSES

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**Abstract.** For the product obtained from the distillation of wine to be used in the preparation of products that are marketed under the name of the divine, cognac, or vinars, it is necessary to improve its quality through maturation and aging. Therefore, to ensure the normal maturation of the distillates, it is necessary to comply with certain technical conditions. The distillates are recommended to be matured in oak pots or tanks with oak staves, at a

temperature of 18-20 °C and a humidity of 70-80%. During the research, there were used the wine distillates obtained at the discontinuous installations "Charente" and continuous "VAND-M-01". Further, during maturation, the distillates were kept in oak barrels, in tanks with oak staves, and with the addition of oak sawdust type "Oaky wine AH" for 3 months. Before being matured, the wine distillates were analyzed under all organoleptic and physicochemical parameters. After 3 months of maturation, physicochemical and organoleptic indices were determined in wine distillates. Also, the profiles of those matured distillates were carried out, and were elaborated the technological schemes for the production of wine distillates and the actual divine. So according to the research, it has been shown that distillates obtained at Charente installation, maturated in barrels, have an intense aroma that is specific to the variety from which it is obtained, with oak shades, pleasant floral, sweet and softer in taste, while other distillates do not have a such an intense aroma, are poorly assimilated, balanced and slightly burning in taste. As for the distillates obtained at the installation with continuous operation VAND-M-01, matured in barrels and on oak staves, they were obtained with a lower quality. Therefore, we can affirm that the divine quality depends not only on the method of distillation and the one of maturation but also on the soil and weather conditions, such as soil, grape variety, region etc.

**Keywords:** distillates, oak staves, oak sawdust, sensory properties, divine.

**Acknowledgments:** The research was funded by State Project 20.80009.5107.09, "Improving food quality and safety through biotechnology and food engineering", running at the Technical University of Moldova, Department of Oenology, Micro-winery Center.

## F.42. YOGURT ENRICHMENT WITH JERUSALEM ARTICHOKE (HELIANTHUS TUBEROSUS) FLOUR AS PREBIOTIC SOURCE

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**Abstract.** Jerusalem artichoke (*Helianthus tuberosus*) tubers are a raw material used to obtain functional food ingredients, especially due to inulin, which is beneficial for people with special dietary requirements (diabetes, obesity etc.). This study was aimed to evaluate the effect of Jerusalem artichoke flour (JAF) addition in yoghurt compositions. Jerusalem artichoke flour was used up to 2% to improve the nutritional status of yoghurt. The chemical, nutritional and sensory properties of enriched yoghurt samples were evaluated. It has been established that the addition of JAF accelerates the fermentation speed and reduces the fermentation and coagulation time of yogurt, fact confirmed and by the increase in viscosity with increasing concentration of incorporated JAF. An inversely proportional relationship was established between the concentration of Jerusalem artichoke flour in yogurt samples and their syneresis index, during 10 days of storage the syneresis index reached a value of 15% for control sample and 10.8% for sample with 2% of Jerusalem artichoke flour. With respect to the sensory quality, yoghurt samples had acceptable scores from the taste panelists, the best results being registered for yoghurts with 1.0 and 0.5% Jerusalem artichoke flour.

**Keywords:** Jerusalem artichoke, yoghurt, inulin, prebiotic, probiotic.

## F.43. ANALYSIS OF MICRONUTRIENT CONTENT IN THE DAILY FOOD RATION OF PRESCHOOLERS OF REPUBLIC OF MOLDOVA

**SUHODOL NATALIA, DESEATNICOVA OLGA, CHIRSANOVA AURICA, REȘITCA VLADISLAV, CAPCANARI TATIANA, COVALIOV EUGENIA, BOIȘTEAN ALINA**

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**Abstract.** Nutrition is one of the decisive factors that influence the health and level of physical development of children. The mandatory requirement is that through quality food children receive trophies in optimal quantities and ratios, correctly distributed over time, in an accessible and appetizing form. Imbalance of nutritional principles, excessive or insufficient consumption of food, other inconveniences are major risk factors for degenerative diseases, malnutrition, obesity, cretinism, reduced physical and mental capacity, physical retardation etc. The degree of economic development, geographical area, family income traditions and other social inconveniences seriously affect children's nutrition. During the last 30 years, the Republic of Moldova has gone through a very difficult and irreversible period, from one socio-economic formation to another, absolutely different in terms of quality, built on absolutely different principles. These changes are very relevant in terms of the negative impact on the health of the population, including children and adolescents, which is also confirmed by official statistics. Although, in recent years, some indicators of children's health have improved, children from poor families are more prone to diseases caused by social factors. Thus, in recent years there are more and more cases of physical retardation in children. Although, in recent years, some indicators of children's health have improved, children from poor families are more prone to diseases caused by social factors. Thus, in recent years there are more and more cases of physical retardation in children. At the same time, about five percent of children are overweight (high weight for height). According to the National Program on Nutrition for 2014-2020, adherence to the principles of rational and balanced nutrition is a simple and effective remedy for strengthening and maintaining health and preventing non-communicable diseases related to diet, malnutrition and nutritional deficiencies. In this context, the National Center for Public Health has developed a model menu in accordance with the physiological norms of food, which is implemented in preschool institutions, starting with the fall of 2020. The aim of this research is to estimate the nutritional status of institutionalized preschool children, which is based on the proposed model menu and consists in assessing the compliance of the content of main nutrients and micronutrients with the recommendations in force. The study highlighted some moments of optimization of the compositions of the proposed rations (content of proteins, carbohydrates, lipids, vitamin C) at the same time the insufficient content in some microelements (Ca, Fe, Zn) was highlighted.

**Keywords:** model menu, nutrition, preschoolers, deficiencies.

## F.44. THE TECHNOLOGICAL QUALITY AND NUTRITIVE POTENTIAL OF FOOD BAKERY PRODUCTS

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**Abstract.** The purpose of this work presents the scientific study of the problem of insurance of the nutritive value and drawing up an adequate technology for manufacturing bakery products with the addition of waste of walnuts, which would be based on the use of natural additives/by-products, taking into consideration the requirements and norms of the normative-technical documents. Waste of walnuts are the products remaining after pressing

the nuts and extracting the walnut oil. Extremely rich in protein, essential amino acids, minerals, vitamins, polyphenols with antioxidant activity, these by-products have attracted the attention of the leading scientists. They can have applications as food additives with nutritional benefits. For the present research, an innovative bakery product with the addition of walnut flour (*Juglans regia L.*) in different proportions (2, 4 and 6%) was prepared. The rheological characteristics of the doughs, analyzed at Mixolabul Chopin, demonstrate that increasing the amount of walnut flour reduces the hydration capacity, the content of free water of dough, the enzymatic activity (proteolytic, amylolytic) as well as and shelf life of bakery products. Fortification with walnut flour (*Juglans regia L.*) ensures the improvement of bread quality: porosity and sensory characteristics of the products, such as aroma, color and consistency. The results revealed that the fortified innovative product obtained is well accepted by the consumers.

**Keywords:** bakery products, by-product, functional, rheology, walnuts waste, walnut flour.

## F.45. STATISTICAL APPROACH ON SENSORY QUALITY OF CROISSANTS STORED IN IMPROPER CONDITIONS

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**Abstract.** The basic criteria of sustainable products are health safety and optimal sensory properties. Both durability and products quality are influenced by the quality of raw materials, recipe and storage conditions. I chose to evaluate from a sensory point of view several types of croissants, which we find in small street shops stored in extreme conditions (cold in winter and hot in summer). The purpose of the research is the determination of organoleptic properties during 30 days, in improper storage conditions (in refrigerator - at 2 °C and on the outer sill of my home - the temperature being variable in this case).

**Keywords:** croissant, quality.

## F.46. SOLID PHASE EXTRACTION METHOD FOR THE EXTRACTION OF NEUROTRANSMITTERS FROM SHEEP BRAIN

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**Abstract.** Catecholamines and indolamines are biological compounds that can play the role of neurotransmitters and hormones and are involved in numerous neurophysiological processes (stress, anxiety, or depression). Dosing of these compounds in different biological samples can lead to a better understanding of the mechanism of diseases like schizophrenia, Parkinson's, and Alzheimer's disease. The present work presents the development of a simple and rapid solid phase extraction (SPE) method for the extraction of the twelve compounds (catecholamines, indolamines, their precursors and metabolites, and an internal standard) from sheep brain extract. In order to achieve the extraction of all the selected solutes using a single SPE cartridge, several types of commercially available support were tested, among them: cation exchange supports, hydrophilic-lipophilic supports, C18 supports

and PGC supports. None of the supports tested offered us the possibility of carrying out the extraction of 12 catecholamines from our standard mixture. We chose to use a coupling of two different cartridges: Oasis HLB and PGC which together ensure the extraction of all the compounds of the mixture with good extraction yields and with simple protocols. The optimized SPE method was successfully tested for the extraction of the 12 catecholamines from the sheep brain spiked samples. It allows both, the purification (a significant part of the components of the matrix is eliminated during this step) and a preconcentration of the samples.

**Keywords:** Catecholamine, Oasis HLB, PGC, SPE, Sheep brain extract.

## F.47. EVALUATION OF THE POTENTIAL FOR USE IN AGRICULTURE OF SEDIMENTS FROM BISTRITA RIVER BY PHYSICAL-CHEMICAL ANALYSIS

**ANDREI SIMONA[1*], RAȚI IOAN-VIOREL[1], RĂDUCANU DUMITRA[1], URECHE DOREL[1], NISTOR DENISA ILEANA[2]**

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**Abstract.** The potential for exploiting nutrient properties in river sediments is an area of interest for agriculture. Because of industrialization, rapid population growth and economic development, heavy metal pollution has become a serious problem for many rivers. Reported to the aquatic system, river sediments are potential secondary sources of metal pollutants. The aim of this study is to analyze the properties of sediments from the Bistrița River as a potential use in agriculture. Three soil profiles were executed, the execution points being determined according to the representativeness of the area, which, through the granulometric and chemical constitution, ensures the necessary nutrients for the plants. The pollution potential with four heavy metals was analyzed (Cd, Cu, Pb and Zn), as well as the content of salts, phosphorus and potassium. Were also analyzed the potential pollution with organochlorinated products (HCH), herbicide (DDT) and total petroleum products (THP). Cd, Cu, Pb and Zn were analyzed by the atomic absorption spectrometry (AAS) method. Following the interpretation of the analyzed results, it is recommended to use the soil in agriculture with an improvement of it by the administration of manure in the amount of 60 tons / ha and a frequency of three years. Covering land, which currently has an insufficient edafic volume, with sediment from the Bacau Leisure Lake, will help to improve the agricultural potential on the covered surface.

**Keywords:** agriculture, river sediments, soil pollution, nutrients, heavy metals.

## F.48. WATER, AN ESSENTIAL COMPONENT OF THE FOOD INDUSTRY

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**Abstract.** The importance of water for the food industry is well known. In other areas of industry, the water should not be hard and the water should not contain any substance that confers acidity or basic character. Unlike these fields of activity, in the food industry, additional conditions are imposed for water. This is because water has a very important

characteristic: first of all, water is the main component of all foods. Taking into account this quality, in this work we analyzed the water coming from some fountains from the village Piscu of Galati county - Romania. It has been found that, despite their great depth, their water is contaminated with several salts, mainly from chemical fertilizers used in the adjacent zone of the residential area. We remarked an increase of salinity, nitrites and nitrates, but also of water hardness in the fountains and as the fountain approached farmland.

