4th SCIENTIFIC SYMPOSIUM WITH INTERNATIONAL PARTICIPATION

"Environmental resources, sustainable development and food production"

OPORPH – 2015

Tuzla, Bosnia and Herzegovina
November 12-13, 2015

BOOK OF ABSTRACTS

Tuzla, BiH, November, 2015

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EVALUATION OF WATER MANAGEMENT, SOCIETY AND SUSTAINABILITY FOCUSING ON SAMSUN CITY/TURKEY

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Abstract:

Sustainable Water Management (SWM) attempts to deal with water in a holistic fashion, taking into account the various sectors affecting water use, including political, economic, social, technological and environmental considerations.

Where sustainability is meeting the needs of the present generation without compromising the ability of future generations to meet their needs. Samsun is a big densely populated city situated in the middle of the Black Sea region with a population of one million 250 thousand which generate a lot of domestic and industrial wastewater. Reuse of wastewater to irrigate crops is not a recent practice in Turkey though this practice has been applied for many years in mostly the rural regions of the country, where municipal sewer systems do not exist. There is a need of development of well-planned integrated urban water management system that will be able to identify criteria for decentralized and centralized system components which can accelerate the implementation of such systems.

Present study is the feature of evaluation for sustainable development of Samsun city wastewater as an aspect of wastewater project. So far, it is observed that direct application of treated effluent on agricultural land is the mostly a viable, convenient and the indirect use of treated effluent in agriculture.

Keywords: **Sustainability, water management, grey water, reuse, irrigation, wastewater treatment plants**

DEVELOPMENT OF ANAEROBIC GRANULAR SLADGE IN LABORATORY SCALE UP-FLOW ANAEROBIC SLUDGE BAD REACTOR

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Abstract:

In this study, the possibility of anaerobic granular sludge development has been investigated. The sludge mixture from the bottom of anaerobic lagoon in which chips wastewater has been treated and sludge from the bottom of lake, in which, in water prevailing anaerobic condition during the production season was used as an inoculum.

The procedure of granular sludge development was performed in a laboratory scale up-flow anaerobic sludge bad reactor (UASB) of 24 L capacity. The wastewater that was used for granular sludge development was transported from potato processing factory two-three times a week. Experiment was conducted at temperature of 30°C. After 80 days of continual process, the granular sludge of good characteristics was developed. The concentration of granular sludge reached 5,70 g/L at the end of experiment. At the end of investigation efficiency of $COD_{influent}$ removal reached 91%.

Keywords: anaerobic processes, treatment, granular sludge development, waste water.

DISPOSAL OF WASTE LUBRICATING OILS IN TUZLA CANTON

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Abstract:

In order to reduce costs and to increase the functionality of different devices and vehicles, the consumption of lubricants oils has been increased. The increase in spending is creating large quantities of waste oils which fall into the category of hazardous waste. Inadequate waste management of lubricating oil, i.e. inadequate storing procedures, leads to compromising environment and is a major threat to nature and humanity. European Union countries are working continuously on solving the problem of waste oils, and a large number of Directives and Regulations have been passed (EEC 75/439, 2008/98/EC).
In countries such as ours, there is no organized disposal of waste lubricating oils and oily packaging due to the absence of appropriate regulations and strict implementation of already adopted laws acompanied by a lack of environmental awareness. Waste oil can in small concentration pollute a large quantity of water, soil; by inapropriate incineration they create carcinogenic compoundsand thus negatively impact on people's health. In Tuzla canton motor oils are mainly changed by the car repair shops, used as a fuel in home furnaces, stored in barrels and discharged into sewers. According to the data on the quantities of treated waste oil by authorized operators, there is a very low percentage of the amount collected in relation to the amount produced. In developed countries, oil is after exploitation, used as an alternative energy source or is recycled into base oil.

This paper examined, through interviewing and direct contact with users of lubricating oils (power plants, mines, industryal companies, autocenters ect.) the current way of disposing waste lubricating oils among bussines consumers and individuals in the area of Tuzla Canton and determined the degree of degradation of oil, depending on the origin of waste oil. From the data collected it is indicated that the present method of disposal of waste lubricating oils is not adequate which represents a great threat to the environment and human kind

Keywords: Waste lubricant oils, waste management, a negative impact, care.

CONDUCTIVE POLYMER/TiO2 PHOTOCATALYTIC NANOCOMPOSITES FOR WASTEWATER TREATMENT

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Abstract:

Methods for wastewater treatment are biological, physical, physical-chemical and chemical. Biological methods include decomposition of contaminants in processes that are governed by certain type of microorganisms, the physical methods include adsorption on the surface or inside of the porous particles, eg. zeolites or clays. Physical-chemical methods, such as coagulation/flocculation, are very efficient and effective but their lack is a large amount of sludge that is lagging behind. The chemical methods are primarily processes of oxidation and reduction of contaminants in the polluted waters. A special group of chemical methods for wastewater treatment processes, which are intensively investigated and commercially applied, are the advanced oxidation processes (AOPs). Their advantage, compared to conventional chemical treatment processes of water, are the possibility of complete decomposition of the organic contaminants to water, carbon dioxide, nitrate, sulphate, chloride ...

A large number of semiconductors like metal oxides have excellent photocatalytic activity, and specially good photocatalyst is titanium dioxide, TiO_2. It is suitable for the application because of its very good properties, such as chemical and biological inertness, photo activity, ease of production, low cost, non-toxicity and friendliness to the environment. The photocatalytic activity of TiO_2 results from the formation of photogenerated holes, h^+, and electrons, e^- due to the absorption of ultraviolet light, which energy is equal to the energy of its band gap, E_{bg}. The recent research is devoted to the development of TiO_2 catalyst with expanded photocatalytic activity that is shifted to the visible part of the UV/Vis light of solar radiation. Extended activity of TiO_2 can be achieved by doping and dopant among the many can be the conductive polymer. Thus, the nanoparticles of TiO_2 as the semiconducting photocatalyst in combination with the conductive polymer (CP) exhibit a synergistic effect and photocatalytic activity in the visible part of the Sun light, Figure 1.

By the synthesis of conductive polymers of corresponding structure: polyaniline (PANI), polypyrrole (PPY) and poly(3,4-ethylenedioxythiophene) (PEDOT) with TiO_2 nanoparticles the polymeric nanocomposite with increased photocatalytic activity in the VIS light can be prepared. In other words, in this case the initiation of the photocatalytic degradation of pollutants in waste water by solar irradiation will be possible. This would, further enable the development and application of advanced technologies for wastewater/industrial wastewater treatment in environment protection.

Keywords: Conductive polymer, TiO_2, photocatalytic activity, nanocomposites

Chemical Engineering Thermodynamics – From Laboratory to Industrial Scale

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Abstract:

Chemical engineering thermodynamics provide an extensive collection of rules, procedures and models for the estimation of energy content of process streams depending of their pressure and temperature, their phase state, homogeneity or heterogeneity etc. and so on. Based on the energy content it is possible to assess the spontaneity of a physical or chemical process as well as the amount of energy released or spent by the process. Therefore, thermodynamics is in the core of energy balancing of any process. Here the professional experience will be exemplified, as collected by balancing the cupola furnace in the production of mineral wool.

The application of thermodynamics in chemical engineering is exceptionally broad and, at a first glance, it can offer numerous possibilities of scientific research topics. On the other hand, fundamental relations are well-known, practical equations and models are incorporated into CAS software and it may be difficult to find a niche where a true advance can be achieved. In this lecture several examples related to chemical engineering thermodynamics are shown, that are dealt with either from the scientific or professional point of view at the Faculty of Chemical Engineering and Technology of the University of Zagreb.

The investigations dealing with the equilibria and interactions in liquid systems will be described, in 1) organic systems comprising ionic liquids with potential applications in desulfurization and denitrification of hydrocarbon fuels, 2) aqueous two-phase systems with actual application in separation and purification of proteins and other biomolecules and 3) polymer solutions to be applied as additives for lubricating oils. Thermodynamics as an empirical, experimental science relies on measured data that are subsequently processed and linked into appropriate correlations, empirical or theoretical models, where the type of model used depends on the nature of investigated system.

Keywords: Chemical engineering thermodynamics, laboratory scale, industrial scale

The kinetics of copper ions adsorption from aqueous solutions on natural and commercial adsorbents

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Abstract:

Kinetika adsorpcije u sistemu čvrsto-tečno može biti pod kontrolom više procesa, uključujući spoljašnju difuziju, unutarčestičnu difuziju, hemijske reakcije i dr.Veliki broj hemijskih reakcija koje su od interesa za kvalitet vode se odvijaju po jednostavnim zakonima brzine reakcije koji se mogu opisati reakcijama nultog, pseudo-prvog i pseudo-drugog reda. Kinetički procesi adsorpcije proučavani su pomoću skupa adsorpcijskih eksperimenata pri konstantnoj temperaturi u funkciji vremena.

Stepen adsorpcije kvantitativno je određen i ispitan pomoću modela nultog, prvog i drugog reda. To je korisno i primjenjivo u prečišćavanju prirodnih i zagađenih voda.

Kinetika adsorpcije jona bakra ispitana je pri konstantnoj temperaturi na 25°C pri različitim uslovima pH vrijednosti, različitim inicijalnim koncentracijama i korištenjem različitih adsorbenasa. Kao komercijalni adsorbensi korišteni su kaolin i huminska kiselina, dok je ječmena slama korištena kao prirodni biosorbent. Rezultati adsorpcije pokazuju praktičan značaj u definisanju efikasnosti uklanjanja jona bakra i njihove biodostupnosti u vodenim sistemima.

Keywords: Kinetika adsorpcije, joni bakra, prirodni i komercijalni adsorbenti

Determination of benzene concentrations as an indicator of air quality near coke plants Arcellor Mittal Zenica and GIKIL Lukavac

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Abstract:

Determinations of immission concentration of benzene were carried out at 4 points in area near coke plant in Arcellor Mittal Zenica (AMZ) and 4 points in the industrial complex of Global Ispat Coke Industry Lukavac (GIKIL). Measurements were performed in AEM in order to determine the air quality and to determine possible cause of the high concentration of benzene in the measuring station in Tetovo, in GIKIL to determine the possible source of emissions and to comparison results. To measure the concentration of benzene GASMET DX4030 portable analyzer gases was used with a Fourier Transform Infrared (FTIR) spectrometer, the measurement range of 0.01 ppm to 200 ppm. Positions of measurement points are selected in relation to the nearest populated area, and based on the wind rose. On location AMZ at the measuring point 1 average concentration of benzene is 44.47 µg/m^3 and the maximum measured 139.2 µg/m^3. Measuring point 2 is the nearest coke plant, the average benzene concentration was 117.28 µg/m^3 and the maximum measured 243.60 µg/m^3. At the measuring point 3 average concentration of benzene was 99.69 µg/m^3 and the maximum 313.20 µg/m^3. Measuring point 4 is located north-east of the coke plant, the average measured concentration of benzene was 108.13 µg/m^3 while the highest concentration was 278.40 µg/m^3. On location GIKIL, at the measuring point no.4 measured the highest concentration of benzene of 5000 µg/m^3 and the lowest at the measuring point 3 of 1450 µg/m^3. The measurement site 1 is located west of the coking plant, the average measured concentration of benzene was 2650 µg/m^3 and 2450 µg/m^3 at the measuring point 2. At the measuring station in Tetovo, in the period of measurement, the average benzene concentration was 1.159 µg/m^3, and the largest value was 4.87 µg/m^3. On the basis of the measurements it can be concluded that air quality in the immediate environment of coke plant does not meet clean air quality with regard to the content of benzene.

