ISCMP 2018

II. International Joint Science Congress of Materials & Polymers
9-12 November 2018 • Durres, Albenia

BOOK of ABSTRACTS & PROCEEDINGS

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Organized by
Çanakkale Onsekiz Mart University
Chemists Society
Turkish Cooperation and Coordination Agency
Tetova State University
University “Mother Teresa” – Skopje
Polytechnic University of Tirana
Prishtina University
Tunisian Chemical Society
University of Tuzla
Dear participants,

Remarkable advances have been achieved in the science of materials and polymer over the last fifty years. A high quality of life away from environmental destruction has been set as a goal for a high level of human welfare and a sustainable future. As a result, more novel and functional materials have been introduced into everyday life. It is expected by not only sectoral and academic stakeholders but also end users that this process will last longer, producing more beneficial results.

Therefore, it is the primary aim of this scholarly gathering to transform research- and innovation-focused scientists, financial success promoting production, and social responsibility-oriented industry into strong stakeholders. To this end, an academic event will be jointly organized by the Chemists Society (Turkey), Canakkale Onsekiz Mart University (Turkey), Republic of Turkey Prime Ministry-Turkish Cooperation and Coordination Agency, Tunisian Chemical Society (Tunisia), Prishtina University (Kosovo), University Polytechnic of Tirana (Albania), University “Mother Teresa” - Skopje (Macedonia), Tetova University (Macedonia) and University of Tuzla Bosnia and Herzegovina (Bosnia and Herzegovina) of four different countries with sectoral supports.

It is believed that the assembly of participants from different countries will allow them to share their knowledge, to exchange views, and to form various partnerships. Along with the scientific activities, a comprehensive social activities calendar was produced by the organizing committee to allow for fruitful interactions.

Although it is, broadly speaking, a scientific congress, it is different from other congresses in terms of such aspects as follows;

(i) A collaboration protocol will be signed between the partners of the ICSMP following the completion of the Congress. Each partner will deliver a presentation on their strengths and interest in field of collaboration. Then, the partners will sign bilateral and multilateral agreements. (ii) Participants with posters will be allowed to deliver a four-minute presentation if they wish to and will be awarded a certificate of short oral presentation.

We would be more than happy to see you with us.

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Prof. Melvin Pascall
Chairpersons of ISCMP Organizing Committee
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# ISCMP 2018 - SCIENTIFIC PROGRAM

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<td>10:30</td>
<td><strong>Melvin A. Pascall</strong>, Ph.D., “Micro-topography Imprints on Polymeric Films and Their Use as a Non-chemical Antimicrobial Packaging Technology”</td>
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<td>10:50</td>
<td><strong>Fadime Kıran</strong>, Ph.D., “Efficiency of the Probiotics, Isolated from Pollen and Honey bee-gut Microbiota for the Treatment of Biofilm-Associated Wound Infections”</td>
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<td><strong>Ahmed Jashari</strong>, Ph.D., “Baylis-Hillman Reactions Catalyzed by Haxamine and Developing of HPLC Monitoring Methods”</td>
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<td><strong>Metin Ak</strong>, Ph. D., “Phthalocyanine-based Superstructural Conductive Polymer Design for Sensor and Electrochromic Applications”</td>
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14:30 – 14:50 İhsan Başaran, Ph.D., “Covalent Attachment of Poly(ε-caprolactone) to the Gelatin/Collagen/Elastin Surface by In-Situ Polymerization”

14:50 – 15:10 Yordan Nikolaev Georgiev, Ph.D., “Pectic Polysaccharides from the Leaves of the Thracian Resurrection Glacial Relic Haberlea Rhodopensis Friv”

15:10 – 15:30 İsmail Taş, Ph.D., “Effects of Different Irrigation Water Salinity Levels On Germination of Guar Gum (Cyamopsis tetragonoloba)”


November 11, 2018 (Sunday)

09:00 – 09:30 Kaan Cebesoy Emregül, Ph.D., “Computational Chemistry and Corrosion Inhibition” (KEYNOTE SPEAKER)


09:50 – 10:10 Yusuf Dilgin, Ph.D., “Electrochemical Sensors/Biosensors Using Nanomaterials/Polymer Modified Pencil Graphite Electrodes”

10:10 – 10:30 Coffee Break

10:30 – 10:50 Elif Ayşe Boyukbayram, Ph.D., “Enzyme Immobilized Cholesterol Biosensor Prepared By Conducting Polymer Composites”

10:50 – 11:10 Hern Kim, Ph.D., “Ionene-based Polyelectrolytes and Their Electrochemical Application in Smart Windows”