**Keywords:** water, food industry, additional conditions

## F.49. THE ABILITY OF SEA BUCKTHORN TO FIGHT AGAINST *L. MONOCYTOGENES*

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**Abstract.** Worldwide, poisoning and food poisoning are one of the most severe public health and industrial development problems. Foodborne listeriosis is one of the most serious and severe foodborne diseases. This is an alarming infection usually caused by eating food contaminated with the bacterium *Listeria monocytogenes*. An estimated 1,600 people get listeriosis each year, and about 260 die. In past outbreaks, foods involved included ready-to-eat meat products, such as frankfurters, meat spread (paté;), smoked salmon and fermented raw meat sausages, as well as dairy products (including soft cheeses, unpasteurized milk and ice cream) and prepared salads (including coleslaw and bean sprouts) as well as fresh vegetables and fruits. Who is most at risk to get infected with *Listeria*? Several segments of the population are at increased risk and need to be informed so that proper precautions can be taken. According to the FDA, CDC, individuals at increased risk of being infected and becoming seriously ill with *Listeria* include the following groups: Pregnant women; Newborns - can develop life-threatening disease from perinatal and neonatal infections; Persons with cancer, diabetes, kidney, or gastrointestinal disease; Individuals with HIV/AIDS; Persons who take glucocorticosteroid medications; Persons with weakened immune systems and elderly. A major problem threatening the food industry is contamination with foodborne microbes of human origin resulting from improper handling and processing. *L. monocytogenes* is a foodborne pathogen that can cause severe invasive human illness (listeriosis) in susceptible patients. *L. monocytogenes* is a Gram-positive, facultatively anaerobic, non-spore forming rod. This bacteria is widely distributed in the environment and has been isolated from a variety of sources, including soil, vegetation, silage, fecal matter, sewage and water. Today we are increasingly looking for ways to combat the resistance of microorganisms to antibiotics and possibilities to substitute synthetic additives with natural ones, extracted from various plants. Sea buckthorn is rich in carotenoids, tocopherols, sterols, lipids, ascorbic acid, flavonoids, triterpenes. These compounds have biological and therapeutic activities such as antioxidant, antitumoral, immunomodulatory properties and antibacterial properties. The microbiostatic activity of some plants is a promising source of alternative solutions for their use in order to reduce microbial contamination of food. The objective of the study was to determine the antibacterial activity of sea buckthorn in vitro on *L. monocytogenes* ATCC 19118 and *L. monocytogenes* EGDe. The antimicrobial effect of sea buckthorn was achieved by the agar diffusion procedure and successive dilutions in order to determine the minimum inhibitory concentration and minimum bactericidal concentration. According to the obtained data, we notice that sea buckthorn has the most pronounced effect on *Listeria*, the diameter of the growth inhibition zone is 22.5 mm (well diffusion method). Identification of minimum inhibitory concentration (MIC) and minimum bactericidal concentration was performed by

double fold dilution. The minimum inhibitory concentration of sea buckthorn for *L. monocytogenes* was 62.5 mg/mL. The sea buckthorn has shown promising antimicrobial potential against listeria and can be used in the food industry to reduce the microbial contamination of raw material and food. It is important to mention that the microbiostatic activity of plant extracts rich in phenolic compounds represents a promising source of alternative solutions for their use in order to substitute certain food preservatives of synthetic origin. The expectation is to reduce the use of synthetic additives and antibiotics as preservatives.

**Keywords:** *L. monocytogenes*, sea buckthorn, antibacterial activity.

## F.50. EVALUATION OF THE ANTIMICROBIAL ACTIVITY OF THE WINE AND OTHER OENOLOGICAL EXTRACTS.

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**Abstract.** It has been done a review of the most relevant publications of scientific literature in the country and abroad using the databases PubMed, EMBASE, Google scholar, virtual health library (LILACS, SCIELO) and Science Direct Publisher Site, Europe PMC free article. According to many authors, red table wines have antibacterial properties. Good antimicrobial activity against pathogenic microorganisms, such as *Shigella sonnei*, *Salmonella typhimurium*, *Klebsiella pneumoniae*, *Escherichia coli*, *Proteus vulgaris*, *Proteus mirabilis*, *Staphylococcus saprophyticus* has been proved experimentally by the standard agar diffusion method. This effect is the result of the action of polyphenolic and antioxidant compounds in wine. Analysis of phenolic extracts of white and red wines revealed their pronounced antimicrobial activity. Moreover, it was noticed that common phenols inhibit the growth of *S. aureus* more actively than *E. coli* and *C. albicans*. *C. albicans* was resistant to more wine extracts than staphylococci and *E. coli.* Studies have also been conducted to evaluate the useful of bioactive extracts derived from certain by-products of wine production, such as the skins and stems of grapes. It is very important to ensure microbiological and biochemical stability in the process of winemaking and storage of finished wine. Therefore, the antioxidant and antimicrobial properties of the skins and stem extracts of grapes and red wines have been studied. Extracts from both grape skins and stems showed high concentrations of total phenolic compounds and antioxidant activity *in vitro*. In addition, they showed excellent antimicrobial activity, more pronounced against pathogens than against yeast. This means that they can be used to reduce or eliminate the use of $SO_2$ in wine production and thus to obtain healthier wines which will be microbiologically stable and protected from oxidation. Among other things, the use of by-products reduces the impact of wine production on the environment, because it provides a circular economy, which is extremely important nowadays.

**Keywords:** antimicrobial activity, wine, polyphenols.

## F.51. SYNTHESIS OF SILVER NANOPARTICLE EMBEDDED CATIONIC CLAY AS AN EFFICIENT CATALYST OF DYES AND ITS ANTIBACTERIAL ACTIVITY

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**Abstract.** Wastewaters contain a wide variety of organic compounds, such as organochlorine pesticides, organophosphorus pesticides, chlorophenols, fuels, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dyes, among others. In the last decades, harmful organic compounds have been reversed in the environment. AOPs (Advanced Oxidation Processes) are essentially physico-chemical technologies based on the *in situ* generation of oxidizing species that have a high reactivity to organic and inorganic matter. The $OH^-$ radical is capable of reacting instantly and non-selectively with both organic and inorganic compounds at reaction rates in the order of $10^7$ and $10^{10}$ L $mol^{-1}$ $s^{-1}$ and can decompose organic compounds by extracting hydrogen from certain functional groups, direct electron transfer or radical-radical interactions. Among all oxidative techniques, the most effective and eco-friendly techniques are represented by catalytic ozonation. This process involves $O_3$ and a homogeneous or heterogeneous catalyst. A facile, eco-friendly, and cost-effective method involving clay coating with silver was developed to prepare a microporous material BN-Ag 0 core shell with high catalytic and bactericidal /bacteriostatic activities against newly isolated bacterium from sewage sludge, named ISO SS. The catalytic activity of this nanomaterial in the mineralization process of Malachite Green and Tartrazine dyes was also tested.

**Keywords:** silver, adsorption, catalyst, catalytic ozonation, dyes, bacteria.

## F.52. CONFECTIONERY MASSES WITH EXTRACTS AND POWDERS OF CHOKEBERRY AND SEA BUCKTHORN FRUITS

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**Abstract.** Currently, the confectionery industry deals with functional foods manufacture with natural ingredients to increase their biological value (vegetable extracts and powders) and shelf life, reduce energy value and expand range of sugary products intended for a healthy diet. Synthetic dyes are used in the manufacture of confectionery products to give an attractive appearance to the food. Prolonged consumption of these foods leads to various harmful effects on the health of consumers. The replacement of synthetic dyes with compounds of natural origin obtained from chokeberry and sea buckthorn fruits in the manufacture of candies is current. Research has shown that these berries have various positive effects: antioxidant, antimicrobial etc. The aim of the research was the elaboration of the technology for the confectionery masses manufacture with extracts and powders from chokeberry and sea buckthorn fruits for the substitution of synthetic dyes. The influence of

vegetable extracts and powders from chokeberry and sea buckthorn fruits and the shelf life (50 days) on the sensory, physico-chemical characteristics, microbiological stability, and antioxidant activity (*in vitro*) in confectionery masses were investigated. It was found that the best results were obtained in the sample with chokeberry extract and powder, with a concentration of 5% (SCEP) and in the sample with sea buckthorn extract and powder, with a concentration of 4% (SSBEP), because it combines the higher points on sensory characteristics. The results show that the moisture content in the samples with extracts and vegetable powders was lower compared to the control sample (CS) 6.23%. During storage, the moisture content decreased unessentially, compared to the values obtained on the first day of production. On the first day of storage, the water activity was in the range of 0.670 - 0.697 u.c. and on the 50$^{th}$ day after production the values of this index decreased, being in the range of 0.611 - 0.695 u.c., proving that the samples were stable during storage. It has been shown that on the first day after production, the pH values in the samples examined depend on the amount of vegetable ingredients added and the chemical composition of the berries, in particular the content of organic acids. During storage, in all researched samples, pH values were decreased: with 4.2% (CS), 9.8% (SCEP) and 13.2% (SSBEP) compared to the first day. Probably, this decrease can be influenced not only by the chemical composition of the berries, but also due to the oxidation of the lipids in the ingredients, which have been used in the technology of manufacturing confectionery masses. It is attested that, during storage, the total number of germs decreased 1.76 times in SSBEP and 1.46 times in SCEP compared to the CS. It was found that all the samples investigated show antioxidant activity, the values being positive. During storage, antioxidant activity values decreased, but remained positive, showing the antioxidant capacity of the candies tested. The extracts in combination with vegetable powders can be used successfully in the technology of manufacturing confectionery masses as natural dyes, helping to increase the biological value of sugar products and allow expanding the range of candies and fillings.

**Keywords:** confectionery products, hydro alcoholic extracts, vegetable powders, antioxidant activity, quality.

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## F.53. QUALITY CONTROL OF RAW MATERIALS FOR POULTRY FEED

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**Abstract.** Quality raw materials are the basis of a balanced feed for the harmonious development of broilers. In the structure of compound feeds they are grouped as follows: energetic raw materials, protein of vegetable origin, mineral ingredients premixes that include vitamins, amino acids. The nutritional quality of the energetic raw materials and vegetal proteins is given first of all by the climatic conditions, by the maintenance of the crops, by the way of harvesting, storage and processing. The qualitative control of the raw materials and the combined feeds continues with the performance of the laboratory analyzes. From the physical point of view, the organoleptic properties are examined (taste, smell, color, shape, dimensions, degree of homogeneity), gradation analyzes (hectoliter weight, humidity, foreign body, infestation). From a chemical point of view, the following determinations are made: protein, fat, ash, acidity index chlorides. Mycotoxicologically are determined aflatoxin, fumonisin, zearalenone, T2, ochratoxin, deoxynivalenol. From a microbiological point of view, the most important analyzes are the detection of *Salmonella*,

yeasts and molds. Going through all the stages of checking the raw materials and the measures that contributes to the profitability of chicken farms offers the possibility to breeders to avoid undernutrition or overfeeding of chickens on the farms.

**Keywords:** quality of raw materials, broilers, combined feeds.

## F.54. THE USE OF ASCORBIC ACID IN BREADMAKING

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**Abstract.** Ascorbic acid (AA) is widely used in the food industry as an antioxidant, preservative, nitrosamine inhibitor, fortifying compound etc., due to its reducing and antioxidant properties. This paper aims to present the role of AA in breadmaking and the ways of replacing synthetic AA with natural vegetal sources. AA is used as an improver or oxidizing agent in short-term or even no-time dough development processes. It is added either to the flour or directly into the dough. The role of AA is to mediate the oxidation reactions that stabilize the dough to preserve its elastic and viscous properties. Thus, the dough can retain more fermentation gases which cause an increase in the volume of the bread, an improvement in the structure of the crumb (finer crumb, with smaller and many pores, uniformly distributed) and reducing the crust thickness. The addition of AA accelerates the consumption of glutathione, a tripeptide that otherwise forms disulfide bonds with low molecular weight gluten proteins, causing the gluten network to weaken. The process is represented as the ascorbate-glutathione or Halliwell-Asada cycle. As most of the AA is obtained by chemical synthesis from glucose or other carbohydrates, current trends are to replace it with plant materials rich in vitamin C such as rosehips, cranberries, acerola and Kakadu plums.