Keywords: air quality, immission, benzene, coke ovens, wind rose

Adsorption of Nickel from Aqueous Solution on waste nitrification organisams

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Abstract:

Toxic heavy metal contamination of the environment is a severe public health problem. Biosorption has the potential to greatly contribute to the achievement of the low cost metal removal from wastewater. One cheap and easily available material having possibilities as suitable sorbent for heavy metal is waste organic materials namely waste sludge. Biological nitrification is a widely applied process in the wastewater treatment facilities. The overall stoichiometric equation of nitrification process can be written as;

$$NH_4 + 1.815\ O_2 + 0.1304\ CO_2 \rightarrow 0.0261C_5H_7O_2N + 0.973\ NO^-_3 + 0.921\ H_2O + 1.973\ H^+$$

As can be seen for the equation about 25% of the consumed NH^+_4 is converted to the biomass in the nitrification process and excess biomass is disposed from the wastewater treatment plants. In this study, the heavy metals nickel biosorption performance of waste nitrifying sludge, which was determined from a laboratory reactor, was examined at a constant temperature. Additionally, temperature effects on the organic matter release from the sludge was determined at various temperatures.

It was found that the organic content in the water and the sorption of heavy metals increased with increasing the temperatures. The rise of adsorption with temperature may enlarge the pore size to some extent which may also affect the adsorption capacity of biosludges. The data obtained from the experiments showed that the contact time of about 360 min was sufficient to achieve equilibrium time for nickel, because the adsorption reached a plateau at this time.

Keywords: heavy metals, nickel, wastewater, biosorption

The usage of alternative fuels in the cement factory Lukavac

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Abstract:

Kategorizirani selektirani otpad i nusprodukti sa odgovarajućom kalorijskom vrijednošću se koriste kao energenti u FCL zamjenjujući dijelom konvencionalna fosilna goriva kao što je ugalj, ukoliko ispunjavaju strogo definirane specifikacije. Suspaljivanje alternativnih goriva se vrši u liniji za proizvodnju klinkera, koja je izgrađena kao "best available technique" za cementnu industriju, u uvjetima kontroliranog sagorijevanja uz kontinuirani monitoring emisije plinova u atmosferu,a prema utvrđenim zakonskim granicama za emisije. Ovakav vid suspaljivanja alternativnih goriva predstavlja ekološki prihvatljivo uklanjanje otpada, jer ne nastaje sekundarni otpad za odlaganje i emisije plinova ostaju u zakonskim graničnim vrijednostima. Korištenjem alternativnih goriva čuvamo prirodne resurse.

Trend upotrebe alternativnih goriva u zemljama EU pokazuje da se u skorijoj budućnosti može očekivati potpuna supstitucija goriva dobivenih iz prirodnih resursa i da tako alternativna goriva postanu regularna goriva. Obzirom da Fabrika cementa Lukavac d.d. spada u red najmodernijih fabrika u Evropi,prati razvoj novih tehnologija i kontinuirano investira u iste, onda se i nama nudi mogućnost da pratimo rastući trend upotrebe alternativnih goriva.

Keywords: cement, alternativna goriva

Diversification of raw materials and possibilities of use for pellets containing the biomass

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Abstract:

Peleti, briketi i druge forme kompaktiranih proizvoda koji su izrađeni isključivo od biomase ili ona učestvuje u sirovinskoj smjesi u značajnoj mjeri, vrlo često se smatraju isključivo energentom i najčešće se kao potencijalna sirovina za njihovu proizvodnju uzima u obzir samo drvna biomasa.

Ovdje će se pokušati proširiti taj okvir, u smislu sistematiziranja mogućih upotreba opisanih kompaktiranih proizvoda bez ograničenja na njihovu energetsku valorizaciju, te razmotriti i moguće alternativne sirovine bez ograničenja na drvnu biomasu. Također, izložit će se i određene smjernice za buduća istraživanja tog područja.

Keywords: biomasa, peleti, briketi, sirovine

IR LASER INDUCED ABLATION OF POLYMER COMPOSITES

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Abstract:

Polymer composites have generated tremendous interest in a wide range of application. An attractive and rather new technique of fabrication polymers containing polar groups that can serve as protective layers to different nano-bodies (metals, conductive polymer nanocomposites carbon-based nanofillers, such as graphene) is IR laser-induced ablative deposition. This specific process occurs within a temperature jump and is controlled by kinetic rather than thermodynamic polymer degradation. We have recently examined IR laser-induced ablative deposition with poly(vinyl acetate) loaded with Fe and Cu particles, poly(ethylene-co-acrylic acid)zinc salt, poly(phenylene ether-sulfone) to establish its specific features and differences from conventional pyrolysis. It was of interest to us to continue our previous effort on pulsed laser ablation of polymer composites and we focused on nanocomposites from graphene incorporated into acrylic/methacrylic matrices. IR laser-induced ablation of PVAc loaded with Fe microparticles and Cu nanoparticles leads to formation of gaseous products and ablative deposition of polar, metal particles-containing polymeric films which contain Cu and Fe particles.

IR laser-induced ablative degradation of poly(ethylene-co-acrylic acid) zinc salt (PEAZn) leads to cleavage of both polyethylene backbone and CO2H group. It yields carbon oxides and volatile hydrocarbons (ethene as a major product) and affords ablative deposition of solid ionomeric films in which the initial ratio -CO2H/-CO2Zn is decreased due to higher thermal stability of the -CO2Zn group.

Pulsed infrared laser-induced ablation of poly(1,4-phenylene ether-sulfone) (PES) results in the extrusion of SO2, CO and hydrocarbon molecules and allows deposition of dark solid paramagnetic carbonaceous films that were analysed by FTIR, UV, XP, Raman and EPR spectroscopy and by electron microscopy and revealed as poor in S and containing CO, >SO2, –SO– and C–S–C units.

Nanocomposites based on poly(butylacrylate-co-methyl methacrylate) and graphene were ablated with IR CO2 laser using incident fluence of up to 6 Jcm-2. This resulted in a deposition of thin composite films with graphene sheets that were very well distributed in the polymer matrix. The deposits were characterized by means of spectroscopy, microscopy, and diffraction techniques.

Keywords: IR-laser, polymer ablation, composites

BIOMASS WASTE – SOURCE OF RAW MATERIALS

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Biomass represents an immense and renewable source for the production of bio-fuels and valuable chemicals. Agricultural crop residues, such as straw, corn stover and wood and wood wastes such as leftovers from timber cutting, broken furniture, sawdust, residues from paper mills etc. contain appreciable quantities of cellulose, hemicelluloses and lignin. New applications and methods for thermochemical conversion of biomass wastes into several new products have been developed by our research group. We have used a high energy ultrasound as an energy source to speed up the liquefaction process. Ultrasound is transmitted through a medium via pressure waves and the main advantage is directly related to the physical effect of acoustic cavitation. The resulting effect was presented in higher yields and 6 times faster liquefaction process. We used liquefied biomass as a feedstock in polymer chemistry, such as synthesis of polyesters, polyurethane foams and adhesives. Polyester polyols were prepared by using adipic acid and/or phthalic acid anhydride in a high temperature polycondensation - esterification reaction. The products were reacted with isocyanates to give a series of polyurethane foams that were comparable with commercial foams. Lignocellulosic biomass was dispersed in glycol and methane sulfonic acid was used as a catalyst. The NCC was isolated as a residue, rinsed with 1,4-dioxane and centrifuged. The product was a NCC suspension in 1,4-dioxane. The crystallinity index was from 83% to 84% and the yield was more than 67% when using cotton as the starting material. The yields were lower when using biomass since they depended on the initial cellulose content in the particular raw material. The NCC was characterized by STEM microscopy, X-ray diffraction and ^{1}H and ^{13}C NMR spectroscopy.. The average particle size was between 200 nm and 500 nm, with diameter from 15 nm to 30 nm. The method was also tested in the pilot plant reactor. Thus produced NCC was used as reinforcement in poly methyl methacrylate plates as well as in epoxy plates. The mechanical properties of such reinforced polymers were enhanced.

One of the main practical values of our research is the utilization of the liquefied lignocellulosic materials in adhesives for the wood particle boards, veneer boards and plywood boards. We have proven that such adhesives emit less formaldehyde and products have the same or even better mechanical and physical properties. A special attention was given to the utilization of the liquefied lignocellulosic materials as a new energy source with high heating value. Most of liquefied products have a heating value higher than 22 KJ/kg, that is in the range of pure ethanol and higher than brown coal. Initial tests have indicated that these products could also be used as a motor fuel. Since the production of such liquid fuel utilizes a huge variety of lignocellulosic wastes and takes place under very mild reaction conditions, an overall energy output is high. Several possible applications in energy production were identified and explored by our group.

The utilization of liquefied lignocellulosic materials can at least partially reduce the crude oil consumption, thus increasing the use of the renewable resources in large extent.

Keywords: Biomass liquefaction, Sonochemistry, Polyester, Adhesives.

NANOSTRUCTURED AND FUNCTIONAL POLYMER BASED ON STYRENE –METHACRYLATE COPOLYMERS AND CHEMICALLY MODIFIED CARBON NANOTUBES

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Abstract:

The nanostructured and functional polymer materials based on alkyl-methacrylates, styrene, amino-methacrylate comonomers and multiwalled carbon nanotubes (MWCNT) were synthesised and prepared ex-situ by polymer solution mixing and in-situ by radical copolymerization in solution. MWCNT were modified through introduction of alkyl-ester groups up to C12, in order to achieve miscibility at the molecular level and as well as dispersity and distribution of carbon nanotubes through the polymer matrix. The obtained polymers and composites were characterized in order to detremine its composition, structure, and special properties targeted towards certain applications such as reduction of noise and vibration level and self-cleaning properties.

With a change of the certain alkyl methacrylates (methyl-, hexyl-, dodecyl-, octadecyl-) content in copolymers, changes occur in the mobility of macromolecule segments as well as in the glass transition temperature of the polymer (from –100 to 100 ^{o}C), the plasticity/elasticity ratio, and electromagnetic nature – from mostly polar to mostly nonpolar (hydrophobic). The modeling of these properties and determination of interrelationships described by mathematical functions between the reaction-process parameters, bulk and application properties enable the creation of materials with optimal properties for specific applications. Furthermore, chemical cross-linking of copolymers and incorporation of even small quantities of functional comonomers such as dimethylaminoethyl methacrylate leads to the modification of existing and introduction of new properties.

As a result, materials of improved mechanical properties, adhesivity, chemical stability and solubility were obtained.

Keywords: carbon nanotubes, nanostructured and functional polymers

Biocompatibility of polymer implants

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Abstract:

Materials for long-term implantation in humans have traditionally been selected on the basis of their mechanical properties and minimal toxicity and development of relatively inert materials has been a main objective in the biomaterials field until only a few years ago. Modern medical implants are, however, also expected to integrate with the tissue in which they are placed. Integration depends on the processes that occur at the implant–tissue interface, and surface design is now recognised as an important part of implant development. Blood and tissue proteins are known to adsorb and denature at implant surfaces, and recognition of this protein adlayer by leukocytes is thought to be a pivotal step in the organisation of a foreign-body inflammatory response.