11:10 – 11:30 Volkan Eskizeybek, Ph.D., “Impact of Seawater Aging on Interlaminar Fracture Performance of Halloysite Nanotube Modified Epoxy/Basalt Fiber Hybrid Composites”

11:30 – 11:50 Gülen Türker, Ph.D., “Extraction of Polysaccharide from the Green Algae Codium tomentosum”

11:50 – 13:00 Lunch

13:00 – 13:30 Turgay Seçkin, Ph.D., “Electromagnetic Interference Shielding and Dielectric Properties of Multi-walled Carbon Nanotube/Polyimide Composites” (KEYNOTE SPEAKER)


13:50 – 14:10 Metin Hayri Acar, Ph.D., “Synthesis and application of amphiphilic graft copolymers”

14:10 – 14:20 Coffee Break

14:20 – 14:50 Altin Gjevori, Ph.D “Incorporation of carbon and nitrogen into photoactive TiO2 thin films” (KEYNOTE SPEAKER)

14:50 – 15:10 Nurettin Yalçın, Ph.D. “Ropes Reinforced Wood Plastic Composites”

15:10 – 15:30 Begüm Barış, Medical Doctor, “Probiotics at Clinical Practice”


15:50 – 16:05 Fatma Moncer, Ph.D. Student, “3D molecularly imprinted sponge: New generation of transducer for highly sensitive electrochemical detection of cancer biomarkers”

16:05 – 16:20 Merve Danişman, Ph.D. Student, “Surface Modification of Hydroxyapatite with Enzyme Catalyzed Reaction and Effect of Temperature on the Modification Reaction”
16:20 – 16:35 **Belinda Aliu**, Ph.D. Student, “Crystallographic Structural Determination and Electrochemical Behavior of the New Complex of Fe(II) with Hydrazinylidene-Chroman-Dione”

16:35 – 16:50 Coffee Break


17:05 – 17:20 **Ayşe Çetin**, Master Student, “Influences of Various Combinations of Flame Retardants on the Properties of Poly(vinyl chloride)”


17:35 – 17:50 **Eren Özüdoğru**, Master Student, “Isolation and Culture of Neural Stem/Progenitor Cells from Rat Subventricular Zone for Use in Neural Tissue Engineering”

17:50 – 18:05 **Blerta Ahmedi**, Master Student, “Microhardness of Al-Mg-Si aluminium alloys for different temperatures and aging times”


**November 12, 2018 (Monday)**

09:30 – 10:00 Closing Speech

10:00 – 10:30 Meeting&Discussion
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LIST OF ABSTRACTS
Application of Nanoparticles in Food Packaging

Maria Rubino*
Prof.
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The use of (engineered nanomaterials) ENMs has expanded significantly in consumer and non-consumer goods applications in the food, agriculture, pharmaceutical, and automobile industries. ENMs in many nano-enabled products have advanced the application and performance of such products. However, the effects of ENMs on human health and the environment are not properly known. Understanding the fate of nanoparticles within the ENMs and the changes of such materials before, during, and after their useful life cycle is essential to mitigate environmental effects of nanotechnologies and to guarantee the safety of ENMs. Before safety studies can be undertaken, the interaction of engineered nanoparticles (ENPs) with different polymeric materials exposed to various environments and the fate and transport of ENPs and their by-products must be understood. The current presentation will focus mainly in montmorillonite (MMT): Part 1: Initially the goal of our research group has centered in developing a basic understanding of the interactions between nanoparticles and a polymer matrix, and from this acquired knowledge predict the coarsening, clustering, and migration of nanoparticles to the physical and biological environments in contact with the engineered nanomaterials. New methodologies and indicators were developed and will be discussed, in order to provide the means to accurately evaluate such interactions and nanoparticle migration. MMT nanoparticles was considered for this study because its low cost and extended application in packaging mainly food packaging. Part 2: Based in our findings in Part 1, the next research focus in a new application of MMT nanoparticles that consisted in the design of active surfaces based on the dispersion of functionalized montmorillonite (MMT) nanoparticles in a coating to be applied on polymeric substrates. The organ-modified OMMT nanoparticle can be functionalized by the immobilization or the adsorption of active compounds, depending on the required active surface mode of action. The surface can be self-active when the active ingredient is immobilized on the MMT, or exhibit sustained-release when the active ingredient is absorbed in the nanoparticle. A combination of both approaches can also be used. A proof of concept was conducted using two different bactericides as the active ingredients, to evaluate the proposed system.