**Keywords:** ascorbic acid, bread, bread making, dough, rosehip, vitamin C, white flour.

## F.55. PREPARATION AND CHARACTERIZATION OF ACTIVATED CARBON FROM *PANDANUS CANDELABRUM* STEM USING $H_3PO_4$

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**Abstract.** *Pandanus candelabrum* stem agricultural biomass was used to produce low-cost activated carbon using phosphoric acid as the activating agent. The aim of this study is to find out the changes occurring in *Pandanus candelabrum* stem during activation with phosphoric acid ($H_3PO_4$). The adsorbent was characterized using Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-ray (EDX) and Fourier Transform Infrared Spectroscopy (FTIR). The BET method was used for textural analyses; surface area increased from 49.225 to 258.99 $m^2/g$, and pore volume increase from 1.046 to 3.383 $cm^3/g$ after treatment. The physicochemical analysis showed 82.51% of carbon and 4.06% of ash, which suggests a good precursor for the production of porous adsorbent.

**Keywords:** *Pandanus candelabrum* stem, phosphoric acid, activated carbon, chemical activation, morphology characterization.

# F.56. ORGANIC WASTE BIOREFINERY: THE KEY ROLE OF ANAEROBIC BUILDING BLOCKS

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**Abstract.** As the need for green energy and bio-based materials is fastly growing to face up the depletion of non-renewable resources, organic waste emerges as a potential feedstock that can reach higher economic and environmental sustainability than by conventional composting or anaerobic digestion. Thus, the objective is first to review and discuss the main potential routes for organic waste biorefineries. Then, a focus is put on their key building blocks among which pretreatment, dark fermentation, biological methanation and some of the processes devoted to the production of platform molecules. Bottlenecks and recent advances are also analyzed, accounting for technological aspects, social acceptability, and economic and environmental sustainability. Up to now, the applicability of the biorefinery concept to biowaste, or more generally to organic waste, has been far less developed than for whole crop and even lignocellulosic biorefineries, even though the potential feedstock of organic waste is high (e.g., 88 Mt/year only for food waste in the EU-28). Among assorted reasons, the heterogeneity and the variability of organic waste composition emerges as a major bottleneck to overcome. This explains why organic waste has been mainly treated using single processes, such as composting or anaerobic digestion (AD), which only provide low economic value products. However, alternative strategies involving the biorefinery concept are available and can be turned towards higher sustainability within a circular economy framework. Structure and potential of the organic waste biorefinery The structure of organic waste biorefinery (OWB) encompasses four families of building blocks which can be adapted as a function of biomass property. (1) First, biomass pretreatments are compulsory, as for composting or AD. Even for food waste, depackaging for inert removal as well as thermal hygienization must be applied, though these are far less severe than the treatments needed by lignocellulosic biomass. This also means that they are cheaper, and more environmentally friendly. (2) A key specific key building block of the OWB is dark fermentation (DF), which is an anaerobic process able to produce a biogas enriched in hydrogen ( ~ 60% v/v) and without methane, and a liquid digestate rich in short-chain fatty acids (SCFAs). DF is close to AD, except that methanogenesis is suppressed. This process is, however, very sensitive to many inhibitions, including pH, SCFAs content, and hydrogen partial pressure. Inhibitory effects of mixing conditions and of viscosity have also been identified. Mixed cultures are the rule, but DF usually leads to simplified community structures through mechanisms that are not fully understood yet. Finally, DF appears to be faster than AD, but is also more difficult to operate. (3) Upgrading digestate from DF can be used to extract/produce platform molecules, and/or a biogas enriched in either $H_2$ or $CH_4$. The simplest route is limited to biogas production and corresponds to the intensification of AD. $H_2$ could also be targeted using microbial fuel cells. But the latter are not mature, while the former has only been investigated recently. Alternatives for bio-based materials involve SCFAs separation (from preliminary purification to complete fractionation), or a direct conversion of SCFAs through biological routes: a typical example is the production of microbial lipids, but the efficiency of such processes strongly depends on the SCFAs profile in the digestate. Therefore, no optimum route can be defined, but OWB design is flexible and can be adapted to technical and economic constraints. (4) Biogas upgrading is the cornerstone to achieve carbon neutrality in OWB. $CO_2$ reuse by in-situ and ex-situ biological methanation has reached the demonstration scale, while the bioelectrochemical conversion of $CO_2$ in formate or acetate, despite promising results, is not mature yet. Thus, such

processes can be coupled to DF or any process producing biogas to enhance environmental sustainability. Organic waste biorefinery encompasses flexible strategies potentially able to produce renewable energy, platform molecules and bio-based materials in accordance with the principles of circular economy. While the recent advances in biogas upgrading enhances the environmental sustainability of this approach, economic viability is, however, still to improve.

**Keywords:** anaerobic digestion, dark fermentation, biological methanation, $CO_2$ reuse.

## F.57. GUIDELINES FOR THE STUDY OF PHOTOPROCESSES: TOWARDS THEIR UNDERSTANDING AND OPTIMIZATION

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**Abstract.** The use of energy sources considered as renewable and erroneously as free is receiving more and more attention from public authorities and scientific community. In addition to wind power, the sun is a source to be exploited through the use of photon energy for energy applications (production of solar fuels) or environmental applications (effluent decontamination). However, before proceeding to an implementation in real conditions (natural solar lighting conditions) and on a large scale (at least one meter for the characteristic dimension), it is necessary to understand all the scales of space and descriptions involved as well as the related phenomena. A photoprocess will thus have to be studied and developed at the laboratory scale by attaching as much importance to the reaction aspect as to the radiation aspect on the one hand and to the modeling and experimental aspects on the other. At this laboratory scale, artificial radiation sources (lamps and light emitting diodes) are classically used and it is necessary to characterize them in terms of incident photon flux density, emission spectrum and collimation degree. For that purpose, it is possible to have recourse to two main methods, one physical by using photosensitive sensors and the other chemical that is actinometry. These two methods are obviously complementary and allow a reliable determination of the boundary condition in the photoprocess. Once the photon flux density is known (in value, in spectrum and in collimation degree) it is necessary to consider the medium in which the photons will be used. If it is a homogeneous liquid solution in this case, it is only necessary to know the solution absorption coefficient and a simple Bouguer's law can be used to describe the photon flux profile in the solution. If it is a suspension ($TiO_2$ particles in a liquid for example), then it is necessary to determine/estimate the radiative properties of the particles. These data are used to solve the radiation transfer equation, which allows the estimation of the local luminance and thus the absorption rate of the radiation. The radiation being then well described within the laboratory scale process, the photoreaction of interest can then be implemented in specifically dedicated devices which must be as simple as possible (at all levels) in order to characterize with the best accuracy the reaction rate. The analysis between radiation absorption and reaction allows to formulate coupling laws according to different levels of complexity from the simplest (with the writing of an apparent quantum yield) to the most complicated, involving electronic transfer mechanisms. Only once this link between absorption and reaction is established under controlled conditions, it is possible to define engineering rules for the optimal design of photoprocesses operating under solar irradiation

**Keywords:** photoprocess, photon flux density, radiative properties.

# F.58. MEMBRANE FILTRATION AS A CRITICAL STEP IN WASTE MEAT BIOREFFINERY: EXAMPLE OF LIQUID EFFLUENTS FROM BOVINE MEAT COOKING PROCESSES

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**Abstract**. Valorization of food wastes through the biorefinery concept considers the chemical composition of the feed. Proteins with high potential as techno-functional ingredients to design complex food emulsion systems have been identified in liquid effluents issued by bovine meat cooking. As this effluent contains low percentage of dry weight (~4.0%, w/w), represented mainly by proteins, it is compulsory to increases the proteins content in liquid effluent before using as ingredient for food formulations. The aim of the present work is to test the feasibility of membrane process such as micro- and ultra- filtration to concentrate/fractionate protein in such effluent. Large amount of waste and by-products produced by the food industry raised serious social, environmental, and financial problems and thus, their valorization is a global issue for our society. However their complex chemical composition make them solid candidates as feedstock for biorefineries in which protein recovery is a major concern. Water issued from cooking of bovine meat with high loads of organic matter remains within the byproduct and may cause problems of disposal, excessive cost of treatment, and a great loss of valuable materials as proteins if classical food wastewater treatment systems are used in order to decrease the biochemical and chemical oxygen demands. Most of the organic compounds belong to proteins with good nutritional and techno-functional value considered as promising sources of new ingredients for food industry. In this context, it is obvious that alternative solution must be found to avoid protein loss in such effluent. However the thermal treatment of bovine meat generates various chemical reactions that induce conformational denaturation of proteins and consequently changes of their physicochemical properties. One of the main outcomes is that classic isoelectric solubilization/precipitation of protein is no longer appropriate for meat proteins recovery from liquid effluent. The main aim of this study was to prove the feasibility of membrane filtration to concentrate and fractionate the proteins of meat juice. The proteins recovered in retentates and filtrates were then evaluated for their physicochemical and functional properties. The raw material is a liquid effluent from the ground meat cooking for frozen prepared meals with low content of dry matter (~ 4.0 % w/w). It was concentrated before considering their assessments as a nutritional and techno-functional agent. The meat juice, after the separation of lipid phase, was passed through different molecular weight cut-off (MWCO) micro- (MF) and ultra-filtration (UF) membrane leading to fractionate it into permeate and retentate. These operations were contacted with a semi-pilot Millipore Cogent M1 device and membranes with 0.1 $m^2$ filtrate surfaces. The performance of the membrane filtration was estimated by measuring the permeate flow rate versus operation duration and by accurate dry weight and protein mass balance. Protein molecular weight distribution (MWD) in different permeate and retentate were assigned by fast size exclusion chromatography (SEC) with a Superdex 200 10/300 GE column. The ability of meat proteins obtained by UF fractionation to form and stabilize emulsions were evaluated through the emulsion capacity expressed in mL of emulsified oil per gram of protein and the emulsion stability expressed in percentage of stable emulsion in a formulation with solubilized proteins and oil. The SEC analysis of the initial feed shows broad MWD and proteins with very low (1 kD) and very high molar weight (700 kD). The MF treatment was not interesting for protein fractionating but acted as a nonthermal sterilization step and provided a permeate with a high biological stability. The protein recover yield in this step was 72.0%. The decrease in permeate flowrate with respect to time for UF was lower than for MF. The SEC results showed that the most interesting protein fractionation was achieved by cascade filtration with 100 kD and 50 kD MWCO membranes. Finally, the proteins extract from UF

retentate developed higher emulsifying properties than classic commercial ingredients such as sodium caseinate. Liquid effluents from beef meat cooking are sustainable biomass resources and the membrane technologies can be a promising way to recover valuable techno-functional ingredients with minimum environmental impact. Indeed, in spite of heat treatment applied during meat cooking the proteins maintain their emulsion capacity and this is an interesting result for food application. This study showed that UF is suitable for concentration and fractionating of high value proteins at low scale UF allowed to collect low and high MW proteins respectively in the permeate and the retentate. The former can be used as an ingredient in food recipes and the latter was suggested to be an emulsifying agent for food products. As a perspective, critical aspects such as the technical feasibility of the UF processes at industrial scale accompanied by an exhaustive techno-economic assessment of scale-up system must be undertaken in order to validate the membrane filtration as a major step in liquid waste stream processing in a waste meat biorefinery.

**Keywords:** membrane technologies, meat proteins, meat liquid effluents valorization, ultrafiltration, emulsifying agent.