Most of the conventional materials do not meet the demands of having both surface and bulk biocompatibility properties to be used as biomaterials. Many polymers exhibiting the desired mechanical properties are hydrophobic in nature. When exposing to a biological environment these polymers are easily fouled by proteins and cells, thus limiting their application in biotechnology and medicine. An effective approach for developing a clinically applicable biomaterial is to modify the surface of a material that already exhibits excellent biofunctionality and bulk properties. Grafting of hydrogels onto polymer surfaces gives excellent results in producing highly wettable and in consequence, low-fouling surfaces. For these materials it is major surface engineering challenge to introduce reactive groups with sufficiently high density, reactivity and surface stability.

Due to the fact that most polymers do not possess functional groups which allow a surface modification, the first step is to create reactive functional groups on the polymer surface by using either CVD polymerisation or plasma polymerization techniques. All modification steps should be verified by means of high sensitive surface analysis (XPS, IR-ATR, ToF-SIMS, AFM, contact angle measurements). The influence of surface properties on protein repellence is studied by means of surface-MALDI-ToF MS.

Keywords: polymer implants, biocompatibility

Production of geopolymers from fly ash and sludge from settling lagune "Bijelo more" SSL Lukavac

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Abstract:

Fly ash is a waste material in coal fired thermal power plants which is eliminated from the waste gases after coal combustion in the electrostatic filters. The main characteristics of the ash are: chemical composition, grain size distribution, specific gravity, specific surface area, pozzolanic properties and radioactivity. Near the SSL there are four settlings called "White Sea" where the waste process water arising from the production of soda is transported. Settling (sedimentation) and cooling of waste process water is performed in the settling ponds. Applying the process of sedimentation (decantation), suspended solids are retained in the settling tanks while the clear part is discharged into the river Spreča using drainage system and collectors. This paper researches the possibility of application of fly ash from PP in SSL, as well as of the sediment "White Sea". For this purpose, activating agent in different proportions was added to the fly ash and to the sediment from the settling "White Sea". The prepared compositions were hermetically sealed in PE in the form of a cylinder mold and cultivated for 24 hours in air, followed by hydrothermal activation at 85° C in the duration of 24 hours. Thus prepared materials, after the hydrothermal activation of the geopolymerization process, were cultivated at room temperature for different time intervals. Testing of mechanical properties (compressive strength) of the hardened geopolymer paste was conducted after a period of cultivation.

Research results indicate that for the preparation of geopolymers using fly ash and sediment of adequate physical and chemical characteristics, initial composition of the total mixture is of a great importance which is determined by composing certain raw materials of fly ash, Water Glass, sodium hydroxide and water, and of all the components addition of NaOH is of particular importance.

Key words: fly ash, geopolymer

Production of $CaCO_3$ as a commercial product from the waste sludge from the process of brine softening

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Abstract:

Lime sludges or sludge waste generated as a byproduct in an industrial process of salt water softening, represent a significant economic and ecological burden, especially if such waste materials are disposed in the lagoons or directly discharged in water streams.

Alkaline character and high content in sludges of calcium carbonate and magnesium hydroxide in particular raises the possibility of their use as a secondary raw material for various purposes.

Obtained experimental results conducted in laboratory conditions confirm that lime sludges may be used as a base raw material for producing calcium carbonate because of its wide industrial applications.

Key words: Lime sludges, $CaCO_3$

THE USE OF ELECTROCHEMICAL SENSORS IN INDUSTRY AND ENVIRONMENTAL MONITORING

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Abstract:

A chemical sensor is a device that transforms chemical information into an analytically useful signal. This information may originate from a chemical reaction of the analyte or from a physical property of the system investigated. Comparing to classical analytical methods, usually very complex, time consuming and expensive, sensors represent simpler solutions with minimum chemicals consumption, no or simple sample preparation, short analysis time. Potentiometric sensors, as a special class of electrochemical sensors, are thoroughly discussed with emphasis on their application in surfactant analysis.

Definition of surfactants, their classification and an overview of analytical methods (classical and instrumental) for their determination in different materials was outlined as well. The principles of operation of surfactant sensors, their design and response mechanisms toward different clases of surfactants are presented.

There are numerous applications of surfactant sensors: from the quality control of surfactant raw materials and formulated products to their quantification in environmental materials etc. Most surfactants are more or less toxic to aquatic organisms due to their surface activity which will react with the biological membranes of the organisms. The biggest challenge in surfactants analysis is the determination of their low levels.

The future trends in development of surfactant sensors might be oriented to synthesis of new ionophores, development of new carriers of ionophores, new conducting substrates and application of nanomaterials in sensor construction.

The advantages and limitations of surfactant sensors in relation to other analytical methods for surfactants analysis are discussed too.

Keywords: electrochemical sensor, potentiometry, surfactant analysis, detergent

APPLICATION OF LONGCHAIN ORGANIC ACIDS IN CORROSION PROTECTION OF STEEL

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Abstract:

Corrosion of metallic structures causes significant material loss and environment pollution. For that reason new ecologically acceptable corrosion protection techniques are developed, especially for ecosystems like marine, sensitive to pollution. One of such protection techniques is a modification of metallic structures by the self-assembled monolayers: thin, well ordered organic films of long-chain organic compounds. In this work the possibility of corrosion protection of steel by long chain phosphonic acids is examined.

Thin films of octadecylphosphonic acid on steel surface are prepared by different methods: dip-coating, electrochemical method and spraying. Then, protective properties of such films are examined in artificial seawater by electrochemical techniques (3% NaCl): potentiodynamic polarization and electrochemical impedance spectroscopy. The surface of modified samples is also examined by contact angle measurements and Fourier Transform Infrared Spectroscopy in order to verify adsorption of phosphonic acid on metal and formation of an ordered organic layer.

The results of electrochemical investigations show that by using an adequate preparation method and conditions (temperature, time, concentration) it is possible to form protective layer of phosphonic acid that significantly reduces steel corrosion rate in artificial seawater.

Acknowledgments: The research leading to these results has received funding from Croatian Science Foundation under grant agreement 9.01/253.

Keywords: long-chain organic acids, steel corrosion protection

VARIETY OF POLYMERIC MATERIALS BASED ON POLYLACTIDE

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Abstract:

Production of synthetic polymers increases steadily, witnessing almost exponential growth since the start of their industrial production. However, biopolymer materials record even larger growth during last 20 years whereat that term encompasses materials obtained from row biomaterials, materials for biological (e.g. medical and pharmaceutical) purposes, in various biological environments (non-)degradable or compostable materials. Among a dozen of the most frequently used biopolymers a special place belongs to polyesters (poly(ε-caprolactone), polylactide (PLA), polyglycolide (PGA) and their copolymers (PLA-*co*-PGA), poly (ortho esters)). Application of these biodegradable polymers in numerous medical and biomedical fields is of a particular importance. The great advantage of these materials is ability to adjust their properties by varying the composition and methods of preparing and processing the material. Biopolymers based on PLA isomers and its copolymers with other monomers are used for the preparation of various products such as implants, hydrogels, carriers for delivery of therapeutic or diagnostic agents, substrates for tissue engineering. In this work different PLA based materials were prepared and tested. It is shown how to obtain materials of different properties and behavior, which is confirmed by numerous analyzes: nuclear magnetic resonance (1H NMR), infrared spectroscopy (FTIR), thermogravimetric analysis (TA), differential scanning calorimetry (DSC), scanning electron microscopy (SEM), testing of mechanical and surface properties.

Keywords: polymers, lactide, biopolymers

Advantages and disadvantages of titanium dioxide photocatalyst

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Abstract:

Titanium dioxide (TiO_2) is a very well-known and well researched material due to the stability of its chemical structure, biocompatibility, physical, optical and electrical properties. Titanium dioxide is the most frequently used photocatalyst for water and air purification. It is relatively cheap and abundant material, non-toxic, insoluble in water and resistant to most chemicals. The most important property of titanium dioxide that makes it a good photocatalyst is that it is a semi-conductor.

Under certain conditions, electrons can become mobile in semi-conductors. For this to happen the right amount of energy needs to be supplied to the semi-conductor. For titanium dioxide, the right energy has a wavelength of about 400 nm. Titanium dioxide can absorb portions of visible light called photons in order to mobilise its electrons.

However, the main drawback is that TiO_2 photocatalysts may only be excited by ultraviolet light (wavelength < 388 nm) due to their wide band gap. Therefore, the overall efficiency of TiO_2 remains too low under natural sunlight irradiation, as UV only accounts for about 4% of the incoming solar energy on the Earth's surface. With the purpose of utilization a wider solar spectrum in the application of TiO_2, considerable efforts have been devoted to the preparation and characterization of visible-light-active titanium dioxide materials doped with nonmetal impurities. This strategy is regarded to be one of the most promising techniques for the harvest of sunlight by TiO_2 photocatalysts.

Keywords: photocatalyst, TiO_2, advantages, disadvantages

SUSTAINABLE WASTE MANAGEMENT IN THE CITY OF ZAGREB

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Abstract:

In order to be able to follow the implementation and evaluation concerning the successful waste management on the European level it its necessary to have the corresponding data and information at disposal. AZO is the central body reporting to the European Commission on the implementation of some certain provisions concerning the protection of the environment, thus including waste as well.

The Report on the Municipal Solid Waste for the year 2011 is based on the data reported by the companies collecting such waste as well as the operators managing the waste depots and submitting such data in accordance with the AZO prescribed forms. Out of a total of 212 companies occupying in the mixed municipal waste collecting activity, 199 delivered such data. The waste disposal was reported by 146 depots, while an evaluation was performed for 5 depots and 13 municipalities not delivering the necessary data All municipalities and all cities had an organized waste collecting and waste transport activity and the population included therewith amounts to 96%.

The total yearly amount in the year 2011 is 1.645.295 t of municipal solid waste and the quantity per capita amounts to 371 kg. The share of the mixed municipal solid waste in the total collected waste amounted to 84% and 1.377.242 t respectively. The share of the separately collected waste in the municipal solid waste amounted to 16%, , however, only half of this quantity was sent directly for processing.

According to the agreement approved during the negotiation process regarding the Republic of Croatia joining the EU, the total amount of waste disposed at the depots which do not satisfy the standards prescribed by the Directive on Waste Disposal will have to be additionally decreased. The total quantity for disposal with the non-coordinated depots till the end of 2013 should not exceed 1.710.000 t. Taking the fact into consideration that the amount of the bio-degradable municipal solid waste is 937.375 t, this quantity exceeds, for approximately 370.000 t, the objective given by the Directive.

Keywords: waste menagement, Zagreb,

THE POTENTIAL OF APLLICATIONON FOOD INDUSTRY BY-PRODUCTS

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Abstract:

Since the various by-products of the food industry are rich with nutritionally valuable ingredients (dietary fiber, vitamins, minerals, antioxidants etc.) they represent a great potential for use in the production of various types of products. The aim of this work is to indicate the production of large amounts of by-products and problems of their disposal.

The food industry produce large amounts of by-products, which mainly represent a major problem and in most cases they are resolved through the usage of these valuable raw materials as animal feed or through landfills. Therefore, in this paper indicates some possible uses of various by-products of the food industry, such as apple pomace, sugar beet pulp and brewers' spent grains, also as defatted oilseeds cake in the development of new products, such as bread, pasta, snack products, etc., which are consumed by wide population.

The result of all this would be clearer picture of the extension of the said these by-products and the utilization of their potential in the development of new food products with better nutritional value.

Keywords: food industry, by-products, application

BIOCHEMICALS, BIOMATERIALS, AND BIOINNOVATIONS WHAT CAN WE GET FROM BIOMASS

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Abstract:

Environmental changes and oil price has triggered an increased interest in bio-based energy, chemicals and materials in the last decades. Thou the oil price have been dropped recently due to new findings, the transformation towards bio-based economy will continue. EU has pumped hundred millions of EURO in sustainability related research and innovation projects.