Keywords:  Packaging, Nanoparticles, Safety, Functionalization of Nanoparticle
Design of Multi-Functional Polymer-based Materials from Nanostructuration Approaches

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Outstanding properties and functionalities could be brought to polymers via the introduction or in-situ generation of organic, inorganic, or organic-inorganic nanostructures. In fact, each physical property has a critical length scale where the fundamental physics of that property starts to change. Nanoscale building blocks which could be considered are within these critical length scales. As a consequence, material properties can be engineered through the controlled size-selective synthesis and assembly of nanoscale building blocks. In addition, for multifunctional applications of polymer materials, more than one property and one length scale must be considered. In this keynote lecture, various strategies for designing nanostructures in both thermoplastic polymers and polymer networks will be reported: i/ self-assembling of organic and organic-inorganic architectures such as block copolymers or metal-oxo nanoclusters; ii/ introduction of pre-formed nanoparticles, nanosheets, and nanotubes; iii/ in-situ construction of ionic nanostructures based on ionic liquids. The existence of such nanostructures within polymer matrices could lead to improved mechanical properties, fire resistance, gas barrier properties, etc. In addition, it will demonstrated how surface nanostructures could be useful to design functional surfaces such as superhydrophobic ones.

Keywords: Polymer, Material, Multi-functional, Nanostructuration
Polysaccharides from Tunisian Natural Sources: Development of Green Materials, Biological Activities and Pharmaceutical Applications

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Natural polysaccharides from different sources have long been studied and widely used in different areas, such as food and feed, medicine and pharmaceutics, and in papermaking. In recent decades, there has been an increased interest in the utilization of polysaccharides, particularly bioactive ones, for various novel applications owing to their biocompatibility, biodegradability, non-toxicity, and some specific therapeutic activities. The main goal of this study was to review the sources, natively biological activities, isolation, characterization, and the structural features of natively bioactive polysaccharides. Moreover, this work has also been focused on the chemical/chemo-enzymatic functionalizations that may create novel opportunities to maximally exploit the various valuable properties of polysaccharides, particularly from wood species, in previously unperceived applications especially for biomedical applications, such as tissue engineering, wound healing, and drug delivery. This work was to review novel strategies to tailor functional materials with above mentioned application potentials for the polysaccharides from wood species.

**Keywords:** Polysaccharides, Physico-chemical Characterization, Biological Activities, Food Packaging
Electromagnetic Interference Shielding and Dielectric Properties of Multi-walled Carbon Nanotube/Polyimide Composites

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Driven by the increased demand for versatile electronics with improved functionality, high performance, light weight, low cost and improved design options, conductive filler/polymer composites (CPCs) have emerged as a distinctive solution. Manipulating the conductive network formation in CPCs allows them to be employed in a wide range of applications, such as charge storage, electrostatic discharge dissipation and electromagnetic interference (EMI) shielding. In this work, controlling the conductive network formation was the key aspect in designing the morphology of CPCs for electrical applications. Multi-walled carbon nanotube (MWCNT) was chosen as conductive filler due to its surprising electronic structure and growing industrial usage. We employed two distinct techniques to improve or deteriorate conductive network formation to improve the electrical properties in MWCNT/polyimide composites, i.e. electrical conductivity, EMI shielding and dielectric properties. Prior to exploring the influence of the above-mentioned techniques on the electrical properties of CPCs, a series of studies were implemented on MWCNT/polyimide composites to obtain a general understanding from the electrical behaviors of CPCs as a function of MWCNT content. The results over the X-band showed that the electrical conductivity, EMI shielding and dielectric properties rose with MWCNT content.

Keywords: Polyimide, Electromagnetic Shielding
Computational Chemistry and Corrosion Inhibition

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The great expanded industrial applications of mild steel based on their properties have been recognized by many researchers. However, despite its importance, the problem associated with corrosion still remains a cause of concern to all and sundry. Huge losses of natural and artificial resources have been noted annually all over the globe as a result of corrosion. In the petroleum and gas industries, more than half of the reported failures of pipelines are caused by corrosion and subsequent rupture of the pipe walls etc resulting in large losses of products, environmental pollution, ecological disaster and loss of human life. The study of corrosion processes and their inhibition by organic inhibitors is a very active field of research. Quantum chemical methods have been already proven to be very useful in the determination of molecular structure as well as elucidation of electronic structure and reactivity. Thus, it has become a common practice to carry out quantum chemical calculations in corrosion inhibition studies. The concept of assessing the efficiency of a corrosion inhibitor with the help of computational chemistry is to search for compounds with desired properties using chemical intuition and experience in a mathematically quantified and computerized form. Once a correlation between the structure and activity or property is found, any number of compounds, including those not yet synthesized, can be readily screened employing computational methodology and a set of mathematical equations which are capable of representing accurately the chemical phenomenon under study.