## F.59. DENITRIFICATION OF TUNISIAN NATURAL WATERS BY BATCH ELECTROCOAGULATION PROCESS

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**Abstract.** In this study, electrocoagulation was proposed as an alternative method for the removal of nitrate ions from real groundwater. The effects of different operating parameters on the performance of the denitrification process, such as current density, electrode purity, emerged electrode area, gap between electrodes, and initial pH were also determined. In Tunisia, water resources are limited, unevenly distributed between the north and the south of the country and with varying periods of drought throughout the year. However, population growth, population urbanization and economic development make fresh water an indispensable good and the demand continues to increase every day. Moreover, in order to meet water needs, there has been an overexploitation of aquifers leading to lowering of their levels and degradation of the quality of their water. These aquatic resources are becoming more and more loaded in salts and nitrogenous compounds, mainly nitrates, which exceed 400 mg/L in the regions of Bizerte and of Cap-Bon in the north of Tunisia. Indeed, an excessive level of nitrate in water has undesirable consequences, on the one hand, on human health by causing several diseases such as hypertension, gastrointestinal cancers and methemoglobinemia or “blue baby syndrome”, and on the other hand, on the environment by causing the toxicity of aquatic ecosystems due to the phenomenon of eutrophication of rivers, lakes, and seas. Thus, with all these undesirable effects of the high concentration of nitrates in water intended for human consumption, it is necessary to find an efficient and economical process for the treatment of water polluted by these ions. The literature reflects many physical and chemical methods used to remove nitrates from water, including ion exchange, reverse osmosis, electrodialysis, and biological denitrification. Among these emerging techniques in the field, we can find electrocoagulation, referred to as EC. The aim of this study is, therefore, to demonstrate the feasibility of applying the electrocoagulation process in the batch mode for the denitrification of real groundwater at the lowest possible

cost. EC was applied in the batch mode and in a galvanostatic regime, on synthetic water with a physicochemical composition identical to that of natural Tunisian water with a nitrate content about 148 mg/L. The electrochemical cell consists of a cylindrical beaker containing 500 mL of electrolyte under agitation. Two horizontal Al electrodes served as anode and cathode. Voltage, current, pH, and conductivity were monitored throughout the process. A small volume of electrolyte was sampled every 20 minutes to determine the change in nitrate concentration over time by a colorimetric method (Reference 26053-45) using an HACH colorimeter DR/890. Since the current density is the parameter the most influencing the performance of the EC process, several current densities have been applied (23.8 $mA/cm^2$ – 42.8 $mA/cm^2$). It has been observed that, for a fixed treatment duration of 160 min, the denitrification efficiency ranged between ranged from 51.3% to 82.3%; the highest value was obtained with the highest current density. However, increasing current promotes anodic dissolution and an amount of aluminum greater than the theoretical dose expected from the Faradic yield was generated due to chemical dissolution resulting from the high concentration of chloride anions. For the same current density, the efficiency of EC rises with the increase of the surface of the emerged electrode; this is accompanied by the increase in the intensity/volume ratio which favors the dissolution of the anode. The gap between the electrodes plays a key role on the efficiency and the energy consumption by the EC process: on the one hand, the increase in the inter-electrode distance for an active surface favors the elimination of nitrates from 75.2% to 82.3%, but with a strong increase in energy consumption; on the other hand, for a reduced active surface, the efficiency is improved with a lower energy demand by reducing the gap between the electrodes. The type of electrode alloy also influenced the performance of denitrification; a decrease in residual nitrate (45.2 mg/L to 42.2 mg/L) was reported with 99.5% pure aluminum plates. Another key factor in optimizing EC efficiency is the initial pH of the water. For constant conditions of current density, gap between electrodes, and time, EC was conducted at initial pH of 3.0, 5.0, and 7.0. It was observed that whatever the initial pH, pH increased with time and levelled off just above 8.5; the best denitrification yield was obtained at initial pH of 7. This study allowed us to prove the feasibility of electrocoagulation as an alternative to classical methods for the denitrification of natural waters. The results indicated that optimum condition was pH of 7, 42.8 $mA/cm^2$ current density, 1.0 cm gap between electrodes and electrolysis time of 160 min, under which removal efficiency was 82.3%. By comparing the results of previous research on water treatment by EC and those of the present study, it can be concluded that the efficiency of the process depends essentially on the physicochemical composition of the treated water and can be managed by optimizing the various operating parameters.

**Keywords:** electrocoagulation, nitrate, real groundwater, current density, electrode purity, pH.

# F.60. IMPEDANCE SPECTROSCOPY TO INVESTIGATE THE DIELECTRIC AND ELECTRICAL BEHAVIOR OF SEAWEED POLYSACCHARIDES IN AQUEOUS SOLUTIONS

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**Abstract.** Polysaccharides are recognized as valuable polymers for industrial applications. They are renewable polymers with a large variety of structure and physico-chemical properties. Plants and more especially seaweeds consist of a large source of polymeric materials. Seaweed are marine algae classified in green, red, and brown algae. Brown algae such as *Cystoreira myriophylloide* contain large amounts of anionic polysaccharides in their cell walls. These are principally the alginates and the fucoidans. Electrical impedance spectroscopy was employed to investigate the dielectric and electric properties of matricial polysaccharides extracted from *Cystoreira myriophylloide* harvested in Sidi Bouzid coast (Morocco). Impedance data were obtained for different concentrations in a very large frequency range from $10^{-2}$ to $10^{6}$ Hz and at temperatures between 20 and 80 °C. These experimental data were analyzed and fitted with an appropriate equivalent circuit which showed a good fit for the experimental data. Moreover, an extrapolation of the very low (up to$10^{-3}$ Hz) and high (up to$10^{8}$ Hz) frequency regions was carried out to investigate the relaxation process. Tree kinds of relaxation processes were observed. The first one is the high-frequency relaxation ascribed to the fluctuation of the loosely bound counter ions to the polyelectrolyte within the range of the correlation length. The second is the relaxation at the medium frequency was also analyzed and was attributed to the hopping of bound counter ions within the polyelectrolyte. In contrast, the third relaxation at the very low frequency was attributed to the electrodes-solution interface due to electrodes polarization. The current study also presents a deep analysis of the electrical properties using the combination of the formalism of complex impedance ($Z^*$) and admittance ($Y^*$), extracting the complex conductivity ($\sigma^*$) from admittance. The effects of key parameters of each relaxation processes observed on the complex conductivity ($\sigma^*$) were analyzed and discussed, which encompasses the conductivity at low and high frequency ($\sigma_s$ and $\sigma_\infty$), the ionic strength $\Delta\sigma = (\sigma_s - \sigma_\infty)$, and the relaxation time $\tau$. Activation energy values ( $E_a$ ) were also determined and discussed. Finally, this approach could be considered as an effective method for analyzing the polymer chain distribution and the counterions binding nature in the polysaccharide solutions. These results were also in good agreement with those obtained during a rheological study, which relates electrical impedance spectroscopy data for the transition from the dilute region to the semi-dilute region.

**Keywords:** polysaccharides, electrical impedance spectroscopy, equivalent circuit, complex conductivity.

## F.61. SCREENING OF MICROALGAE FOR EXOPOLYSACCHARIDE PRODUCTION WITH INDUSTRIAL APPLICATION

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**Abstract.** Polysaccharides are macromolecules widely exploited as hydrocolloids (gelling, thickening and stabilize agent) and biological agents (elicitors of plant defense reactions, anticoagulants, antiparasite, antioxidant, prebiotic etc.) in various industrial fields. Various structures of polysaccharides were identified in all living organisms, but the mains are obtained from terrestrial plants, macroalgae, bacteria or fungi. In spite of their taxonomic diversity, photosynthetic microorganisms as microalgae and cyanobacteria have been the subject of very few studies regarding the exopolisaccharides (EPS) production. As part of the program ANR POLYSALGUE, 166 microalgae and cyanobacteria from Biological Station of Roscoff were screened in order to identify new producers of EPS with very high valorization potential and that can be cultivated in controlled conditions in photobioreactors. This screening led to the identification of 45 strains with EPS+ phenotype and 20 of these have been eligible for the structural characterization.

**Keywords:** exopolysaccharide, polysaccharide, microalgae, cyanobacteria, photobioreactor

## F.62. DETERMINATION OF PRIMERS EFFICIENCY IN THE DETECTION OF *PEDIOCOCCUS* IN WINES

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**Abstract.** *Pediococcus spp.* are lactic acid bacteria which are considered spoilage in the wine making processes. They are responsible for fast production of diacetyl and glucan, causing undesirable olfactive changes in wines, instabilities and increasing viscosity levels (wine ropiness). Early detection can minimize the negative effects of *Pediococcus spp.* on wine quality and prevent the development of advanced spoilage stages. The goal of this work was development and testing of a fast and efficient Real Time Polymerase Chain Reaction (RT-PCR)-based method for easy detection of *Pediococcus spp*. strains in wine in the early stages of wine spoilage. To achieve this goal, primer sets for the RT-PCR were designed to allow for correct and efficient detection of *Pediococcus spp*., and experimentally tested. Total DNA from the red wine produced from endogenous grapevine variety Feteasca neagra infected with *Pediococcus spp.* was isolated. Specific primers were designed based on the DNA sequences available in public databases. The primers were tested in RT-PCR reaction with the isolated DNA as a template. The melt curves for each primer set were built. The melt curves for each primer set showed a single well pronounced peak of the expected melting temperature. The efficiency of the primer sets was determined using the serial dilutions of the template and the appropriate calculations. The best primer pair showed the efficiency of 100.36%. The average Cq/Ct value obtained for the wine sample was equal to 22.51. All tested primer sets can be used for detection of *Pediococcus spp.* in wine in the

early stage of wine spoilage, with one primer set showing the best efficiency and capability of detecting *Pediococcus spp.* in the template with higher dilution factor. Significance and Impact of the Study: The developed primer sets can be successfully used for early detection of *Pediococcus spp*. in wines by RT-PCR, as an alternative to the traditional culture-based methods which are time and labor consuming.

**Keywords:** Real time PCR, wines spoilage, lactic bacterium, dilutions, microbiological DNA

## F.63. PRODUCTION OF A FUNCTIONAL FOOD DRINK BASED ON THE BIOLOGICALLY ACTIVE POTENTIAL OF THE ANTHOCYANIN EXTRACT FROM GRAPE POMACE

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**Abstract.** Global and regional climatic, energy and food crises impose on the current scientific society the task of acquiring new fundamental and applicative knowledge in highlighting, evaluating, and directing the genetic and physiological mechanisms of the production process and the ecological resistance of plants. Research aimed to obtain a functional drink based on triticale species, with the optimization of its biological potential by the administration of some functional components. Triticale species homologated in the Republic of Moldova Inger 35 cultivated on the experimental field of the Institute of Genetics, Plant Physiology, and Plant Protection was studied in the Biochemistry Laboratory of the Genetic-Vegetable Resources Center and Bioaliment Platform of the University of Dunărea de Jos, Galati. The functional components used in the research were represented by natural bee honey harvested in 2018 in the proportion of 5 g /100 mL studied drink and anthocyanin extract from dried sweet grape pomace with a weight of 3 g /100 mL studied drink. The fermentation process of functional drink was carried out by the *Lactobacillus Plantarum* species (concentration $3,2 \cdot 10^9$ UFC/mL) for 4 hours. The obtained beverage was kept for 40 days at the temperature of 4°C and in the dynamics, every 7 days the specific and technological parameters were determined. The experimental results described the growth dynamics of lactic acid (0,5 g/100 mL beverage), log UFC/mL (0,42), and the descendant content of reducing sugars, starch, and pH value. The high content of antioxidants, obtained by fermentation and maintained at a high level during storage, has attributed to this drink the title of functional food quality with a benefic potential for human health. The number of viable *Lactobacillus Plantarum* cells was maintained at a high level during the conservation, thus giving the drink the quality of probiotic food and providing the human body with a quarter of the daily need for soluble and insoluble fiber at consumption of 150-200 mL/day. The optimization of the functional beverage production process by mathematical treatment of the results made it possible to establish the technological scheme that keeps the highest content of polyphenols, reducing sugars, fibers and NTG for 35 days of conservation.

**Keywords:** anthocyanin extract, functional drink, germination, technological process and triticale.

**Acknowledgments:** the research was funded by EMS-ENI 2 SOFT 1.2.83 Project "Intelligent Valorization of Agro-Food Industrial Wastes", running at Technical University of Moldova and conducted at Department of Oenology and Chemistry, Micro-winemaking Center.