Sweden has followed the pattern and has been pushed towards the green economy by establishing the vision to create and develop a bio-based economy in the first half of the twenty-first century. Sweden is rich with non-edible bio-mass i.e. forest. Traditionally the forest was used in pulp and paper industry, but digitalization boom requires paradigm shift. Green materials and green chemicals were identified as a big potential. Ambitious research was started supported by Swedish government and industry.

Some of the industrial initiatives are:

- The new research agenda, NRA 2020, is the collective assessment of Swedish forest-based industries regarding research, development and demonstration, which is necessary for the sector to be able to contribute to achieving.

- Chemical cluster in Western Sweden started an initiative called Sustainable Chemistry 2030 with the vision that their business will be based on renewable feedstock and energy and contribute to sustainable society.

Keywords: product from biomass, biochemicals, miomaterials, Sweden

Diagnosis, control and optimisation of process and plant perfomance

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Abstract:

In the laboratory, pilot plant and industrial facilites a large number of variables should be kept within defined limits in order to plant run stable, and product quality to be satisfied.

Monitoring, diagnosis and optimization of process control systems play a key role in ensuring of the optimal process operation. The aim is routine monitoring the processes, detection and diagnosis of failures, preventive monitoring and optimal control.

Using modern software tools it is possible to statistically analyze processes and control systems, identify dynamical process models and control loops and optimize control system parameters. This ensures a more stable process control, higher product quality and optimal operation.

This paper will present the examples of process and device diagnostics as well as tuning and control system optimization.

Keywords: device diagnostics, control, optimisation

Packaging and environment

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Abstract:

Modern packaging is a feature of modern society and one of the indicators of its relationship to the environment. Due to the inadequate disposal and handling of packaging waste, package itself is placed in the bad context in public discussion about waste, often ignoring the critical role that packaging plays in securing the food system that protects the food practically reduces food waste and loss of food that negatively affect the environment. According to Hanssen (1998) food through losses and waste has a much higher impact on the environment than packaging.

EU legislation requires countries in the European Union and countries in transition to develop a waste management plan in accordance with the relevant directives. The Waste Framework Directive (2006/12/EC) (2008/98/EC) introduces a five-step hierarchy of waste management, where the prevention / reduction of waste the best option, followed by reuse, recycling and use of this energy, and least desirable disposal option. The Directive 94/62/EC, which covers all packaging and packaging waste by the manufacturer placed on the market in the EU has introduced the Extended

Producer Responsibility principle, which shifts part or all, of the waste management responsibility to the producer.

The potential of packaging to convey a specific message is put into function to protect the environment by using a variety of eco-labels on the packaging, such as: Mobius loop, Green Dot, Nordic Swan, FSC logo etc.

Keywords: **packaging waste, eco-labels, recycling, reuse**

COMPUTER-AIDED ENVIRONMENT FOR INCREASING THE EFFICIENCY AND COMPETITIVENESS OF PROCESS INDUSTRIES

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Abstract:

This presentation presents a computer-aided environment for supporting investment decision-making in process industry with the purpose of improving its efficiency and competitiveness. The following problems arise during such decision-making: i) conflicting factors affecting the decision-making process, ii) using the accounting information, such as the profit and cost, instead of cash flows, iii) presence of uncertain and indefinite input data.

In order to overcome the above problems, a computer-aided environment has been developing at the University of Maribor, Faculty of Chemistry and Chemical Engineering, for generating long-term optimal compromise solutions while designing capital-expensive plants for the efficient production of energy and chemicals. The computer-aided environment involves the following tools for sustainable decision-making: a) the appropriate economic criteria and optimization process models, b) multi-criteria optimization for considering economic, environmental and social goals, c) the innovative combined economic-environmental indicators, and d) designing optimal flexible processes by considering risk and uncertainty.

This computer-aided environment provides a methodological support for adopting those decisions that lead to the sustainable improvements of the competitiveness, as well as the energy, environmental and economic efficiencies of process industries.

Keywords: **computer-aided environment, efficiency, competitiveness, process industries**

PREPARATION AND PROPERTIES OF COMPOSITE MATERIALS POLY (L-lactide) / GROUND OLIVE PITS

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Abstract:

Polimerni materijali obilježje su modernog doba i preduvjet brzog napretka modernih tehnologija. Njihovo svojstvo bionerazgradljivosti nije nužno nedostatak kao što se često želi prikazati i pokušava ih se zamijeniti biorazgradljivim polimerima. Međutim, biorazgradljivi polimeri vjerojatno nikada neće uspjeti postati širokoprimjenljivi te mjesto za njih treba tražiti u specifičnim primjenama, tzv. nišama, gdje će njihova svojstva biti najbolje primjenljiva
Poli(L-laktid), (PLLA), jedan je od najviše istraživanih biorazgradljivih polimera, bilo kao komponenta polimernih mješavina, bilo kao komponenta kompozitnih materijala. Komercijalno se primjenjuju kao ambalažni materijal, u medicini, farmaciji i poljoprivredi.

Iako sve do nedavno PLLA cijenom nije mogao konkurirati konvencionalnim polimerima, danas je njegova cijena tek nešto viša od cijene PET-a. Nedostatci PLLA su krtost i loša preradbena svojstva. Također, zbog male brzine nukleacije proces kristalizacije ne završava tijekom procesa preradbe pa dolazi do nepoželjne sekundarne (hladne) kristalizacije.

U predavanju će biti prikazana svojstva PLLA omekšanog tributil-acetil-citratom (TBAC) te PLLA kompozita s lignocelulozним punilom (mljevenim košticama masline određene granulacije). Rezultati istraživanja svojstava modificiranog PLLA pokazali su da nije postignuta dovoljna adhezija polimera i punila, ali punilo i omekšavalo ubrzavaju proces nukleacije tijekom hlađenja. Rezultati biorazgradnje u okolišupokazuju da najprije počinje razgradnja omekšavala odnosno punila, što doprinosi dezintegraciji samog materijala. Međutim, u istraživanim uvjetima u okolišu PLLA ne pokazuje svojstvo biorazgradljivosti

Keywords: kompozitni materijali, PLLA, koštice masline

Effects of goat skin bag and innovatiing casing materials on volatile aroma compounds of Tulum cheese

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Abstract:

Aroma compounds of cheese are effected by various conditions when cheese processing and maturation. In this research, firstly goat skin bag properties were determined and than alternative innovating casing material which has high, medium and low oxygen permeability were produced. Tulum cheese were maturated in goat skin bag, high density polyethylen plastic material and three innovating materials. The objectives of the study are to investigate the some volatile aroma compounds of Tulum cheese ripening in goat skin bag (GSB), plastic material (PPM) and alternative casing materials (HPIP, MPIP, LPIP) Alternative casing materials has three different oxygen permeability properties; HPIP 8139 cc/m^2day; MPIP 5100 cc/m^2day and LPIP 1896 cc/m^2day.

Fifty compounds were identified in the volatile fractions of Tulum cheese including 10 acids, 10 ketones, 4 aldehydes, 14 alcohols and 12 miscellaneous compounds. Propiolic, acetic and butanoic acids of samples ranged between 0,07-4,97%, 0,13-3,06% and 0,19-7,345%, respectively. Major methyl keteones were identified as 2-butanone, acetoin, acetone, diacethyl and 2-heptanone. Aldehydes were identified in cheese samples including 2-methyl butanal, 2-methyl-1-butanal, 2-methyl propanal and 2- furancarboxaldehyde. The major alcohols in total 14 alcohols were ethanol, 2-methyl 1-buthanol, 2-3 butandiol ve 2-methyl 1-propanol. Twelve miscellaneous compounds including hexane, chloroform, toluene, 2,2,4,6, penta methyl heptanes, diethyl ether, 2-bromopropene and acetonitrile were identified.

Keywords: goat skin bag, tulum cheese, volatile aroma

Evaluation of hydroxymethylfurfural content in honey; comparison of chromatographic and spectrophotometric method

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Abstract:

HMF (5-hydroxymethyl-2-furaldehyde) is primarily used as honey quality parameter indicating processing and storage conditions of honey. HMF is cyclic aldehyde which is formed in honey during the acid-catalysed degradation of hexoses (fructose or glucose) and/or degradation of 3-deoxyhexulose by the Maillard reactions. It is practically absent in fresh honey, but its concentration tends to rise after heating and storage of honey.

The aim of this study was to compare two official methods prescribed by International Honey Commission for determination of HMF content in honey (chromatographic (HPLC) method and spectrophotometric method after White). Linearity range was confirmed for both methods up to 10 mg/L. HPLC method was more accurate (recovery 99-103% compared with 90-91% for spectrophotometric method) while spectrophotometric method showed better precision regarding repeatability of sample preparation (RSD 3.45% compared with 5.52% for HPLC method).

Measurement repeatability obtained by repeated measurements of same solution was comparable for both methods. Comparison of methods was performed on 13 honey samples (8 chestnut and 5 black locust honey samples), and the results showed that methods are comparable within the evaluated range.

Keywords: HMF content, honey, HPLC

Influence of lignite on the physico-chemical characteristics of the soil and the possibility of its application as substrates in the soil

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Abstract:

Microstructure of lignite coal and his chemical properties, the ability to be linked of a variety organic and inorganic compounds in ionic and molecular form, with physical and chemical forces of different strengths, makes lignite coal is very good substrate. It is known that the introduced of lignite coal into the soil leads to a reduction action of a high concentration of H^+ and OH^- ions. Lignite can improve soil conditions as well as to support plant nutrition mainly due to the high content of humic substances, especially humic acids.

Since the input of the main plant nutrients are mediated by humic substances, it is the growth of the plant directly or indirectly under the influence of these. As the stimulating effect of humic substances on plant growth increased intake operates major plant nutrients: N, P and K. In addition, when appropriate humic substances are present in the soil, they reduced demand for the NPK fertilizer. The study used the lignite mine "Šikulje" of lignite ore mine "Kreka".

Lignite used in the experiment was taken from the roof layer, excavated and comminuted in a shredder to granulation size of 0-15 mm, further screened to granulation size 0-5 mm and dried in an oven at a temperature of 105°C. These investigations were conducted by growing plant strawberries to eight different combinations of soil with the addition of certain amounts of coal, manure and/or mineral fertilizer NPK 7:15:30, including the control variant of soil without any additive. It has been found that the addition of ground lignite influence to the improvement of physico-chemical characteristics of the soil (electrical conductivity, pH value, the content of humic acids, the content of the main plant macronutrients N, P and K) and the increased plant yield.

Keywords: soil, lignite, humic acids, plant yield

Spectrophotometric determination of caffeine from ground coffee and black tea

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Abstract:

Hemijska struktura ksantina ($C_5H_4N_4O_2$) bazirana je na purinu koji je najviše zastupljeni heterociklički aromatski organski spoj sa azotom u prirodi. Kofein je purinski alkaloid najšire primjene, naročito zbog svog slabog stimulativnog djelovanja. Nalazimo ga u najvećem procentu u kafi, ali ga ima i u čaju, guarani, koli, oraščiću, kakaou, itd. Izolovan u čistom obliku, kofein je bijele boje, kristalan prah bez mirisa. Sastavljen je iz bijelih kristala jako gorkog ukusa, koji se rastvaraju u vodi.