Keywords: Computational Chemistry, Quantum, Corrosion Inhibitor, Theoretical Approach
Incorporation of Carbon and Nitrogen into Photoactive TiO₂ Thin Films

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Titanium dioxide is well known as a photoactive material to be activated under UV irradiation and employed either as a photocatalyst or exhibiting superhydrophilic after reducing the surface energy under illumination for self-cleaning or anti-fogging surfaces. For increasing the reactivity of the thin films, especially indoors, a reduced band gap is desired. Doping with transition metals or with nitrogen has been reported in the literature. The latter dopant is theoretically readily accessible during PVD processes. However, the incorporation of nitrogen into the growing film, in contrast to ion implantation into TiO₂ thin films or selective oxidation of TiN, is a much more complex process which is presently not completely understood. Alternatively, TiO₂ nanotubes with a reduced band gap, visible-light-active N-doped TiO₂ nanorods by hydrothermal treatment or hydrazine doping of brookite nanorods at 200°C for 18 h have been proposed recently. In this work we have utilized an energetic one-step PVD process for obtaining N-doped TiO₂ layers, which should allow the usage of temperature sensitive substrates. The deposition will be performed for a range of backfill gas composition (oxygen and nitrogen) in order to investigate the influence of the total pressure and nitrogen/oxygen ratio on the film properties while comparing ion beam sputter deposition (IBSD) and plasma based ion implantation and deposition (PBIID). The resulting layers will subsequently be investigated for correlation between their gas content and optical properties. The aim is to optimise the nitrogen incorporation for band gap reduction while avoiding additional defects within the band gap and to investigate whether the process is suitable for transfer or scaling when assuming a future industrial application.

Keywords: TiO₂, Photoactivity, Surface Energy, Doping, Ion Beam Sputter Deposition
ORAL PRESENTATIONS
(Type I)
Speech Time: 20 minutes.
Effects of Different Processing Conditions on the Selected ABS/PET Blends on Mechanical Properties

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Twin-screw extruder melt blending method was used to prepare blends of ABS (acrylonitrilebutadiene-styrene terpolymer) and PET (polyethylene terephthalate) with different compatibilizers to improve temperature resistance of ABS which can withstand higher temperatures especially for paint curing process. At first different ratios of ABS/PET blends were prepared and evaluated by rheological, thermal and mechanical properties. In order to evaluate effect of processing parameters on properties of ABS/PET (70/30 % wt) blends, two different processing profiles were used for different compatibilizers as low and high temperature conditions. Blends were characterized by mechanical measurements like notched izod impact and tensile testing. For the optimum processing conditions, melt viscosity vs. composition curves for ABS/PET blends exhibited a trend similar to the rule of mixtures in which addition of ABS to PET improves the processibility. Scanning Electron Microscopy (SEM) examination revealed different morphologies depending on the composition and processing conditions such as dispersed, co-continuous and phase inverted, which is indicating that the binary blends are immiscible and form a two-phase structure. Tensile properties increased with increase in the PET content while the unnotched impact strength reached a maximum at 40 wt % ABS but also high processing temperatures caused a decrease in mechanicals especially for the PET rich blend but for the ABS rich blends it did not affected that much for all compatibilizers.

Keywords: Blend, ABS, Mechanical, Polyethylene Terephthalate, SEM,
Micro-topography Imprints on Polymeric Films and Their Use as a Non-chemical Antimicrobial Packaging Technology