## F.64. OPTIMIZATION OF ALIGOTE DRY WHITE WINE PRODUCTION UNDER TUM MICRO-WINEMAKING CONDITIONS

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**Abstract.** Sulfur dioxide has been used in winemaking since antiquity, first for the disinfection of grape processing areas and for the storage of wine, containers, and technological equipment, and later for the treatment of must and wine. Currently, winemakers consider that obtaining quality wines under industrial conditions without the use of sulfur dioxide is practically impossible, but it is obvious that there are currently wines that have not been treated with sulfur dioxide, but they require special care to prevent various diseases and get a quality product. In laboratory conditions, three samples of dry white wine of the European Aligote grape variety were studied, produced by three different processes respecting the entire technological process: I – classical method without sulphation, II – classical method with sulphation of 20 mg sulfur dioxide/L of wine and III – the classic method with sulphation of 40 mg sulfur dioxide/L of wine in industrial micro-winemaking conditions. According to the results of the microscopic examination, yeast colonies, agglomerates of bacteria, crystalline particles, tartaric salts, microorganisms, and autolyzed yeasts were identified. Also visible were the cells of genus *Oidium* and *Aspergillus* molds from brown to black color. It follows that the wines obtained by processes I and II do not correspond microbiologically and physico-chemically to the quality standards in force and are harmless to human consumption. The most sensitive oenological microorganisms are bacteria, for the destruction of which the concentration of molecular sulfur dioxide lower than 5 mg/L of wine is sufficient, followed by oenological yeasts of the Saccharomyces genus with doses over 10 mg/L and the most resistant are molds, for destruction which require high concentrations of molecular sulfur dioxide - greater than 35 mg/L of wine. Organoleptically study, the primary flavors characteristic of the wine variety ware associated with the $SO_2$ dose of 0 and 20 mg/L, but otherwise absent in the samples with the treatment of 40 mg/L $SO_2$. In this organoleptic study, no defects of the wine (sensory or visual) produced by the 3 technological processes were detected.

**Keywords:** oenological microorganisms, sensory characteristics, sulfur dioxide and white wine technology.

**Acknowledgments:** The research was funded by State Project 20.80009.500727 “Physico-chemical mechanisms of redox processes with electron transfer involved in vital, technological and environmental systems”, running at the Technical University of Moldova and conducted at Department of Oenology and Chemistry, Micro-winemaking Center.

## F.65. OPTIMIZATION OF OPERATIONAL PARAMETERS OF AN IMPROVED MAIZE SHELLER USING RESPONSE SURFACE METHODOLOGY

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**Abstract.** Maize shelling is an essential process in preserving the quality of maize after harvesting. The three parameters speed (850 rpm, 950 rpm and 1100 rpm), moisture content (12, 15, and 17%) and feed rate (120 kg/h, 130 kg/h and 140 kg/h) illustrate the ability of the machine to shell maize. The research is to optimize factors on three parameters for the evaluation of an improved motorize maize sheller. Statistical analysis was performed using

response surface methodology (RSM) with 3 by 3 factorial experiments with 3 replicates. Results obtained showed that the throughput capacity of 630.97 kg/h; shelling rate 485.34 kg/h and machine efficiency 93.86% of machine is maximum for 129.6 kg/h feed rate and moisture content 16.49 (%) and machine speed of 1026.9 rpm. The machine can be used on commercial farms with these operational results.

**Keywords:** maize sheller, optimization, ANOVA, machine efficiency, throughput capacity and shelling rate.

## F.66. CHARACTERIZATION OF SANDSTONE PORE NETWORK USING MERCURY POROSIMETRY, HELIUM POROSIMETRY AND SCANNING ELECTRON MICROSCOPY

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**Abstract.** Porosity and total pore volume are fundamental properties which are vital in gaining a comprehensive insight into the structure of porous rocks. Sherwood sandstone was characterized using Mercury Intrusion Porosimetry (MIP), Helium Intrusion Porosimetry (HIP) and Scanning Electron Microscopy (SEM). The total intrusion pore volume and total porosity increased after treatment. While the bulk density decreased after treatment. The total accessible porosity was higher in the treated sample (26.95 % MIP and 30.67 % HIP) when compared with the raw (7.41 % MIP and 11.06 % HIP). The total pore volume was also larger in the treated sample (0.1538 mL/g; MIP and 0.231 $gcm^{-3}$ HIP) when compared with the raw (0.0775 mL/g; MIP and 0.116 $gcm^{-3}$ HIP). The helium intrusion had a higher result than the mercury intrusion. These results suggest helium due to its small size must have penetrated smaller and finer pores in the rock samples. The modal pore size moved from 14000 to 24000 nm. These results show that treated has more micro, meso, macro and coarse pores than the raw samples. The densities of the samples determined from HIP and MIP decreased after treatment. SEM shows the difference in surface morphology and textural properties. The raw sample was homogeneous and displayed a fine grain size, while the treated has loose and less dense-packed pore space distribution. These techniques provided more insight into the assessment of porous solids.

**Keywords:** Sandstone, pore volume, porosity, PSD, MIP.

## F.67. TUNING THE CAPABILITY OF AL: $SRTIO_3$ IN PHOTOCATALYTIC APPLICATIONS BY ALTERING THE CHEMICAL COMPOSITION AND PHYSICAL APPEARANCE

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**Abstract.** An efficient photocatalyst is expected to have a large surface area, superior sensitivity to the visible region of the solar spectrum, appropriate band energetics, and agile carrier transport to inhibit recombination processes. In fact, a basic problem remains to be solved, which is the development of novel semiconductors with superior electronic

properties and optimal potentials, additionally showing a high capability of absorbing the visible components of sunlight. Photo catalytic reaction is strongly dependent on the structural and electronic properties of the semiconductor and various strategies have been applied to increase the charge separation efficiency of semiconductor-based photocatalysts, such as modification of the surface with a suitable co-catalyst, crystallinity for the recombination of photoexcited charges, small particle size for easier diffusion of photogenerated charges to the surface reaction sites. We want to present here the developing method of 3D heterostructures based on oxyhydroxides (γ-FeOOH) coupled to a well-known perovskite photocatalyst, Al:$SrTiO_3$. The structural, morphological and optoelectronic properties, charge/energy transfer mechanisms and his potential asvisible-light driven photocatalyst are discussed in detail. Moreover, we will present how chemical functionalisation with oxyhydroxide nanoparticles as co-catalysts leads to the stabilization of the smaller perovskite particles, reduction of the agglomeration resulting in larger accessible surface areas for the use of solar energy to activate the process.

**Keywords:** Photocatalytic applications, novel semiconductors, perovskite photocatalyst, structural, morphological and optoelectronic properties.

**Acknowledgments:** This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS - UEFISCDI, project number PN-III-P1-1.1-TE-2019-2037 within PNCDI III".

## F.68. METHYL ORANGE DRIVEN $NIFE_2O_4$ NANOPARTICLES SELF-ASSEMBLY AS SPONGE-LIKE FORM AND THE REVERSIBILITY OF THE PROCESS UNDER THERMAL TREATMENT

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**Abstract.** Materials at nanoscale levels with morphology-controlled features are of great significance to the design and photocatalyst development. In the mentioned context, the present study highlights a phenomenon of organic azo dye driven self-assembly of $NiFe_2O_4$ nanoparticles as sponge-like form. The unexpected features of solid-state morphology changes from zero-dimensional to quasi one-dimensional and back again were evaluated by applying a wide range of complementary physico-chemical characterization techniques to unequivocally assess the nature of the self-assembly process. Scanning electron microscopy reveals the reversibility of the above mention process under various applied conditions. Zero-dimensional nickel ferrite nanoparticles (as-synthesized) are assembled into quasi one-dimensional fibers, uniformly distributed in all three directions by adsorption of Methyl orange (MO) dye, with texture preserved after the photocatalytic process, and finally it returns to the initial appearance (zero dimensional) by applying a thermal treatment.

**Keywords:** Nanoparticles self-assembly as sponge, photocatalyst development, $NiFe_2O_4$ nanoparticles.

**Acknowledgments:** This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS/CCCDI –UEFISCDI, project number PN-III-P2-2.1-PED-2019-4215, within PNCDI III.

## F.69. $SRTIO_3/NIFE_2O_4$ TYPE VISIBLE-LIGHT DRIVEN POROUS-FOAM NANOCOMPOSITE BY JOINT SOLID STATE AND SOL-GEL AUTO-COMBUSTION TECHNIQUES

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**Abstract.** Nanomaterials such as nanoparticles, nanowires, nanotubes, nanorods and quantum dots present unique opto-electronic, electrical, magnetic and mechanical properties. The development of new strategies to assemble these nanomaterials into patterned heterostructures with multiple functionalities and tailored physical properties is an urgent need for application in nanotechnological devices. The heterostructures offer attractive new possibilities for device applications due to the controlled integration of complementary nano-components, which exhibit synergistic effects that combine multiple functionalities in one structure. In this research, we reported on the formation of highly porous foam $SrTiO_3/NiFe_2O_4$ heterostructure by joint solid state and sol-gel auto-combustion techniques. We proposed a mechanism describing the highly porous framework formation confirmed unequivocally by a series of complementary analytical techniques. As revealed by FE-SEM analysis, SrTiO3-$NiFe_2O_4$ nanocomposite self-assembled into robust porous-foam with internally well-defined porous structure. HRTEM characterization certify the distinctive crystalline phases obtained and reveal that $SrTiO_3$ and $NiFe_2O_4$ nanoparticles were closely connected.

**Keywords:** porous foam SrTiO3/NiFe2O4 heterostructure, sol-gel auto-combustion techniques, crystalline phases.

**Acknowledgments**: This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS/CCCDI –UEFISCDI, project number PN-III-P1-1.1-TE-2019-2037, within PNCDI III.

## F.70. FROM ZERO-DIMENSIONAL TO QUASI ONE-DIMENSIONAL $N_IF_{E2}O_4$ PHOTOCATALYST: TOWARDS DEVELOPMENT OF NANOFIBERS-TEXTURED MATERIALS

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**Abstract.** Combining nanotechnology with solar energy can lead to innovative technologies for water purification. More serious is that the contamination of water bodies occurs by the extended discharge of persistent and bio accumulative contaminants in effluents to the environment with a huge toxic effect in wildlife and human. The present study present for the first time the extraordinary concurrent adsorptive and photocatalytic properties of fibrous $NiFe_2O_4$ photocatalyst over Methyl orange (MO) dye up to almost complete mineralization

in one step, in the presence of visible light irradiation. Moreover, the study highlights essentially also a self-assembled phenomenon rarely encountered in $NiFe_2O_4$ nanoparticles. To the best of our knowledge, $NiFe_2O_4$ nanoparticles with fibrous morphology is unprecedent. The presented results may contribute to photocatalyst development by in/ex-situ tuning the morphology of the material, which allows active sites to spread over a wide internal surfaces and pores which, in turn, enhance the photodegradation ability of the catalyst. To date, there is no study on how adsorption of an organic dye occurs on magnetic nanoparticles, and the results will bring an initial and very useful understanding of the adsorption mechanism of MO molecule over the oxide type-composite surface.

**Keywords:** photocatalytic properties, self-assembled phenomenon, $NiFe_2O_4$ nanoparticles.

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## F.71. OBTAINING AND STABILIZING DYES, ANTIOXIDANTS AND PRESERVATIVES OF PLANT ORIGIN FOR FUNCTIONAL FOODS

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**Abstract.** The purpose of the work is establishing the theoretical and practical principles of obtaining and stabilizing dyes, antioxidants and preservatives of natural origin by elucidating chemical, physicochemical and biochemical transformations that take place under conditions of extraction, storage and addition of plant matter in food, with the formulation of technology of some functional foods. Determination of the optimal hydromodule for the extraction of the BAC (minimum bactericidal concentration) complex and application of empirical mathematical models to describe the kinetics of the extraction process; the influence of conventional extraction conditions, of different "green extractions" techniques and heat treatments on the yield of BAC from berries and grape marc, of antioxidant activity and chromatic parameters; the influence of pH and the effect of metal ions present in food on the color stabilization of extracts and their antioxidant activity; determination of the microbiostatic activity of the vegetal matter, of the bioavailability BAC in vitro; elaboration of functional food manufacturing technologies, determination of quality and food safety indicators, of chromatic parameters and antioxidant activity and their evolution during storage. Scientific novelty and originality: For the first time, all stages of obtaining and stabilizing BAC from berries and grape marc with the use of secondary metabolites of plant matter with coloring, antioxidant and antimicrobial properties were examined in order to replace synthetic dyes, antioxidants and preservatives in the formulation of functional foods. ain results: The optimal hydromodule for the extraction of the water-soluble complex from berries and grape marc was determined, which ensures the obtaining of an important BAC content and an optimal solvent consumption; the influence of conventional extraction conditions, various "green extractions" techniques and heat treatments on the water-soluble and fat-soluble BAC yield of berries and grape marc, antioxidant activity and CIELab (three-dimensional space of color representation) chromatic parameters was elucidated; the influence of pH and the effect of metal ions present in food on the color stabilization of extracts and antioxidant activity has been demonstrated; the microbiostatic activity of the vegetal matter on the pathogenic microorganisms was determined; the bioavailability of carotenoids was determined in vitro; technologies for the manufacture of functional foods have been developed with the determination of quality indicators, chromatic parameters, in vitro antioxidant activity and their evolution during storage. Theoretical significance: For the first time, the methodology for determining the optimal hydromodule for the extraction

of the water-soluble complex in solid-liquid system was elaborated; for the first time various Informatics methods such as analysis of mutual information and sensitivity, canonical correlation, mathematical models as cubic spleen function and fuzzy sets were applied to determine the influence of extraction conditions and technological parameters on the yield of BAC, quality, food safety and on biological value of functional foods.