Konzumiranje kofeina u normalnim koncentracijama nema negativnih utjecaja na koncentraciju i visoke mentalne funkcije, a pića obogaćena kofeinom se često konzumiraju da bi poboljšala fizičko stanje.

Cilj ovog istraživanja bio je uporediti sadržaj kofeina u prženoj mljevenoj kafi i crnom čaju. Izolacija je izvršena ekstrakcijom pomoću hloroforma, koji se pokazao kao najpogodniji rastvarač . Metodama identifikacije i karakterizacije korištenih u radu dokazano je, da je, bez obzira na polazni materijal, izolirani spoj kofein.
Jednostavna i brza spektrofotometrijska metoda je opisana za određivanje kofeina u kafi i čaju. Prikazani rezultati istraživanja IR spektroskopijom potvrđuju strukturu izoliranog spoja.

Keywords: kofein, ekstrakcija, mljevena kafa, crni čaj, FTIR, UV-spektrofotometar

POSTER SECTION

Extraction of curcumionoids from turmeric (Curcuma longaL) with subcritical water

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Curcuma longa L., also known as turmeric, is grown in warm, rainy regions of the world such as China, India, Indonesia, Jamaica and Peru. The rhizome of turmeric is an important source of a yellow natural pigment, which in the past has been used as a spice, a coloring agent in the food industry, for household medicine usage and as an insect repellent. The yellow color, which is characteristic for turmeric rhizome, is due to the presence of 3-5 % of curcuminoids. Curcuminoids are practically insoluble in water at ambient conditions, therefore water cannot be used as an extraction solvent for these compounds.

On the other hand, when heating water above its boiling point and applying just enough pressure to maintain it in liquid state, its properties change significantly. At these conditions, the polarity decreases drastically, which enhances the solubility of many less-polar organic compounds, such as the curcuminoids. Nevertheless, when high temperatures are applied the possibility of hydrothermal degradation reactions that degrade the organic compounds exists, which consequently lowers the quality of obtained extract. Extraction parameters should therefore be studied more in detail and optimized.

In this study, the isolation of curcuminoids from turmeric (*Curcuma longa* L.) was performed using the subcritical water extraction. The effect of extraction parameters, such as temperature and time, on the extraction yield of curcuminoids was observed. Obtained extracts were analyzed for the contents of curcumin, demethoxycurcumin and bisdemethoxycurcumin by HPLC and the antioxidant activities were determined using the photochemiluminisce (Photochem®) method.

Keywords: Curcuminoids, turmeric, subcritical water extraction

POSTER SECTION

The effect of the extraction techniques on the yield, kinetics and total phenolic and flavonoids content of aqueous-methanolic extracts from nettle root (Urtica dioica L.)

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Abstract:

The goal of this study was to define the optimal extraction technique for obtaining the maximum yields of the extractive matter, maximal total phenolic and total flavonoids content of nettle roots (*Urticae radix*) as well as to determine the parameters in the extraction kinetics equations. Five extraction techniques: maceration, reflux, Soxhlet, Tillepape and ultrasonic extraction, were used to obtained the extractive matter from nettle roots. The total phenolic and total flavonoid contents were determined according to the Folin-Ciocalteu method and by the complexation reaction with $AlCl_3$, respectively. Two kinetics models - model Ponomarev and a non-stationary diffusion model through the plant material were successfully used for modeling extraction process of extractive matter.

The extract obtained by the Soxhlet extraction contained the highest total extractive matter yield (16.22 g/100g of dry plant material), as well as total phenolic (497.25 mg GAE/g dry extract) and total flavonoids (11.42 mg RE/g dry extract). The use of ultrasound reduced the extraction time, as well as total phenolic and total flavonoids content. The results indicate that aqueous-methanolic extracts from nettle root are natural products with potential application in the food and pharmaceutical industry.

Key words: extraction techniques; nettle root; total phenolic; total flavonoids.

POSTER SECTION

Landfill leachate quality evaluation through the landfill pollution index

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Abstract:

Recent regulations in field of solid waste management require treatments before the disposal of municipal waste on landfills. Chemical and physical parameters of the landfill leachate can be used for evaluation of the landfill age as the main parameter for the stage of degradation inside the landfill body. In order to approach the impact of leachate pollution into the environment, different pollution indexes can be calculated.

One of the common indexes is the Leachate Pollution Index (LPI) suggested by Kumar and Alappat, who have developed a system of comparing leachate pollution potentials of various landfill sites, in relation with the content of a particular pollutant. This calculation includes the concentration and significance of each pollutant and can be used as the main criterion for ranking of the environmental impact and for the design of leachate treatment processes. LPI has been calculated for the "Bikarac" landfill based on the following parameters: suspended matter, COD, BOD, ammonia nitrogen, zinc, copper nickel, mercury, arsenic phenolic compounds, chlorides and pH value.

The calculated results are discussed and compared with the literature data.

Key words: landfill leachate, Leachate Pollution Index (LPI)

POSTER SECTION

Some properties of kefir made from different type of milk

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Abstract:

Kefir properties are effected by different conditions; i.e. milk type, kefir grains and flora, inoculum rate, incubation temperature. Kefir grains have a highly diverse and complex microbiota. Fort his reason, kefir has a highly complex flavor. Milk compositions generally show differences according to animal species, feeding style and region and animal diseases. Besides this, technological and manufacturing prosess are also effected kefir properties.

In this research, some properties of kefir made from cow, ewe and goat's milk (hair, saanen and halep goat milk) was investigated throughout 15 days storage period. The chemical composition (g/kg) of the Kefir samples ranged from 129,1-193,4 for total solids, 34-62 for protein, 7-11 for ash. In addition, pH and lactic acid were ranged 4.18-4.39 and 0.83-1.14%, respectively.

In all kefir samples, acidity increased during the storage period. Some volatile aroma compounds were also determined by GC-MS. Volatile arome compounds were ranged 0.5-25.11 mg/kg for acetaldehyde, 0-0.79 mg/kg for aceton, 1209.8-5415.5 mg/kg for ethanol, 319.1-135.30 mg/kg for acetic acid. CO_2 amount of all samples were ranged 55.77-135.30%. Tyrosine content was changed between 0.15 to 0.24 mg/5 ml. The chemical and biochemical peoperties of the product were also influenced by the type of milk used. All the sensory attributes tested were infuenced by the type of milk. Especially, ewe milk's kefir was so heavy and had intensive taste and odour.

Keywords; kefir, cow milk, ewe milk, goat milk

POSTER SECTION

Entity of dioxin in milk

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Abstract:

Polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and polychlorinated biphenyls (PCBs) show toxic and carcinogenic effects. They have also destructive effect on endocrine, immune, cardiovascular and reproductive systems. Dioxin and PCBs are formed as a result of herbicide usage, during inflammation and incineration of industrial wastes. They accumulate especially in adipose tissue. People take these substances by consuming contamined food such as shellfish, fish, dairy products and meat. Since dioxins can easily cross the placenta in pregnant women, it may affect embryonal and fetal development. In addition to this, worrisome consequences may occur during the first three months after birth and breastfeeding.

Dioxins are lipophilic character and therefore can be found in meat and dairy products containing animal fat. Dioxin concentration in milk can change environmental factors or properties of feed eaten by dairy animals. In a research collected in farms located in Napoli and Caserta districts, Italy, it was found that the total concentrations of PCDD/Fs ranged between 3.36 and 16.4 pg/g fat. Furthermore, in 58 milk samples, it was found that this level was under the legal limits, Because it is reported that the WHO-TEQ PCDD/Fs mean value ranged from 0.05 to 2.38 pg/g fat while the WHO-TEQ dl-PCBs was between 0.04 and 2.62 pg/g fat. İn Netherlands, dioxin was also determined in farm milk. In another study on sheep milk fat, it was found that dioxin amount was measured as 1:02 to 20:42 ng/g. However, the level of dioxin in milk reduces day by day in Europe, but in our country there is no any data about decreasing.

Keywords; dioxins, milk

POSTER SECTION

Determination of some volatile aroma compound by GC-MS in Kefir produced from different milk types and incubation temperatures

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Abstract:

Kefir is one of the important fermented milk products made from different milk types ie. cow, ewe, goat. After fermentation, kefir is viscous and slightly carbonated with a sharp acidic and slight yeasty flavour. When consuming kefir, a prickling sensation on the tongue is typical, due to CO_2 produced by the yeast microflora. But kefir properties is effected by not only mikrobial flora but also milk type, fermentation temperature and time, inoculation ratio. The aim of this project was to describe changes in the some aroma compound in kefir samples produced with cow, ewe, hear goat, saanen goat and honamlı goat's milk at different ıncubation conditions (18, 25 and 30°C) during 15 days. Acetaldehyde, aceton, ethanol, diacethyle, butyric acid, acedic acid, isovalerik acid and valeric acid content of sample were determined during storage. At the beginning of the storage time, acetaldehyde was the highest concentration in saanen milk's kefir (15.36) at 18°C, but in honamlı milk's kefir (5.14 and 62.03) at 25 and 30°C. In cow and hear goat's milk kefir samples, acetaldehyde amount were determined as 6.85 and 1.12 at 18°C; 0.39 and 1.47 at 25°C; 54.28 and 4.70 at 30°C, respectively. Acetaldehyde amount were changed in cow, hear goat, saanen goat and honamlı goat's milk kefir as0.40, 0.82, 0.48 and 0.60 at 18°C; 0.70, 0.62, 0.87 and 1.09 at 25°C; 3.02, 6.57, 3.38 and 0.53 at 30°C, respectively. Aceton were changed as 0.91-5.70 in cow's milk kefir, 0.19-4.10 in hear milk's kefir, 1.24-4.10 in saanen milk's kefir and 0.75-1.05 in honamlı milk's kefir at 18°C, respectively. Aceton content of cow, hear goat, saanen goat and honamlı goat milk's kefir samples produced at 25 and 30°C were changed between 0.20-5.40; 1.33-8.22; 1.41-3.56; 0,0-3.80; 0.65-3.45;1.04-4.02; 2.04-3.18; 1.35-6.05, respectively. In the first storage day, ethanol content were important in Hear and Honamlı goat's milk kefir as 902.33 and 491.46 at 18°C; in Saanen and Hear goat's milk kefir as 432.18 and 345.00 at 25°C; in Saanen and Hear goat's milk kefir as 517.53 and 271.12 at 30°C. Ethanol content of Honamlı and Hear goat's milk kefir were determined to be more important during 15 storage days. Diacetyl amount were very low concentration in all samples, but diacetyl content were high level in kefir samples produced at 30°C then others. Saanen milk's kefir were included 1.43 at 30°C. Highest acetic acid content were determined in cow's milk kefir (355.00) at 18°C; in Honamlı goat's milk kefir (242.05) at 25°C; cow's milk kefir (200.11) at 30°C in the first day of the storage. Therefore, acetic acid content were generally decreased during the storage period. Butyric acid, isovaleric and valeric acid contents of samples were very low concentration during storage.

Keywords: Kefir, milk type, volatile aroma compound

POSTER SECTION

Antioxidant properties of kefir produced with cow, ewe and goat milk

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Abstract:

In this research, five different milk type (cow (A), ewe (B), hair goat (C), saanen goat (D) and halep goat (E) milk) were used in the production of kefir and stored 21 days in +4°C. Some antioxidant properties of samples were investigated. It was found that the glutathione peroxidase activity of kefir samples may differ according to milk sample which they produced with. On the first day of storage, the highest glutathione peroxidase activity was determined in kefir sample produced with B sample whereas the lowest glutathione peroxidase activity was determined in D sample. The differences between the groups were statistically significant ($p < 0.05$). The Glutathione peroxidase activity of D sample decreased but increased in E sample during the storage period. Glutathione peroxidase activity in D sample folded 3 times and this change was time dependent. Unlike in other samples, the glutathione peroxidase activity in D and B samples were determined very low. According to results of analysis performed on the 21st day of study, the highest glutathione peroxidase activity was measured in E and A samples.