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Bacterial adhesion to and transfer between contaminated surfaces is a major source of food related outbreaks. One method that microorganisms use to increase their survival and attachment to surfaces is by the formation of biofilms. To minimize the formation and proliferation of biofilms by harmful microorganisms, the incorporation of antimicrobial chemical agents on the surface or in the matrix of food contact materials has been used. However, the concentration of any residual chemical on or in food packaging materials is a major concern since it has a negative impact on consumers perception of chemicals in foods. As an alternative to chemically absorbed antimicrobial compounds in packaging materials, a physical approach to limit biofilm formation on food contact surfaces was investigated. The main goal of this study was to evaluate differences between a micro-topography technology and a regular polymer for biofilm formation by foodborne microorganisms of public health concerns. This technology was initiated after observing that the topographic design of shark skin appears to minimize the growth of microorganisms. The central hypothesis of this study was that the attachment and survivability of foodborne bacteria on polymeric films can be inhibited by creating an undulating micro-structured surface. The main objectives were: 1) evaluate the effect of the micro-topography on the attachment and biofilm formation of selected foodborne microorganisms and compare it with a material not having the micro-topography; 2) determine the concentrations of quaternary ammonium and sodium hypochlorite sanitizers required to produce bacterial reductions and biofilm formation on a smooth when compared with a micro-topography material; 3) perform the test using the following organisms: *Escherichia coli* K12 (Gram-negative bacteria) and *Listeria innocua* (Gram-positive bacteria) as surrogates for *Escherichia coli* O157:H7 and *Listeria monocytogenes*, respectively; *Salmonella enteritidis* (Gram-negative pathogenic bacteria); and *Pseudomonas* spp. (known as a prolific biofilm producer). The results showed that the initial cell counts of all bacterial strains on the micro-topographic films were significantly less (P<0.05) than those on the smooth films. No viable *L. innocua* and *S. enteritidis* cells were found on the micro-topographic films after 3 h drying at 22°C. The viable numbers in milk-based biofilm were higher than 5 log CFU/cm² for each organism at 23°C storage temperatures. Except for *E. coli*, cells in PBS-based biofilms showed good survival when stored at 23°C. There were no significant differences in viable numbers in biofilms between the micro-topographic and the smooth surfaces at each condition. Most organisms were attached to the biofilm itself instead of the surface of the micro-pattern film. Washing of these samples with a detergent and rinsing with sterile water significantly reduced (P < 0.05) biofilm cells on both film surfaces for *E. coli* and *L. innocua*. The cleaning efficacy was slightly more effective for biofilm cells on micro-topography films than the cells on smooth films in most of the storage conditions. On most of the micro-topography surfaces, bacteria were not detectable after the application of QAC or Chlorine solutions, although evidence of cell viability was shown on the smooth film after sanitation. After the washing and rinsing steps during the cleaning process, bacteria on the micro-topography films were clearly isolated from each other due to the micro-pattern.

**Keywords:** Micro-patterns, Biofilm, Antimicrobial, Polymeric Film, Bacteria, Sanitization
Efficiency of the Probiotics, Isolated from Pollen and Honey Bee-gut Microbiota for the Treatment of Biofilm-associated Wound Infections

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Keywords: Probiotics, Postbiotic Mediators, Infection, Biofilm, Wound Healing,

1. Introduction

Wound healing process affected from infection is ever more dangerous case for the patients. Antibiotics are in use for prevention from the infection during this period. However, antibiotic resistance is an irreversible problem in all over the world, reported by World Health Organization (2015). Therefore, development of anti-microbial and anti-biofilm strategies against important pathogens is of major concerns of wound healing and new therapies including innovative materials are urgently required for wound therapy. Nowadays, some studies focus on alternative therapies such as honey or plant extracts (Okhiria et al., 2009). In addition to these natural approaches, probiotics has been recently gained attention as a suitable, safe and novel medication alternative for the patients in wound care. Commensal bacteria originally isolated from microbiota are called as probiotics due to their beneficial effects via different mechanisms (Markowiak and Slizewska, 2017). Few studies have also addressed that these beneficial effects may depend on secreted probiotic-derived factors, recently identified as postbiotic mediators. Probiotic metabolic byproducts as postbiotic mediators found in cell-free supernatants and provide additional bioactivity to the host (Aguilar-Toala et al., 2018). Although numerous studies have demonstrated their importance of within the gut, probiotics and postbiotic mediators are receiving renewed attention in the medical fields of skin health. This study was undertaken to determine the potential effects of probiotic strains isolated from pollen and honey bee gut microbiota, against bacterial human pathogens which are responsible for infections in wound area as well as a significant risk for wound management processes. To clarify the potential value of the isolates, their anti-microbial and anti-biofilm activities were analyzed.