**Keywords**: extracts, vegetable powders, biologically active compounds, dyes, antioxidants, preservatives, functional foods, quality.

## F.72. ISOLATION OF DNA FROM PLANT MATERIALS - EXPERIMENTAL APPLICATION FOR TEACHING LABORATORY

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**Abstract.** Isolating DNA from plant tissues can be very challenging as plants produce secondary metabolites that interfere not only with extraction of high-quality genomic DNA. For example, polysaccharides and polyphenols are two classes of plant biomolecules that vary widely between species and are very problematic when is isolated DNA. There are various methods for DNA extractions, each having its advantages and disadvantages. In order to illustrate a simple procedure for the isolation of DNA was chosen onion as plant material because this vegetable does not contain starch, thus eliminating some of the interference that occurs when isolating DNA. The use of a liquid detergent, facilitates the separation of polysaccharides during purification, while some additives can aid in removing polyphenols. At higher salt concentrations, polysaccharides are insoluble, while at lower concentrations DNA is insoluble. Consequently, by adjusting salt concentration in lysates containing liquid detergent, polysaccharides and DNA can be differentially precipitated. In summary this experiment is rapid, cost efficient and can be easily realized in the teaching laboratory.

**Keywords**: DNA extraction, onion, liquid detergent, teaching laboratory experiment.

## F.73. BENEFITS OF EGGS FOR HAIR AND SKIN

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**Abstract.** Protein-packed eggs are among the super foods for good health. Not only are eggs beneficial for the body, they also can provide a good dose of nourishment to the skin and hair and make them healthier. Rich in Lutin, eggs can provide hydration and elasticity to the skin while the high protein content can help in repairing tissues and firming skin. The proteins in eggs can be used in softening the hair, and also to give it strength and shine. Eggs for hair. Eggs can work wonders on damaged hair. As hair is made up of 70 per cent keratin protein, eggs can be used to rebuild damaged and dry hair making it smooth and moisturised. And guess what, it is suited for all hair types. Whip up some eggy hair masks to get strong, soft and silky hair of your dreams. Eggs for skin. Eggs can be used in improving skin texture, be it dry or oily. Egg yolks are rich in fatty acids which can lend moisture to the skin while

the egg whites contain albumin, a simple form of protein that helps tighten pores and also remove excessive oil.

**Keywords**: protein, eggs, hair, skin.

## F.74. TRACEABILITY OF ORGANIC BREAD WITH ADDED RYE FLOUR

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**Abstract.** The paper presents a documentary study on the traceability of organic bread with the addition of rye flour. Bread is the most consumed food and that is why it is very important to know its traceability. In the bakery, pastry, confectionery industry, in the technological process are used in addition to classic raw materials: flour, water, yeast, salt and a large number of auxiliary materials that contribute to improving product quality and nutritional value. In order to know exactly what we consume, to be always sure of the product we buy, that these meet the ecological standards, the traceability indicator is used. In the food industry, the role of the traceability system is to document the flow of food from the raw material to the finished product. Traceability is a basis for ensuring the quality of processes and products, so we can say that it is possible a fundamental component of any quality management system in the food industry and is part of the legislative effort to track the path of food with the articles and is an important indicator of the company's power in the market, because by implementing the quality management system, consumer confidence in the product increases.

**Keywords**: traceability, organic bread, rye flour, food safety, quality.

## F.75.COMMON CHEMICALS USED IN ORGANIC FARMING

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**Abstract.** An old Indian philosophy, Ayurveda, says, "You are what you eat." With each passing day, it is becoming increasingly clear that everyone's health, and even everyone's life, depends to a large extent on what we eat, how we eat and when we eat. But if we do the analysis of the food in the laboratory, we will notice that most of them are full of additives and pesticides. The development of industry has led to the discovery of chemicals that act as insecticides or fungicides on plants. In the desire to earn as much as possible, these substances are often used in agriculture. What is the consequence? The layer of humus on the surface of the earth degrades with each passing day. Did you know that 0.5 cm of humus recovers in 100 years? What can we do to avoid destroying the fertility of the earth? There are handy solutions for small farmers which are not very expensive but natural. One of these

solutions is the use of ordinary baking soda.Baking soda can be used to make a 100% natural fungicide. The recipe is made as follows: in a liter of water will dissolve two teaspoons of baking soda. Using a spray container, the resulting solution will be sprayed on the leaves of plants with small black spots. This action will be repeated weekly for the solution to work. White mold is one of the most common plant diseases in the garden. It can be removed with a solution made from a tablespoon of baking soda, 1 tablespoon of vegetable oil, a tablespoon of dish detergent and 3 liters of water. The solution will be sprayed weekly on the plants in the garden, preferably after the rain. If it is noticed that their appearance begins to change, stop spraying to avoid burning the plants.

**Keywords**: organic farming, baking soda, fungicide

## F.76. MEDICINAL WINES

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**Abstract.** The concept of "Medicinal wines" is not new. Wines in combination with plants have been used by people to treat different diseases and improve health. Medicinal wines are obtained from good quality white or red wine with a minimum content of 12 % volume in alcohol, mixed with 10 to 50 g of dried plants left to be ground for 8 to 10 days and then filtered. During the maceration, substances extracted from plants are combined with ethyl alcohol and other constituents of wine resulting in valuable substances for the Regulation of metabolism, curative effects in digestive diseases, for the toning of the heart and for many conditions. Thus, white wine can be combined with mugwort, rosemary, parsley, wild garlic and red wine grape bulbs, and ash leaves. Medicinal wines are obtained in small quantities because the storage time is short due to the low alcohol content. They will not be obtained from lower quality wines because the taste and shelf-life and even the therapeutic effect may be affected. Such macerated, called medicinal wines, are consumed undiluted in small quantities of 20 to 40 ml and will not replace the medicines established by the specialist doctors, they will supplement and help the treatments. The use of wine assortment and their combination with medicinal plants is a way of using creativity and developing the desire of high school pupils to gain additional knowledge of food and health.

**Keywords**: wines, medicinal properties, food, health.

## F.77. CHEMICAL METHODS OF IDENTIFICATION OF THE CHARACTERISTIC INDICATORS OF THE SHAMPOO

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**Abstract.** Shampoos are designed to wash and purify the hair and scalp, but also to care, beautify, smooth and nourish the hair. Technically, shampoos are produced aqueously containing foaming surfactants and detergents. Surfactants are able to remove fats absorbed from the surface of the hair. There are also dry shampoos, based on herbal powders, very practical between two shampoos, to refresh the scalp. Shampoos come in different shapes and textures: Gel shampoos: mixtures of foaming surfactants and detergents; Cream shampoos: emulsions containing emulsified foaming surfactants and detergents; Dry

shampoos: mixtures of absorbent plant powders, Shampoos also differ depending on the effect they have on the hair: against hair loss, anti-dandruff, nourishing, moisturizing. Foam is not a guarantee of the effectiveness of a shampoo. Some shampoos that foam little or not at all are still very good. The pH represents the acidity of a product. It is between 1 and 14. Lemon, acid, has a low pH, while water, considered neutral, has a pH of about 7. A shampoo must have a pH adapted to the hair, named slightly acidic. Therefore, when making the formulas, it is recommended to check the pH obtained at the end, with the help of a pH map. If it is too high, lower it by adding citric or lactic acid. If it is too low, increase it by adding lime water or baking soda. In this scientific study we presented the characteristic indicators of the hair shampoo: foaming ability and foam stability, viscosity and how to prepare a handmade shampoo.

**Keywords:** shampoos, pH, foam.

## F.78. NEW SUBSTITUTED PYRAZOLES DERIVATIVES WITH ANTIBACTERIAL ACTIVITY

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**Abstract.** In recent years, research has been focused on the development of new antimicrobial agents. Development of novel antimicrobial drugs is one of the most important global health problems, justifying the necessity of identifying innovative antimicrobial agents. Pyrazoles constitute an important class of heterocyclic compounds, being remarkable therapeutic agents. Some substituted pyrazoles were synthesized, characterized by IR, $^{1}$H-NMR $^{13}$C-NMR, UV-Vis, MS and elemental analysis, and tested for their biocompatibility on a fibroblasts cell culture. All the synthesized compounds were tested *in vitro* for antimicrobial activity against a panel of selected bacterial and fungal strains using erythromycin and clotrimazole as standards.

**Keywords:** Pyrazoles, antibacterial activity, NMR, IR.

## F.79. BIODEGRADABLE AND EDIBLE MEMBRANES A VIABLE ALTERNATIVE FOR THE TRADITIONAL NON-BIODEGRADABLE PLASTIC PACKAGING

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**Abstract.** The aim of this work was to develop biodegradable and edible membranes prepared from polysaccharides to be used for meat products packaging. Edible films and coatings are produced from edible food biopolymers that together form a new material as a result of covalent bonds formed between component molecules as well as electrostatic, hydrophobic or ionic interactions. A relatively large number of hydroxyl groups indicate that

hydrogen bonds may play significant roles in the formation and characteristics of membranes. Biopolymers are biodegradable, abundant, renewable, inexpensive, environmentally friendly. Sodium alginate, agar, and glycerol as plasticizer were used. Water vapor permeability (WVP) expressed in g*mm/h*$m^2$*kPa of the films were determined gravimetrically in accordance with the ASTM E96-01 method (ASTM, 2001b). Membrane water transfer rate (WVTR) was determined by the amount of water transferred relative to time and transfer area. Biodegradable and edible membranes that can replace conventional packaging materials made of polyethylene (PE), polypropylene (PP) suitable for packaging meat preparations that ensure stability against the influence of the environment can be made from agar and alginate in a ratio of 1:2.

**Keywords:** Edible membranes, food packaging, water vapor permeability, water vapor transmission rate, alginate, agar.

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# G. INDUSTRIAL POWER ENGINEERING & COMPUTER SCIENCE

## G.1.DETERMINING THE FUNCTIONAL CHARACTERISTICS OF HALL CURRENT SENSORS USING SOFTWARE SIMULATION APPLICATIONS

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**Abstract.** The paper analyzes the characteristics of the ACS712 current sensor depending on the value and type of load. For the simulations we used the Proteus Professional 8 application, the ACS712ELCTR-05B-T current sensor, and an Arduino UNO that will be used to numerically express the value of the electric current intensity through the load circuit. A purely resistive and an inductive load will be analyzed, in direct current and in alternating current, and the obtained results will be analyzed.

**Keywords:** Hallsensor; currentsensor; simulation; Proteus.

## G.2. STUDY ON PHOTOLUMINESCENCE CHARACTERISTICS OF POLYCRYSTALLINE ZNO 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 transsmision 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 spectra, is ranged 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 of the intensity of the main peaks has been discussed.