On the first day of storage, Superoxide dismutase (SOD) activity of kefir samples were measured C sample 95.46 U / g protein, 87.58 U / g protein B sample, 62.64 U / g protein A sample (54.08 U / g protein and 52.87 U / g protein D sample. During the storage period there was significant decline in SOD activities of kefir samples, apart from kefir samples produced with ewe milk ($p<0,05$). At the end of storage period, the highest SOD activities were measured in kefir samples produced with ewe, cow and hair goat milk. Because catalase is one of the most sensitive enzymes to heat, it was considered that this enzyme was inactivated by the pasteurization temperature applied during kefir production. Therefore, catalase activity of kefir samples could not be identified.

Keywords: Kefir, antioxidant properties, milk type

POSTER SECTION

Some properties of cow's and donkey's milk kefir

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Abstract:

Compared with ruminant's milk, donkey milk has been studied less in the past, therefore many researchers interest in donkey milk have increased because its composition is similar to that of human milk. Although donkey milk is consumed directly, it may be prosses as pasteurized milk and milkpowder. Besides this, donkey milk is used in cosmetics ındustry. In this study, it was investigated that it was examined used and can not be used in the production of kefir with donkey milk. In traditional kefir production, kefir grains was occured by directly adding about %3 grains to pasteurized donkey milk after cooling 25°C.

After period of 18-24 hours at 20-25°C fermentation, the grains were seperated from the milk and kept at 4°C during 21 days. Some chemical, biochemical and microbiological properties of donkey milk kefir were analysed in 1., 7., 15. and 21 days. The chemical compositions in cow milk kefir were ranged from 11.47-11.52% for total solids, 3.25-3.40% for fat, 0.53-0.54% for total nitrogen, 3.41-3.45% for protein, 0.75-0.76% for ash, 65.2-110.4% for CO_2 amount. Meanwhile, the chemical compositions in donkey milk kefir were ranged from 9.71-9.75% for total solids, 0.86-0.90% for fat, 0.27-0.28% for total nitrogen, 1.75-1.79% for protein, 0.48-0.49% for ash, 21.4-47.3% for CO_2 amount.

Viscosity of donkey milk kefir was lower, so donkey milk total solids can be increased with donkey milk powder or stabilizer/emulsifier agents. Lactococcus spp., and Lactobacillus spp. content of kefir samples was similar during storage period in all samples.

Key words: Donkey milk, kefir, functional products

POSTER SECTION

GC/MS identification and quantitive determination of selected phenolic acids in red wine

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Abstract:

Wine as a complex matrix with over 600 different chemical compounds present analytical challenge especially by identification and quantification in low concentrations region.The chemical composition of red wines include: mineral matter, acids, vitamin A and particularly important phenolic compounds, which also included phenolic acids (PA). PA have properties beneficial to human health such as anti-bacterial, anti-inflammatory and anti-tumor. As mentioned in the literature, the most common techniques for the determination of PA are high-performance liquid chromatography (HPLC) and gas-chromatography coupled with mass spectrometry (GC/MS) [1,2].

In the present work, GC/MS method for the determination of PA in red wine samples was studied in detail. In the selected samples, hydroxy-methoxy-benzoic (syringic) and hydroxy-cinnamic (p-coumaric and caffeic) acids were identified. The method linearity was tested in the concentration range from 10 to 100 mg L^{-1}. It was confirmed that the method is linear with the correlation coefficients (r^2) between 0.993 and 0.998, for all analyzed compounds. Also, the method was proved to be repeatable (RSD < 5%) and precise.

For the PA isolation from wine samples, the following extraction techniques were used: liquid-liquid extraction (LLE) and solid phase extraction (SPE). The techniques were compared and the SPE was selected as efficient and selective. In addition, the application of the SPE cartridge significantly improved sample preparation time and reduces the use of harmful organic solvents, which makes this technique simply and cheap. The selected compounds were identified in the samples by comparing their retention times (r_t) with those of standard compounds, taken under the same chromatographic conditions or EI mass spectra available in NIST database. An internal standard (ISTD) - 2,5-dichlorobenzoic acid was used in order to control derivatization and to determine extraction efficiency.

Keywords: Wine, p-coumaric acid, caffeic acid, syringic acid, GC/MS identification

POSTER SECTION

Study of impact of wastewater load on processing technology selection

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Abstract:

Living and working man produces different properties of liquid and solid pollution origin . When it comes to treatment of contaminated water , we aim to be one of their harmful effects neutralize and safely dis-pose, so as not to endanger the quality of the environment , and above all the water sphere. Collect contaminated water (influent) appropriate sewage facilities - sewage, transported as quickly as possible to the place of treatment or disposition and drop the appropriate recipient must (receiver). To successfully execute the tasks purification contaminated water, it is necessary to know the quantity, type, quality, methods and processes of purification and conditions of the recipient. In practice, treatment of polluted water is commonly used mechanical and biological treatment, and sometimes chemical, including disinfection of the effluent. Chemical processes are particularly present in the purification of polluted process industries. Industrial water purification is performed most often in plants (less common in natural conditions), - a complex set of structures of buildings in which are located the appropriate equipment, and automation devices whose operation requires adequate energy (usually electricity), various chemicals, and qualified personnel operation management and exploitation of plant discharges of polluted water, untreated or insufficiently purified water in the recipient, although looks simplest way and most economical way of disposition, can cause a variety of cause -related consequences that harm and restrict its use. Changes in water quality in the recipient can reduce the total amount of available water reserves, and thus cause significant sanitary and technical and economic problems for water users. To increase or preservation of existing fish stocks recipient is of utmost importance the content of dissolved oxygen in the water. Sanitation (sewage) water formed on sanitation systems for residential, public, industrial and other buildings where people live and work. Quantity of fresh water depends on the specific consumption of water, and is equal to or less than about 10 %. The aim of this study was to determine the impact of the cargo load on wastewater treatment technology selection. The results of this study could represent a significant contribution to the protection and management of the environment as one of the strategic directions of research in the Federation of Bosnia and Herzegovina.

Keywords: burden of waste water, the selection of technology for processing

POSTER SECTION

Assessing the degree of contamination of the soil around the lake Modrac after the flood of 2014

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Abstract:

Reliable and most important water resource for the Tuzla region did is Modrac lake. Due to the great development of agriculture in this area, resulting in the use of chemicals that are released into the lake, this approach directly affects the great pollution of the lake, the destruction of flora and fauna and others.

The consequences of the accumulation of negative impact on the health of people and animals who consume such agricultural products. A significant danger is heavy metals originating from industry. For this reason, research soil around the lake Modrac are extremely important because they represent indicators of contamination by permanent pollutants and the impact of floods that afflicted 2014 years this area. The main task of this research is to determine the degree of contamination of soil from the area lakes Modrac by organic and inorganic substances and heavy metals after the flood.

Although the sampling was done a month after the floods, assuming that there were layers of sediment, heavy metal analysis results are encouraging, since the concentration of cadmium, lead and copper, which are considered dangerous pollutants soil, below the limit values. Winning the value of the research show that it is safe to use the soil for agricultural purposes.

Key words: Modrac Lake, flood, heavy metals, contamination, agriculture

POSTER SECTION

The temperature and smoking time influence on chemical and sensory properties of smoked chicken

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Abstract:

The aim of this study was to determine the chemical and sensory properties of smoked chicken produced in controlled conditions, changing the temperature values and time at constant pressure. First category deboned chicken meat was used for testing. It was prepared in accordance to the familiar preparing raw material procedure for technological smoking process.

The product was smoked at various temperatures ranging between 52.5 and 62 °C, over 10 to 30 minutes. In heat treated products we determined the chemical properties (water, protein, fat, ash and nitrites) and sensory properties by applying the tripartite test or triangle method. Basic chemical parameters of meat in a switched smoking procedure had no significant difference and they were very similar to the characteristics of smoked meat, while in sensory properties we observed some differences.

Differences in the sensory properties of changed smoking process were in sample color, softness, flavor and aroma. Smoked meat derived in a changed way of smoking process is rated to be very acceptable.

Keywords: smoked chicken, smoking process, chemical parameters, sensory properties

POSTER SECTION

Prediction of water quality parameters of river Una using evolutionary methods

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Abstract:

The water quality and quantity of water resources is a subject of ongoing concern. The assessment of long-term water quality water changes is also a challenging problem. Many spatial and temporal techniques require that the monitoring be equally spaced over time or space. In this paper GPdotNET program was used for mathematical modeling and prediction of time series of river Una water samples, which is based on the genetic programming method.

Monthly water samples of the river Una were taken at three locations: Lohovo, Hatinac and Pokoj, at which several important water parameters were monitored. The research was conducted from September 2012 to July 2014 and include all four seasons. Study results show the ability to apply mathematical patterns obtained in the prediction of water quality parameters.

This fact provides a very useful tool for filling the missing values of time series of water quality parameters, that is a serious problem in many river Una monitoring stations.

Keywords: GPdotNET, Genetic programming, water quality parameters, Una River

POSTER SECTION

Efficiency of nonionic tenzides as ligands for metal cations

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Abstract:

It is known that tensides as surface active agents find wide application in different analytical procedures („cloud-point" extraction, membrane ultrafiltration, bioremediation techniques, etc.), due to their amphiphilic properties and possibility of micellar agregation. However, application of tensides as ligands for metal cations became the subject of many investigations recently. Actually, the presence of repeating oxyethylene units (contains electron-donor oxygen atoms) in their structure explains the interactions with cations. These kind of interactions are not explained enough, so the principle of „molecular recognition" and formation of coordination bond can not be confirmed (compared to typical macrocyclic ligands). In this paper, interactions cation-tenside were investigated.

Spectrometric measurements on model-systems (cation+counter ion+tenside) were applied. Interactions were explained based on the position and intensity of absorption maxima. Investigated model-systems were also applied in liquid membrane preparation. Nonionic tensides dissolved in nonpolar organic solvents were tested as ligands in liquid membranes for metal cation transport. The effect of their application reflects in decreasing the level of cation transport, caused by strong metal-tenside interactions within the membrane. Nonionic tensides: TX-100, TX-45, Brij 35, Brij 58 and Brij 78 were used in experiments. Interactions with metal cations (Cu(II), Pb(II) and Cd(II)) and competitive ligand 18-crown-6 dissolved in organic solvents (1,2-dichloroethane, dichloromethane and chloroform) were investigated.

The results showed that the strongest interactions occured between cations and tensides with longer chain, eg. higher number of electron-donor centers (TX-100 compared to TX-45). AAS technique were applied for metal cation concentration measurements, after 3 hours of experiment: lower transport efficiency actually proved the efficiency of nonionic tensides as ligands in liquid membranes.

Key words: metal cations, ligands, nonionic tensides, liquid membrane transport

POSTER SECTION

Catalytic conversion of diethyl ether on Ni-Moredenite

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Abstract:

The study examined influence of the presence of Ni^{2+}-ions in the synthetic zeolite of mordenite (NaM) on its catalytic characteristics in the reaction of dehydration of diethyl ether in the gas phase. The conversion was observed in the static system in the temperature interval of 425 to 653 K. The reaction products were ethene and water and only on NaM a small quantity of butene.