2. Materials and Methods
Bacterial strains and growth conditions: Pseudomonas aeruginosa PAO1/ATCC 27853, methicillin resistant Staphylococcus aureus (MRSA) ATCC 43300, Staphylococcus aureus ATCC 25923 and Staphylococcus epidermidis ATCC 12228 were used as important pathogens generally effective in wound infections and were grown in TSB (Tryptic Soy Broth) medium for 24 h at 37 °C. All bacterial strains were preserved in 50 % glycerol at -80 °C. Isolation of bacteria from pollen and honey bee-gut microbiota: The honey bees (Apis mellifera), collected from different region of Turkey, were anesthetized on ice and then washed in 50 % ethanol. The whole gut (Figure 1a) was dissected out using a sterile dissecting forceps. The gastrointestinal content of each honey bee was mixed in sterile phosphate buffer, made a suspension to subsequent bacterial culture. Pollen samples were also collected from different region of Turkey and suspended in sterile phosphate buffer. Prepared suspensions were serial diluted and then cultivated in De Man, Rogosa and Sharpe (MRS) agar for 2 days at 37 °C. Following the incubation, grown bacterial colonies were transferred to MRS broth and cultivated under the same conditions (Figure 1b). Gram-positive, catalase-negative and non hemolytic isolates were selected for further analysis. Assessment of anti-microbial activity: Anti-microbial activity of the isolates was assessed by spot on lawn method against important pathogens (Bhunia et al., 1988). For the activity assay, cell-free filtrates were used as postbiotic mediators and live cells were used as probiotics. Pathogenic bacteria grown in TSB for 24 h at 37 °C were adjusted to Mc Farland 0.5, inoculated in soft agar and then pour plated on agar surfaces. Treatments were spotted on agar surfaces and incubated 24 h at 37 °C. MRS medium was used as negative control. Following the incubation, the diameter of the inhibition zones around the spots was measured as mm. MIC (minimum inhibitory concentration) was also determined according to Clinical and Laboratory Standard Institute (2012). Assessment of anti-biofilm forming activity: Anti-biofilm activity of the isolates were determined following the co-incubation of pathogenic bacteria with probiotics as well as postbiotic mediators, according to the method of Stepanovic et al. (2000) and Vestby et al. (2009). Following the 24 h incubation, biofilm mass was evaluated by measuring the absorbance of crystal violet at 595nm. Identification of the isolates: The isolates showing the best activity were identified by matrix assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS). Statistical analysis: A student’s t test was used to evaluate the statistical significances (p<0.05) of the differences. Values of p<0.05 were considered significant.

3. Result and Discussion

In this study; based on the ability of lactobacilli to secrete acids, bacteriocins and other by-products that may neutralize the infection caused by pathogens, we investigated whether potential isolates might interfere with the pathogens play important roles in wound infections. Among the 32 isolates exhibited Gram-positive (Figure 1c), catalase-negative and non hemolytic phenotypes, 4 pollen and 5 bee gut isolates have been selected with their potential anti-microbial activity against all pathogens tested (Figure 1d). According to the biofilm assays, postbiotic mediators of 5 potential isolates were reduced the biofilm formation of pathogens that all of them lost their ability to form biofilm and became no biofilm producer. The isolates were identified as Lactobacillus spp. by MALDI-TOF MS analysis. Further molecular identification based on 16S rRNA sequences will be evaluated. The effect of probiotics on MRSA and P. aeruginosa, was also carried out by Valdez and colleagues (2005) who evaluated the ability of L. plantarum to inhibit the P. aeruginosa with the viable culture cells as well as culture filtrates. Similar inhibitory effects were also obtained by Sadowska and co-workers (2010) with the cell free filtrates of L. acidophilus H-1 via competitive interactions between S. aureus strains and the probiotic strain.

4. Conclusion
Viable cells of probiotics, isolated from pollen and honey bee gut microbiota and their natural metabolites defined as postbiotic mediators could potentially be used as an adjunct therapy against infection during wound management and they can be used as a novel and unique component in the new pharmaceutical products. However, clearly more work is needed in this area to fully demonstrate the proof of principle.

References

Baylis-Hillman Reactions Catalyzed by Hexamine and Developing of HPLC Monitoring Methods

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Carbon-carbon bond formations and functional group transformations are the most fundamental reactions for the construction of molecular frameworks and they are at the forefront of organic chemistry researches. HPLC method is presented here for reaction monitoring between aldehydes and methyl acrylate. As long as these reactions are known to have a slow reaction rate, different conditions for accelerating the rate of the reaction were tested. Reactions were conducted in different equivalents (in relation to the aldehyde) of the catalyst hexamethylenetetramine (hexamine, HMT), in different mediums, pure DMSO and DMSO/H₂O at different proportion, at room temperature, and monitoring by HPLC until all the starting material was consumed. HPLC proved to be an efficient way for monitoring the reaction, equipped with dual wave UV detector, C-19 reversed-phase column, using methanol/water=45:55 as the best eluent with flow rate 1mL/min, whereas thin layer chromatography was not very appropriate. The use of 0.1 equiv, 1.0 equiv or 5.0 equiv of HMT proved to be an efficient catalyst for the preparation of desired products under mild reaction conditions and with reasonable reaction times. Apart of this, a great improvement in the rate of the reaction, was observed when the reaction between 4-nitrobenzaldehyde and methyl acrylate, catalyzed by HMT, was carried out in medium DMSO/Water = 4/1. HPLC and TLC obtained results showed that shorter reaction time was achieved when the reaction was developed in ratio 4-nitrobenzaldehyde/methyl acrylate/hexamine = 1/5/5.