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

## G.3. OPTIMIZATION METHODS APPLIED TO GAS TURBINE PLANTS

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**Abstract.** In this paper are presented the main optimization methods which can be applied on the components of a gas turbine plant. One of these methods is the exergoeconomic procedure which is used to find the optimal values of the functional parameters. The exergoeconomic optimization uses an iterative model that does not aim to calculate the global optimum for a predetermined objective function, as conventional methods to, but tries to find a solution for the entire designed system.

**Keywords:** gas turbine, optimal efficiency, exergoeconomi.

## G.4. A METHOD FOR CALCULATING THE CONTINUITY INDICATORS OF A POWER SYSTEM

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**Abstract.** The paper presents a methodology for determining, in the design stage, the continuity indicators in the electricity supply of consumers. In operation these indicators are determined based on the recorded number and duration of consumer power outages in the analyzed network. The first part of the paper presents the continuity indicators provided in the performance standards, indicators required by some distribution operators in the design phase. The following is the calculation algorithm: The reliability indicators are established for the equipment and component installations of the power system. They can be taken, with caution, from the specialized regulations or can be determined based on the recorded operating and repair times for the respective equipment or installation. The reliability indicators for the consumer supply areas are calculated. The indicators include at least the annual number of interruptions handled through repairs, manual or automatic maneuvers. The zones are divided according to the voltage level. At low voltage the zones are established according to the transformer substation. The number of consumers for each area is determined. The number of consumers must be provided by the distribution operator that manages the installations in the area. The continuity indicators are calculated. The calculation of the reliability indicators will be done using the continuous time Markov chain method which assumes that the equipment is either in a failure process with intensity $\lambda$, or in a repair process with intensity $\mu$. The calculated continuity indicators are: SAIFI (System Average Interruption Frequency Index); SAIDI (System Average Interruption Duration Index); ENS (Energy Not Supplied); AIT (Average Interruption Time). The last part of the paper presents a calculation example for a 20 / 0.4 kV power system in Bacău County.

**Keywords**: continuity indicators, power system, consumer supply.

## G.5. ON THE SELECTIVITY OF PROTECTIONS AGAINST EARTHING IN MV POWER SYSTEMS

**GHEORGHE HAZI, ANETA HAZI, SORIN VERNICA**

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**Abstract.** The paper presents an analysis on the selectivity of earthing protections in the case of MV power systems with the neutral treated through a coil provided with an automatic system for connecting a resistor in case of earthing. The analysis is made for the situation in which, at a simple grounding, a high value resistance is connected in parallel with the arc suppression coil. This resistance generates an active current through the grounding of about 10A which influences the phase shift between the voltage and the zero sequence current. The earthing current occurs on both the faulty and the healthy line. On healthy lines the zero sequence current detected by the measuring system is a capacitive current 90° out of phase before the zero sequence voltage. On the faulty line, due to the active current in phase opposition to the zero sequence voltage, the phase shift between the zero sequence current and the zero sequence voltage is greater than 90°, the difference being given by the value of the active component.The practical variants for generating the active zero sequence current are shown: the use of a resistor connected directly to 20 kV or a resistor connected in a secondary of the arc suppression coil.In the first variant a 20 kV single pole circuit breaker with electric drive is required. In the second case, the resistor can be connected by means of a low voltage contactor. In both cases the connection time must cover the operating time of the protection, a maximum of 10s.The results of the calculations on the zero sequence current and voltage values and on the phase shift between them are presented in two situations: without resistance in parallel with the arc suppression coil, as well as with the connected resistance. We analyze the influence on this phase shift for several outgoing lines for which the value of the capacitive current greatly differs. The values of the capacitive currents of the outgoing lines depend on the type of line: overhead or cable. For cable lines the capacitive current is high, 2-4 A / km, while for overhead lines with uninsulated conductors it has small values, 0.1 A / km. All calculations and conclusions are analyzed for a real installation: the 110/20 kV Dărmănesti substation

**Keywords**: earthing protections, power system, selectivity, arc suppression coil.

## G.6. INCREASING THE TECHNICAL-ECONOMIC EFFICIENCY OF A COMBINED GAS-STEAM CYCLE

**ANETA HAZI, GHEORGHE HAZI, ROXANA GRIGORE, SORIN GABRIEL VERNICA**

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**Abstract.** The reduction of energy resources determines the orientation of producers, transporters and users of electricity and heat towards the "first fuel" as it is considered energy efficiency. Increasing energy efficiency in a power plant leads to fuel economy and, consequently, to reducing the cost of fuel consumed. This paper analyzes the thermal circuit diagram of a combined cycle gas-steam power plant. The power plant generates electricity that it delivers in the National Power Grid and hot water that it delivers in the district heating network of a city. The combined cycle energy indicators for a power plant operating regime are calculated. Then solutions are proposed to increase energy efficiency by increasing

efficiencies: of the recuperative steam boiler; of the recuperative heat exchanger on the flue gas path from the boiler outlet and of the steam turbine condenser that heats water which is returned from the the district heating network. It is obtained: increasing the energy recovery rate in the combined cycle; increasing the steam flow generated in the boiler and the electricity generated in steam turbines; increasing the amount of heat recovered in the district heating water. Taking into account the price of electricity and the price of heat, the savings obtained by increasing the energy efficiency of the combined cycle shall be calculated, too.

**Keywords:** energy efficiency, power plant, combined cycle gas-steam, heat recovery.

## G.7. IMPROVING THE ENERGY EFFICIENCY OF THE ELECTRICAL DIAGRAM OF A POWER PLANT

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**Abstract.** One of the goals of energy efficiency is to improve energy security. Reducing energy losses leads to a decrease in energy demand and therefore to an increase in energy availability. In this paper is analyzed the electrical diagram of the electricity evacuation installations from a power plant in terms of energy losses and reliability in operation. They are proposed: solutions to reduce energy losses by choosing the economic operating regimes of power transformers; solutions to increase reliability by modernizing the installation; After applying these measures are obtained: electricity savings of approximately 170 MWh / year; improving reliability indicators: yearly mean number to failure, yearly mean time to failure, degree of satisfaction in the power supply, et all.

**Keywords:** energy efficiency, power plant, energy losses, reliability indicators.

## G.8. REMOTE CONTROL SYSTEM OF THE SPEED OF THE DC MOTOR WITH TWO ARDUINO UNO DEVELOPMENT BOARDS

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**Abstract.** In this paper was presented a system of remote control of the speed of the DC motor made with the help of two Arduino Uno development boards. Two NRF24L01 wireless modules were used to transmit the commands remotely via radio waves. Two programs have been developed in the Arduino IDE programming environment: a program for the transmitter circuit that allows the generation of PWM signals and a program for the receiver circuit that allows the control of power transistors from the H-Bridge structure in order to adjust the rotation speed of the DC motor. In the Electrical Machines laboratory from the "Vasile Alecsandri" University of Bacau, the experimental stand for the implementation and validation of the programs saved in flash memory of Atmega 328 microcontrollers from the structure of Arduino Uno development boards was made. The remote speed control system of the DC motor can also be used for the industrial applications.

**Keywords:** DC motor; Arduino Uno; modul wireless NRF24L0.

## G.9. APPLICATION OF SIEMENS PLC IN TWO-AXIS TRACKING SOLAR PV

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**Abstract.** This paper presents a modern solution for closed loop control of the orientation of photovoltaic panels on two axes. For the system control it was use a PLC S7 1500 with a CPU 1511C-1 Pn, to which an analog input module was added. This system ensures a very fast processing of instructions (60 ns - Processing time for bit operations). The PLC program has a main program and a block function that calculates the current position of the sun based on astronomical equations. This function has as inputs the current date and time provided by the system and the coordinates of the given position of latitude and longitude. The position is provided by a GPS module connected to the serial port. Based on these inputs the function will provide the position of the sun through two azimuth angles and the elevation angle (inclination). The closed loop control will be done with the help of two sensors that will measure the current values of azimuth and elevation. Orientation to the direction of the sun will be done only if there is sufficient illumination measured by a sensor. A web interface has been installed on this controller that provides information about the stored energy, the position of the panels, the degree of illumination and offers the possibility to stop or start the system remotely. The proposed guidance system can be used for reduced systems with PV installed on fixed or mobile platforms. In addition, this solution can be used for photovoltaic power station.

**Keywords:** PLC Siemens; PV tracking; Closed loop tracking system; S7 1500.

## G.10. SOME ASPECTS ABOUT THE USING OF RENEWABLE SOURCES OF ENERGY FOR NZEB SINGLE FAMILY HOUSES

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**Abstract.** The official documents of UE about energy and climate policies stipulates ambitious targets. In the countries of European Union, the greenhouses emissions will be reduced by at least 40% by 2030, compared to 1990. The buildings sector is a large energy consuming sector and almost 30% of the CO2 emissions are due to the energy consumption in buildings. In Romania, law no.372/2005 (recast 2020) establishes that a new building, which has the building permit issued on or after December 31, 2020, will be nZEB. According to EPB Directive, 2010/31/UE, "nearly zero energy building (nZEB)" is a building that has a very high energy performance. The very low amount of energy should be covered to a large extent by energy from renewables sources produced on-site or nearby. The law no.101/2020, which amends and supplements Law no.375/2005 on the energy performance of buildings establishes that there has to be a minimum of 30% from the amount of energy required by the building that comes from the renewable energy sources produce on-site or nearby. The paper analyses a single family house from energy performance of building and greenhouse gas emissions points of view. Four cases considered: the house is located in four characteristic cities (Constanta, Bucuresti, Bacau, Brasov) for Romania climatic zones. The following renewable energy sources are proposed: ground-to-water heat

pump for heating, solar thermal panels for hot water preparation and photovoltaic panel system for electricity production. In addition to the energy calculation, an economic calculation is also made where the previously mentioned solutions are compared to the situation of using conventional energy sources to ensure the energy consumption of the building.

**Keywords:** nearly zero energy buildings; renewable energy sources; climate change; greenhouse gas emissions.

## G.11. MONITORING THE TEMPERATURE AND HUMIDITY OF AN ENCLOSURE USING RASPBERRY PI AND THINGSPEAK

**DRAGOŞ ALEXANDRU ANDRIOAIA, GEORGE CULEA, PETRU-GABRIEL PUIU**

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**Abstract.** In this paper, the authors propose an IoT system for monitoring temperature and humidity in an enclosure. A Single-board Computer Raspberry Pi 4 and ThingSpeak cloud platform will be used to implement this system. The Raspberry Pi 4 development board collects ambient temperature and humidity data from form the DHT 11 server and transmits it via the WiFi connection to the IoT ThingSpeak platform cloud for further analysis. The ThingSpeak cloud platform is oe of the most popular IoT platforms, which offers storage, processing and data visualization services.

**Keywords** IoT, IoT Platform, ThingSpeak, temperature monitoring, humidity monitoring, Raspberry Pi.

## G.12. THEORETICAL STUDY ABOUT THE USING OF HYBRID PV/T PANELS FOR A RESIDENTIAL HOUSE

**ROXANA-MARGARETA GRIGORE, ANETA HAZI, GHEORGHE HAZI, SORIN VERNICA**

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**Abstract.** The paper presents a theoretical study related to the advantages of using PV / T systems as renewable sources to assure a certain quota of the overall amount of electricity and heat needed within residential house. The Photovoltaic integrated hybrid PV / T solar panels rely on a new technology and its represents a clean alternative for the electricity and heat production. The PV / T panel is a combination of a photovoltaic panel with a flat solar panel. In this technology, a thermal agent is used as a coolant, being able to absorb heat from the photovoltaic part. This paper also showcasts types of PV/T panels which can be currently found on the market. Furthermore, schemes for the realization of PV / T systems are proposed, both as the only renewable energy sources and as well as in combination with other sources. The proposed schemes are analyzed from the point of view of energy efficiency, as well from that of their implementation in different climatic conditions.