In the observed temperature interval, the reaction on mordenite (NaM) and on Ni-mordenite (NiM) does not follow the kinetics of I order, has an initial period and in time gets accelerated. By the temperature increase, the initial period gradually disappears and the reaction becomes the reaction of I order on NaM (T= 653 K), while on NiM at all observed temperatures the reaction has an initial period.

NiM proves to have a bigger catalytic activity for the reaction of dehydration of diethyl ether than NaM, so the reaction of dehydration on NiM occurs at the temperatures by 150 do 200 K lower than on NaM. The increase of catalytic activity of NiM compared with NaM is a result of removing Na^{+}-ions in the original zeolite NaM, so that we get a more acid catalyst that contains a bigger number of acid catalytically active centers and stronger ones compared with NaM.

Keywords: mordenite, Ni-mordenite, dehydration, diethyl ether

POSTER SECTION

Organic activated bentonite as adsorbent in ammonia-phenol wastewater treatment

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Abstract:

Ammonia-phenol wastewater belongs to the group of most contaminated wastewater that can occur in the industry. They contain high concentrations of phenol and ammonia as well as many other organic and inorganic compounds. Phenol is one of the most common pollutants of water, is toxic at very low concentrations, and its presence in open water systems can lead to the formation of substituted halogenated compounds in the process of disinfection and oxidation. Phenol is important in studies related to the treatment of industrial waste water, as it is often used as a model pollutant. Phenol is persistent organic pollutant that can have long-lasting negative impact on the water ecosystem.

This type of wastewater generated in various stages of the technological process of coke, benzene, ammonium sulphate in Global Ispat Coke Industry Lukavac, and leads to plant for biological treatment. Biological wastewater plant treatment is based on biochemical degradation of phenol and ammonia by bacteria adapted to the phenol and ammonia. The aim of this work was to determine the possibility of applying the organic activated bentonite in the treatment of ammonia-phenol wastewater. For the purpose of this study was used bentonite from open pit located near Sipovo, this is the first deposit of bentonite in Bosnia and Herzegovina. Quaternary ammonium cation (heksadeciltrimetilamonijumbromod-HDAM) was used as activator. Samples were taken before the entrance to the treatment plant and analyzed in the period of one hour, research has lasted seven days. In the raw samples were determined ammonia, phenol, cyanide and thiocyanate, after the addition of activated bentonite, the mixture is stirred, filtered and again analyzed on mentioned pollutants content.

On the basis of this research, it can be concluded that the bentonite activated with HDAM has adsorption effectiveness of thiocyanate (39,8%), phenol (27,3%), ammonia (18,8%) and cyanide (12,3%).

Keywords: wastewater, ammonia, phenol, bentonite, organic activator

POSTER SECTION

Bioaccumulation of metals from the environment as a factor of food safety

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Abstract:

Results of numerous studies show the constant presence of heavy metals in the environment. Metals are present in the air, water and soil due natural processes, but mostly as a result of human activities such as industrial and agricultural processes.
Fruits and vegetables accumulate soil metals during growth while different animal species bioaccumulate metals either from their environment or through food. Since metals are not biodegradable they can accumulate towards the top of the food chain presenting a risk to human health.

This paper presents lead, cadmium and mercury concentrations in food sampled in the area of Split and Dalmatia County in the period 2001 - 2013. Study includs food that is most prevalent in the daily diet such as fruits, vegetables, grains, milk, meat, fish and their products. Concentrations above LOD were determined in 83% of analyzed samples for lead, 78 % of analyzed samples for cadmium and 61 % of analyzed samples for mercury, respectively. In certain food groups more than 30% of the samples contained 75% of the maximum allowed concentration.

Therefore simultaneously with measures for reducing emissions of heavy metals into the environment, it is necessary to conduct constant monitoring of heavy metals presence in food which is an important route of human exposure to metals.

Keywords: metal pollution, bioaccumulation, environment, food

POSTER SECTION

Determination of heavy metals in Jala and Spreča rivers and overflow water from coal ash disposal sites

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Abstract:

The western part of the Tuzla municipality is under strong anthropogenically impact by uncontrolled emissions of different waste streams. Technological process in manufacturing of salt, thermal and electrical energy had significantly contribute to the pollution of the environment in particular aquatic ecosystems, rivers Jala and Spreča.

During the long period of pollution of the river Jala given result is that this watercourse become one of the most polluted in Bosnia and Herzegovina. Significant contributions to pollution are among others the overflow of water from coal ash disposal sites. This study was aimed at determining the ecological status of surface water bodies of the western part of Tuzla municipality. Six samples were taken and analyzed on atomic absorption spectrometer to determine concentrations of As, Ba, Cd, Cr, Co, Cu, Hg, Mn, Ni, Pb, Sr and Zn.

As part of research carried out to determine the pH level, electrical conductivity and dissolved oxygen. Ecological status of water quality analyzed watercourses indicates a poor state in terms of content Cd, Cr, Cu, Pb and Ni.

Keywords: heavy metals, cola ash, overflow water, disposal site

POSTER SECTION

Diagnosis, control and optimisation of process and plant perfomance

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Abstract:

In the laboratory, pilot plant and industrial facilites a large number of variables should be kept within defined limits in order to plant run stable, and product quality to be satisfied.Monitoring, diagnosis and optimization of process control systems play a key role in ensuring of the optimal process operation.

The aim is routine monitoring the processes, detection and diagnosis of failures, preventive monitoring and optimal control. Using modern software tools it is possible to statistically analyze processes and control systems, identify dynamical process models and control loops and optimize control system parameters. This ensures a more stable process control, higher product quality and optimal operation.

This paper will present the examples of process and device diagnostics as well as tuning and control system optimization.

Keywords: **Diagnosis, control, optimisation of process and plant perfomance**

POSTER SECTION

In situ synthesis of Polymer/reduced Graphene oxide Nanocomposites and their characterization

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Abstract:

Polymer/reduced graphene oxide (rGO) nanocomposites were prepared via in situ synthesis by semi-continuous emulsion polymerization. The composition of the hybrid monomer system was: methyl methacrylate (MMA), butyl acrylate (BA) and 2-hydroxyethyl methacrylate (HEMA) in ratio 49.5/49.5/1 by weight and different amounts of aliphatic polyurethane (PU) prepolymer. The aqueous dispersion of rGO platelets stabilized by polyvinylpyrrolidone (PVP), in which the polyurethane (PU) containing free NCO groups on both chain ends was added, was used as a seed. The monomer mixture containing functional monomer 2-hydroxy ethyl methacrylate (HEMA) in order to provide OH functionalities to the polymer chains, was fed slowly.

The NCO functionalities from PU have reacted with the OH groups present on rGO platelets surface, performing a kind of in situ functionalization of the platelets and preventing their aggregation during the polymerization. Also, the NCO functionalities have reacted with the OH from HEMA incorporated into the polymer chains. As a result a highly cross-linked hybrid nanostructures dispersed in aqueous media (hybrid latexes) were obtained, from which the composite films were prepared by water evaporation. The obtained nanocomposites were examined by Wide-angle X-ray diffraction (WAXD). The electrical conductivity was measured by four point probe. The gel content and the degree of swelling were also determined.

Keywords: in situ polymerization, semicontinuous emulsion polymerization, HEMA, WAXD, electrical conductivity

POSTER SECTION

Physical properties determination of various types of polypropylene and polyethylene

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Abstract:

Polypropylene (PP) is thermoplastic polymer, widely used for manufacturing plumbing, drains, gas pipelines, laboratory equipment, automotive components, etc. It can be treated with several different processes: extrusion, blow molding, injection molding. This polymer is unusually resistant to many chemical solvents, bases and acids [1].

Polyethylene (PE) is a thermoplastic polymer, which means that it can be melted to a liquid and remolded to a solid state. It is the most common plastic, chemically synthesized from ethylene, a compound that's usually made from petroleum or natural gas. Its primary use is in packaging: plastic bags, plastic films, geo-membranes, containers (including bottle) etc [2].

The main aim of this research was to examine the physical properties of different types of PP and PE. Following analysis were performed: Melt flow index (MFI) and the density were measured by melt flow indexer CFR 91/2 and KERN PLS 360-3, respectively. The contact angles were measured by SEE system and the hardness was determined by durometer in Shore D. The hardness was measured for 5 and 15 seconds. Also UV-vis analyses by UV-vis mini were performed [3,4,5].

Keywords: **Polypropylene, polyethylene, melt flow index, density, hardness**

POSTER SECTION

Antioxidant activity in water infusions of various plant mixtures

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Abstract:

Since modern lifestyle is associated with inadequate diet, an increasing consumer interest is directed towards functional food products including water infusions of various plant mixtures have an importnat role. The objective of this study was to examine a now formulation of herbal tea mixture based on the use of tradicional medicinal plants (balm leaf, chamomile flowers, roots rabbit mandrel).

Nin tea mixtures was prepared, which have been implemented in a number of analyses in order to characterization of biological activity (determination of antioxidant capacity, DPPH and FRAP methods), and the content of total phenols, flavonoids share and share nonflavonoids spectrophotometric method of Folin-Ciocalteu. For reserch purposes, the following tea blends: tea pressure regulating, tea for better sleep, tea for reduction migraine, Vlašić tea, tea for fungal diseases of the oral cavity, tea with urinary tract infections, tea acne stop, tea for problems with the liver and tea lowering high cholesterol. The best antioxidant activity had an infusion of tea for fungal diseases of the oral cavity (5703 ± 36,22 µmol Fe^{2+}/L, FRAP method), as well as the highest content of phenolics (23,91 ± 0,81 mg GAE/g čajne mješavine, Folin-Ciocalteu method).

Considering the diversitiy of natural plant raw materials used and the complexity of the composition of all the tea formulations are rich source of bioactive compounds with high biological activity. Innovative tea formulations showed considerable antioxidant capacity, and they represent a desirable functional products suitable for consumers of all ages completing their daily intake of high-quality nutrients.

Keywords: tea blends, herbal infusions, phenol compounds, antioxidans, oxidative stress, antioxidant capacity

POSTER SECTION

Chemical characterization of edible mushrooms

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Abstract:

Mushrooms (*lat. fungi*) belong to the most widespread on earth. Fungi include yeasts and molds, and a group of macroscopic organisms often called the fleshy fungi and it is believed that there are about 50.000 species of mushrooms in the world. Mushrooms contain a high percentage of water 75-90%. They have rich nutritional value, low source of fat; theyare rich in protein, dietary fiber, minerals, vitamins and phytonutrients. They also contain essential amino acids, enzymes, polysaccharides and carohydrates.

Vitamins are represented by B complex vitamins: B1, B2, B6, and B12, vitamin D, C and beta carotene. Minerals are represented by sodium, phosphorus, calcium, manganese, copper, etc, and some heavy metals such as arsenic, copper and lead. Because of their chemical cemical nd biological composition, the fungi are very important for human health, especially in the fight against cancer and various viral, heart, bllod vessel diseases, as well as diabetes. In the present work we haveperformed quantitative analysis of the contents (water, ash with the elemental composition, protein, fat, fiber and carbohydrates) of certain types of mushrooms (morel, boletus, oyster and button mushrooms). Each of the analyzed consumption of mushrooms, available in our market, characterized by the appropriate content of mineral substances, total proteins, fat and fiber, depending on the view and type, so that the content of mineralized substances from 13.55% the highest in chanterelle, porcini mushrooms and the lowest in and amounted to 6.24%.