Keywords: Baylis - Hillamn Reaction, Aldehydes, Acrylates, Hexamine, Catalysis, HPLC
Effects of the Water Salinity on Seed Germination and Seedling Growth of Dent Corn

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Corn is an important food and feed resource with a high yielding crop. And also corn is an important resource to industry (as production for ethanol, glucose, starch and paper). Soil and water salinity are big problems as yield limiting in many crops. Soil and water salinity have effects on the water intake of plants by osmotic and toxic effects. Increased osmotic pressure in saline soils hinders plant water uptake and excess Na⁺ and Cl⁻ concentrations may create toxic impacts on plants. Excess salt intake destroys cell functions of the plants and thus interrupts photosynthesis and respiration processes, may result in leaf necrosis, pollination disorders and small fruits and ultimately creates significant yield and quality losses. The present study was conducted to investigate the effects of different irrigation water salinity levels that prepared as to have final Sodium Absorption Ratio (SAR) 1 on seed germination and seedling growth of dent corn (Zea mays indendata). Laboratory experiments revealed that irrigation water salinity levels had significant effects on seed germination ratio, shoot dry weight, root dry weight, shoot length and root length of dent corn seedling (P<0.05). Negative effects of salinity on the seed germination rate and seedling characteristics were started at 3 and 5 dS m⁻¹ respectively. The degree of adverse effect on the seed germination rate and seedling characteristics increased with the increase of the salt concentration. It is understood that corn plant is sensitive to irrigation water salinity. For this reason, it is necessary to pay attention to soil

**Keywords:** Corn, Water salinity, Germination, Seedling Growth

**Acknowledgement:** This work was supported by Çanakkale Onsekiz Mart University Scientific Research Coordination Unit. Project number: FBA_2018_1434.
FeCl₃ Immobilized Melamine-Formaldehyde-Urea Resin Adsorbent: Synthesis and Application for Adsorption of Phosphorus from Wastewaters

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Environmental issues have arisen due to increasing industrial activities in last century. Therefore, the pursuit of new materials has begun in order to overcome environmental problems and provide a sustainable future. Based on these facts, a new adsorbent was synthesized using melamine-formaldehyde-urea (MFU) resin (which may also be considered as a waste product). Agitating with FeCl₃ solution Fe³⁺ was immobilized on MFU resin, and optimum FeCl₃ solution concentration was maintained as 0.5 M using flame atomic absorption spectrometer. This new adsorbent was tested for removal of phosphorus from phosphorus standard solutions and applied to wastewaters. Phosphorus determination was performed obtaining phosphomolybdenium blue complex and measuring the absorbance of it at 826 nm. The results were found to be agreeable when compared with those of graphite furnace atomic absorption spectrometer. Important adsorption parameters such as; contact time, pH and amount of adsorbent were investigated through experiments. Langmuir and Freundlich isotherms were studied to understand and describe the adsorption phenomena. Finally, it was concluded that, 0.5 g FeCl₃ immobilized MFU resin adsorbed 92.0% of phosphorus at pH 2.0 in 60 minutes. The regeneration of adsorbent is also possible with 0.5 M HCl solution making the proposed technique more efficient and environmentally friendly.

Keywords: Melamine Formaldehyde Urea Resin, Adsorption, Water Treatment, Phosphorus Removal, Phosphorus Determination, Materials
Phthalocyanine-based Superstructural Conductive Polymer Design for Sensor and Electrochromic Applications

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Phthalocyanines have been researched in a range of areas owing to their numerous properties such as chemical and thermal stability that possess unique physical and chemical properties. These properties caused them to be initially utilized in various fields such as chemical and biosensors, catalysts, sensitizers in photodynamic therapy and so on. Conducting polymers have also attracted much interest as interesting optical and electrical properties. In this study, phthalocyanine-based superstructural conducting polymers have been synthesized and characterized. Optical, electrical, and sensing properties of these super-structured conducting polymers have been investigated comparatively. In addition to these, the sensor platform has been successfully established, and analytical optimizations have been carried out. When the sensors prepared with zinc(II) phthalocyanine are examined, it was specified that the n-ZnPc-co-TP/GOx was ranked first in the literature with high sensor response and stability. As a result, by changing structure of the phthalocyanines, their physical properties can be tuned to meet the requirements of desired technological application.