**Keywords:** renewable energy sources, PV/T panel, energy efficiency.

## G.13. STUDY CONCERNING THE CONSTRUCTION OF A MEDIUM FREQUENCY INDUCTION HEATING OVEN WITH PWM FREQUENCY ADJUSTMENT

**PETRU-GABRIEL PUIU, DRAGOŞ ALEXANDRU ANDRIOAIA, LILIANA TOPLICEANU**

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**Abstract.** The work is a study that aims to identify the possibilities of realizing an induction heating furnace, with PWM regulation of the working frequency so that the furnace can operate with an optimal efficiency, adapted to the working load. The voltage induced in the low ohmic resistance part generates intense currents which, through the Joule-Lenz effect, raise the load temperature, as a result of an energy conversion with advantages regarding the modulation of power by varying the working frequency according to the physical characteristics of the loads.

**Keywords:** induction; PWM.

## G.14. CYBERNETIC SECURITY OF IOT DEVICES WHICH TRANSMIT DATA IN THE CLOUD OF THE THINGSPEAK PLATFORM

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**Abstract.** In recent years, IoT platforms and smart-home systems have grown rapidly due to their untapped potential. Due to its accessibility, IoT now faces several Security challenges. The security of IoT systems is given by attack vulnerabilities that can occur on every layer of the IoT architecture. In this paper the authors aim to test the cyber security, through a sniffing attack, of an IoT device, which transmits ambient temperature data in the Cloud of the ThingSpeak platform. The IoT device was made using the NodeMCU development board and the KY-028 temperature sensor.

**Keywords:** IoT, IoT security, IoT attacks, sniffing IoT attacks, ThingSpeak, Cloud Platform.

## G.15. OPTIMIZING THE ACTIVITY OF ATI STAFF BASED ON AN ERGONOMIC MODEL

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**Abstract.** Anesthesia and Intensive Care (ATI) is the medical specialty that provides, through specific pharmacological and technical means, on the one hand, the conditions necessary for the performance of surgery, perioperative care and other diagnostic / therapeutic procedures, and, on the other hand, indispensable support for the critically ill patient for the assessment and treatment of acute, life-threatening organ dysfunctions / injuries, provoked by virus. In pandemic conditions with COVID-19, the activity of these

brave people became overloaded and more and more people became in poor health.Application of job rotation schedules in a hospital environment developed in various studies to the real settings has been less considered in the literature. A mathematical model for job rotation must take account of various biomechanical parameters for instance postures, force, material handlings, repetition, and energy consump-tion. This paper proposed math-heuristic solving approaches for multi-period human assignment problem to optimize the satisfaction rate of requests by meeting the patients' and medical practitioners' preferences.ATI staff planning by ergonomic considerations in a hospital system is modeled mathematically. There are various criteria in the ergonomic analysis of job and human. In this study, the ergonomic factors, cognitive and physical, are concurrently considered, to compare worker capacity with the job requirements for measuring the adequacy level between them. Ergonomic method SCANIA Ergonomic Standard (SES), is utilized to analyze the workplace and determined physical work-loads. Than a hybrid heuristic and two math-heuristic approaches are proposed and solved, for resolve this combined optimization problem. The result was an ergonomic schedule consisting of job task and rotation for a planning time workload. It makes possible to determine which medical practitioner performs which job in which day, but in an optimum manner. The shiftless times and ergonomic risks will be considered as the futures works.In conclusion, considering the ergonomic factors in the medical practitioner assignment with job rotation planning, possibly will be an effective strategy enhance efficiency as well the quality of life of ATI staff, even in pandemic conditions.

**Keywords** ergonomic model, hospital environment, math-heuristic approach.

## G.16. TOWARDS REDUCING ENERGY USAGE IN DATACENTER

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**Abstract.** Energy efficiency is an important issue that relates to energy consumption and system performance in large scale computing systems such as cloud computing. Apart from the energy consumed via processor, this study combined the energy usage in network devices in datacenter using the technique of firefly to allocate resources. First Come First Served Particle Swarm Optimization and firefly were compared in sharing cloud resources. The performance improvement rate percentage of firefly technique over FCFS and PSO are 29.56%, 25.33% and 17.19% using Energy Consumption (EC), Makespan (MS) and Central Processing Unit Utilization (CU).

**Keywords:** energy, network datacenter.

## G.17. ASSESSMENT OF CODE BASED COMPLEXITY METRIC ON XML SCHEMA LANGUAGES

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**Abstract.** Length in Schema (LIS) is a numerical measurement of Extensible Markup Language (XML) for documents that contain schemas from XML Schema Language (XSL), in a manuscript form. LIS is used to calculate the amount of effort that will be required to develop a schema document. List is likened to SLOC in complexity metric with different of LIS considered for 60 different schema files acquired online implemented in two different schema languages: Regular Language for Next Generation (RNG) and World Wide Web Consortium XML Schema (WXS) in order to estimate schema productivity and maintainability.

**Keywords** RNG, WXS; XSL, XML, LIS, BLIS, TLIS, CLIS, ELIS.

## G.18. MODELING AND SIMULATION WITH GRAFCET OF THE REACTIVE POWER CONTROL PROCESS IN A WIND FARM – CASE STUDY VANATORI WIND FARM

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**Abstract.** Given the national grid supply and the applicable legislation in Romania, every energy generating plant must fulffil the requirements of reactive power control**.** This paper highlights the process of reactive power control in a wind farm using the modeling and simulation of Grafcet. In this case study, of the Vanatori Wind Farm, we modeled the reactive power control process in three stages of regulation depending on the reactive power set point required by the national grid dispatcher. In order to control the reactive power, the wind farm has a STATCOM installation and 5 WTG (wind turbine generator) with an installed capacity of 2 MW each. The Grafcet modeling and simulation helped us to establish the process structure of the reactive power control, and it will be implemented in the wind farm SCADA system.

**Keywords:** modeling and simulation; Grafcet; wind farm; reactive power control.

## G.19. ELECTRICITY METER WITH THE FACILITY TO DETERMINE THE QUALITY OF THE ELECTRICITY SUPPLIED

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**Abstract.** The vast majority of areas of activity face the problem of electricity quality. At the same time, diagnosing the quality of the energy provided makes it possible to identify and remedy problems that have arisen in the system. Advanced signal processing techniques and the use of advanced systemsallow a complex analysis of thephenomenon. The paper presents an electricity meter equipped with an electricity quality analysis system. It was developed based on the Xilinx Artix-7 programmable logic matrix. A Digilent Article-7 development plate was used due to its design and experimentation facilities. The developed system determines the power consumed and the main elements that define the quality of electricity: harmonics and other deviations from the frequency of nominal power supply, flicker, voltage gaps, voltage variations, transient surge, temporary surge, etc. The possibility of using an embedded system equipped with the Microblaze soft microprocessor, the existence of a 12-bit analog-digital converter and the maximum sampling frequency of 1 MSPS and the possibility of assisted design allow to obtain a measurement system with superior characteristics. The results obtained and the experiments carried out confirm the expected performance for the electricity meter.

**Keywords:** electricity quality, electricity meter. electricity quality analysis system, programmable logic matrix, embedded system.

## G.20. REDUCING THE ENERGY CONSUMPTION OF SYSTEMS WITH THE INTEGRATED CIRCUIT TI 430FR2433

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**Abstract.** The Texas Instruments microcontrollers of the MSP 430 series offer four ways to save power in operation in such a way as to allow for consistent reduction of the electricity consumed. Code Composer Studio programming environment also provides support in making low-power applications. In addition to these, the MSP430FR2433 microcontroller with ferroelectric RAM allows data to be stored even in the absence of power voltage. In view of these properties of the microcontroller, a data logger application has been developed to monitor the quality of the environment in a building. Given that the MSP430FR2433microcontroller can process both analog and numerical signals, the device monitors the temperature, humidity, carbon dioxide concentration and amount of light present in the enclosure. Thanks to energy-saving mechanisms and the possibility of keeping information for an indefinite period of time without the need for energy consumption, the environmental quality monitoring devicecan operate for a long time in places without energy resources. The device has also been tested with good results for

autonomous operation using solar energy and has also been used to determine the energy performance of buildings.

**Keywords:** programming environment, low-power applications, ferroelectric RAM, autonomous operation, energy performance of buildings, power saving.

## G.21. DESIGN ANALYSIS OF AN AUTOMATIC PHASE SELECTOR

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**Abstract.** Power instability in Nigeria caused by overbearing demand of power by consumers and lack of proper maintenance of the power system devices among others has brought about the need for alternative power sources such as generators, solar, typical inverters and other alternative supplies which requires one form of switching or the other to achieve phase selection during power failure. This paper gives a design analysis of an automatic phase selector linking available power supplies, that is; switching between a three-phase public utility supply, as a result of total power outage in the public supply to an alternative secondary supply (in this case a Generator and an Inverter system) and back when power is restored. The design adopts the use of a microcontroller-based system interconnected with other hardware components for proper isolation, switching and visualization of switching conditions. The system design is divided into two major part: the hardware which consists of the power supply, sensing circuit, controller or control logic circuit, display and the power electronics switching unit and the software instruction code on the microcontroller unit. The design analysis was first carried out accompanied with computer simulation on a software tool (Proteus 8 Professional, version 8.4) to carry out performance evaluation of the sub-circuits, thereafter, a practical implementation of the design was carried out and tested with the utility power supply using five (5) switches, three of which represents the three-phase primary supply and the other two represents the secondary supply.

**Keywords:** System Automation, power system, phase selector, optocoupler.

## G.22. CYBER SECURITY OF SIMATIC S7 1500 SYSTEMS

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**Abstract.** This paper aims to analyze the security of SIMATIC S7 1500 systems both from the intranet and from the internet. Methodology for this study included the following steps: installing a web server for the S7 1500 controller; network scanning with PLC S7 1500; identifying vulnerabilities; perform intranet and internet vulnerability tests for S7 1500 and validation of discovered results. The paper presents the vulnerabilities discovered in the S7

1500 type equipment following the tests performed. It also presents measures to prevent attacks based on these vulnerabilities. Industrial security solutions for these types of equipment are also highlighted.

**Keywords:** cyber security, vulnerability, PLC, S7 1500.

## G.23. SOLAR PANEL CARPORT WITH SECOND LIFE ELECTRIC VEHICLE BATTERIES

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**Abstract.** The solar carport should be defined as an overhead canopy placed above a parking place that has the purpose of providing shelter for a car, and transform the sun's power into usable electricity, which should be used for electric vehicle charging. The novelty of this project is that the energy produced by solar carport should be storage in lithium ion batteries. The used lithium accumulators are second hand accumulators from old Nissan Leaf cars. It is a fully green concept, not just because of the solar panels, or because it is charging electric vehicles, but most importantly, because it is giving a 2nd life to electric vehicle batteries of which very soon we will have a huge amount, coming back from the automotive market and ready to be utilized for green energy storage. The system contains next: Glass-Glass, modern, high quality solar panels; 7 kW Fronius inverter with smart meter and remote control functionality; 2 units of 22 kW Wallbox Copper SB smart charger with remote control functionality; 2 units of modern and very flexible Victron Battery Management System with remote control functionality; 2 units of Nissan LEAF 2nd life batteries. The scope of the project is to check the efficiency of the system during the time.

**Keywords:** solar carport, electric vehicle, solar panel, inverter, wallbox, battery management system, lithium ion battery.

## G.24. TRANSFER OF DATA FROM SCREEN TO VIDEO CAMERAIMPERCEPTIBLE BY THE HUMAN EYE

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**Abstract.** Systems for imperceptible screen-camera data transfer have many applications: in security, in file transfer systems, in advertising. In this paper ChromaCode has picked as the current best performing data transfer system which has both high throughput and good imperceptibility. It has been designed a testing methodology, has been implemented the ChromaCode algorithm, and has been tested the system's reliability, performance, and imperceptibility. It has been made several optimizations for lowering the execution time and bettering the configuration parameters and then, has been implemented a machine learning module for advanced error correction. The results show that the optimizations that have been created are significant contributions for increasing the data transfer speed and for lowering the error rate.

**Keywords:** imperceptible, ChromaCode algorithm, machine learning, automatic testing.

Cu sprijinul Consiliului Județean Bacău.
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a Consiliului Județean Bacău”.

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