Proteins as the most important component of table mushrooms, are mostly represented in the nose, to 40%, and the lowest content had chanterelles about 23%, which shows that they can be classified as a valuable source of protein, with meat.

Keywords: mushrooms, chemical characterization, proteins, fat and fiber

POSTER SECTION

Re-use and recycling of water in the process industry

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Abstract:

Industrijski procesi su veliki potrošači vode. Iz tog razloga su u zadnje dvije decenije aktuelna istraživanja u vezi racionalizacije potrošnje vode jer se time pored smanjenja potrošnje svježe vode smanjuje i količina otpadne vode koja se iz procesa ispušta u okolinu. Na taj način se smanjuju pogonski troškovi i postiže održivost i profitabilnost procesa.

U radu su predstavljene osnove problema sinteze procesnih mreža vode i istaknut je značaj ponovnog korištenja i recikliranja vode u procesnoj industriji. Predstavljeni su metodološki koraci u rješavanju problema sinteze procesnih mreža vode matematičkim programiranjem, koje se bazira na optimizaciji superstrukture. Istaknut je značaj kompjutersko podpomognutih alata za modeliranje, sintezu i optimizaciju mreža vode i date su osnovne upute za korištenje visoko sofisticiranog sistema za modeliranje i optimizaciju General Algebraic Modeling System (GAMS). U GAMS-u su kreirani i riješeni optimizacijski modeli mreže vode.

Modeli su formulisani kao problemi nelinearnog programiranja (NLP). Na konkretnim primjerima procesnih mreža vode komponovanih od procesnih i tretman jedinica predstavljeni su rezultati optimizacije. Pokazano je da ponovnim korištenjem vode, regeneracijom i recirkulacijom vode moguće je smanjiti ukupne troškove mreže vode.

Keywords: sinteza mreže vode, superstruktura, optimizacijski model.

POSTER SECTION

The influence of soil pH on copper content in fruits

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Abstract:

U savremenoj poljoprivrednoj proizvodnji, unos teških metala iz tla u jestive dijelove biljaka predstavlja važan problem, posebno ako se uzme u obzir njihova toksičnost, bio-nerazgradljivost i sposobnost akumuliranja, kao najopasnije karakteristike koje direktno utiču na zdravlje potrošača.

Sam sadržaj teških metala u tlu zavisi od karakteristike i vrste tla, imisije teških metala, unosa sa đubrivom, herbicidima, pesticidima, od mehanizma adsorpcije i/ili fiksacije, vrste voćne sorte i dr.

U ovom radu je ispitivan uticaj pH tla na sadržaj bakra u plodovima pojedinih biljaka. Povećanje pH vrijednosti tla je izvršeno sa krečnjakom a obaranje pH vrijednosti tla sa rastvorom aluminijum sulfata. Biljke koje su korištene za navedena ispitivanja su dvije sorte šljive. Rezultati provedenih ispitivanja pokazuju da akumulacija bakra iz tla u biljke zavisi ne samo od vrste podloge tla nego i od vrste voćne sorte. Takođe se generalno može reći da je povećanje, odnosno smanjenje kiselosti tla doprinijelo povećanju akumulacije bakra iz tla u plodove kod određene sorte.

Keywords: teški metali, bakar, tlo, pH, akumuliranje

POSTER SECTION

Properties of crackers with buckwheat sourdough

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Abstract:

Objective of this study was to examine the influence of biological acidification and use of buckwheat sourdough on the properties of dough for the production of crackers and finished products. Freshly prepared sourdough from two types of lactic acid bacteria (*Lactobacillus plantarum* and *Lactobacillus brevis*) are used for acidification as biological agents.

During the fermentation of the dough, the dynamics of changes of pH and total titratable acidity (TTA) were monitored. Analysis of finished products included the measurement of pH, TTA, total phenolic contents (TP), antioxidant activity (AA) and sensory evaluation of crackers. It was found the buffering effect as the results of lactic acid fermentation. The biggest change of pH and TTA were in another part of the dough fermentation, and results showed that were no significant changes in pH and TTA during baking.

The results showed higher content of TP and AA in the dough with biological agents for acidification and crackers with sourdough. Sensory analysis showed that all tested crackers had a very good quality, while crackers with sour dough had more aromatic, slightly sour taste.

Keywords: crackers, properties, sourdough

POSTER SECTION

Impact of application of selective ion exchange column on quality of mineral water «Tuzlanski kiseljak Mg^{++}

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Abstract:

The quality of bottled mineral drinking water is conditioned by a number of factors, primarily the quality of water in the spring, the efficiency of methods for managing water before bottling, and the integrity of the distribution system. Mineral water from different sources, even directly located given to flow through the different layers of the earth, and have different content.Each mineral spring has its special physical and chemical characteristics. This fact indicates the need for additional processing of mineral water before bottling in bottling plants, primarily as due to various natural impacts, composed of mineral water often present undesirable metal ions, and other matters that need to be reduced to the level prescribed by the Regulation or removed completely.The primary objective of this study is:

- Reducing the content of Ni (II) and Mn (II) ions in the mineral water after treatment by selective ion exchange column at a allowable concentrations.
- To achieve optimal operation of the column, in the course of the technological process of water treatment, such that the concentration of Mg (II) ions in the mineral water is reduced significantly, and thereby the cost of water treatment are increased.
- To determine the physico-chemical characteristics as well as the content of ions present in the mineral water after treatment.

Key words: natural mineral water, the quality of mineral water, selective ion exchange column.

POSTER SECTION

Technologies for densification of biomass for energy production

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Abstract:

Relativno mala gustina biomase ograničavajući je faktor za njenu energetsku valorizaciju. Da bi se to ograničenje prevazišlo, primjenjuju se različite tehnike za povećanje njene nasipne gustine.

Ovaj rad predstavlja pregled raspoloživih i perspektivnih tehnika za obradu biomase, uključujući tehnike za kompaktiranje, sa metodama predtretmana i specifičnim utroškom energije za te operacije.

Keywords: biomasa, energijska upotreba, tehnologije densifikacije

POSTER SECTION

Processing of domestic waste organic origin with the technology of effective microorganisms

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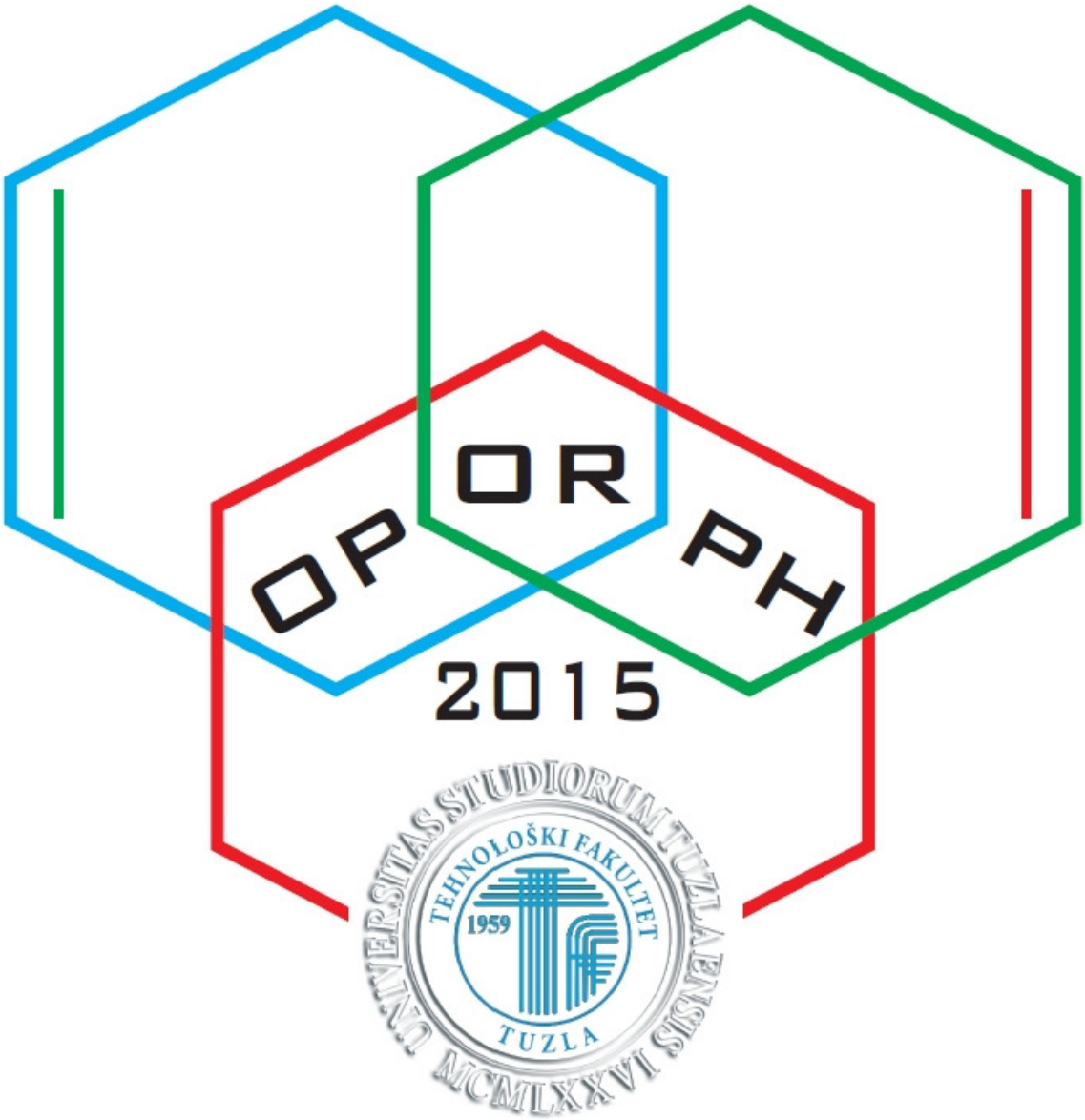
Abstract:

U ovom radu koji se bavi mogućnostima primjene tehnologije efektivnih mikroorganizama ispitana je mogućnost proizvodnje efektivnih mikroorganizama prilikom kompostiranje organske biomase koja zaostaje prilikom svakog procesa pripreme hrane u kućanstvima. Organski otpaci koji se inače beskorisno bacaju mogu se uspješno iskoristiti tako da se prikupe na odgovarajućim mjestima i u odgovarajućim posudama i tretiranjem biomase pomoću suspenzije efektivnih mikroorganizama dobiti bezbroj blagodati u mogućnostima primjene.

Dakle, prema postavljenom cilju istaživanja utvrđen je mikrobiološki sastav dobivene fermentacijske tekućine, kako u smislu udjela efektivnih mikroorganizama tako i u smislu sadržaja nekih drugih prisutnih mikroorganizama u kompostnoj masi. Ustanovljeno je kako se brojnost efektivnih mikroorganizama umnožila prilikom kompostiranja, pri čemu se kao rezultat tretiranja smanjio broj nepoželjnih vrsta mikroorganizama.

Ovaj postupak stoga valja učestalo ponavljati sa svim otpacima organskog podrijetla bilo u kućanstvima ili uopće u svakodnevom životu, jer time se sprječava zagađivanje okoliša, a otvaraju se brojne pogodnosti primjene dobivenih korisnih i lako upotrebljivih vlastitih proizvoda.

Keywords: kućni organski otpad, efektivni mikroorganizmi, kompostiranje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