**Keywords:** Conducting Polymers, Phthalocyanine, Biosensors, Electrochemistry, Spectroelectrochemistry,

**Acknowledgement:** This work was supported by BAGEP Award of the Science Academy
1. Introduction

Phthalocyanines have been researched in a range of areas owing to their numerous properties such as chemical and thermal stability that possess unique physical and chemical properties. These properties caused them to be initially utilized in various fields such as chemical and biosensors, catalysts, sensitizers in photodynamic therapy and so on [1-4]. Conducting polymers have also attracted much interest as interesting optical and electrical properties [5-10]. In this study, phthalocyanine-based superstructural conducting polymers have been synthesized and characterized. Optical, electrical, and sensing properties of these super-structured conducting polymers have been investigated comparatively. In addition to these, the sensor platform has been successfully established, and analytical optimizations have been carried out. When the sensors prepared with zinc(II) phthalocyanine are examined, it was specified that the n-ZnPc-co-TP/GOx was ranked first in the literature with high sensor response and stability. As a result, by changing structure of the phthalocyanines, their physical properties can be tuned to meet the requirements of desired technological application.

2. Materials and Methods

Peripheral and nonperipheral ZnPc have been synthesized according to literature. Electrochemical studies have been performed in a three-electrode cell with an Ivium Compactstat. For electro-polymerization, indium tin oxide (ITO) glass slides or graphite electrode have been used as the working electrodes. A platinum wire and Ag wire have been used as counter and reference electrodes. Reference electrode has been calibrated the presence of a ferrocene Fe/Fe+ redox couple. Electrochemical cell composed of dichloromethane containing 0.02 M corresponding monomers and 0.05 M TBP6. For biosensor applications, 0.5 mg of GOx enzyme has been dissolved in 10.0 μL of PBS. For immobilization 10.0 μL of enzyme solution and then 10.0 μL of GA was dripped onto the graphite electrode surface. Chrono-amperometric measurements have been carried out at ambient temperature in a cell contain with 10 mL of PBS at ?0.7 V potential in different pH range.

3. Result and Discussion

Redox behaviors of n-ZnPc and p-ZnPc have been investigated by cyclic voltammetry studies. Onset oxidation potential of n-ZnPc and p-ZnPc has been observed at around 0.83 V and 1.0 V, respectively. Substituting carbazole group from the non-peripheral position to the phthalocyanine ring caused a reduction of 0.17 V in the onset potential. The redox peaks of n-ZnPc have been observed at 0.62 and 0.22 V. Oxidation and reduction peaks of the n-ZnPc polymer has been observed at 0.88 and 0.43 V due to polymerization of n-ZnPc in the second cycle at the electrode surface. For spectroelectrochemical experiments of the phthalocyanine-
based superstructural conductive polymers, ZnPc-coated ITO electrodes have been used as a working electrode. \( \text{??}^{*} \) transition wavelength has been observed at about 303 nm for P(n-ZnPc) in the neutral state. Optical band gap has been calculated as 3.39 eV from the onset of the \( \text{??}^{*} \) transition band. Meanwhile P(n-ZnPc) has exhibited color changes from light green and dark green in the neutral and oxidized states, respectively. Optical contrast has been measured as 70.5\% at 665 nm. Metal-containing phthalocyanine complexes can strongly adsorbed on electrodes such as graphite or graphene. Also, high physicochemical stability and excellent catalytic properties of these complexes may enhance the biosensor responses. In order to determine the best biosensor response of P(ZnPc)s biosensor responses of P(ZnPc)s prepared different feed ratios of ZnPc and co-monomer have been measured and compared with each other. The highest current difference has been measured for P(ZnPc) prepared with 0.6 n-ZnPc/0.4 TP ratio. The same ratio has been also obtained as a result of comparing the optical and electrochemical properties of the copolymers. Biosensor responses of P(ZnPc) has been investigated in different pH (pH range between 4.0 and 8.0). The highest response has been measured at pH 6.0. Synthesis route, spectroelectrochemical properties and sensor responses as the glucose sensor platform for n-ZnPc and p-ZnPc have been exhibited in figure 1. Figure 1. Synthesis route, spectroelectrochemical properties and sensor responses of p-ZnPc and n-ZnPc Surface morphology of the materials (P(n-ZnPc), P(TP), P(n-ZnPc-co-TP), and P(n-ZnPc-co-TP)/GOx) have been investigated SEM studies. It has been observed SEM studies surface modification has been accomplished successfully. Surface morphology of P(n-ZnPc) has a carpet-like surface. A remarkable surface morphology change has been observed after GOx immobilization onto the modified electrodes. It has been determined in this study that substitution at non-peripheral or peripheral positions of the phthalocyanine ring has an apparent effect on the spectroscopic properties and molecular structure of the phthalocyanine. Non-peripheral substitution has a more substantial influence than peripheral substitution since the non-peripheral position is closer to the phthalocyanine

4. Conclusion

Phthalocyanine-based super-structural conductive polymers P(n-ZnPc) and P(p-ZnPc) have been synthesized and optical, electrical and sensing properties of these super-structured polycarbazole conducting polymers have been investigated. Substitution of carbazoles to the phthalocyanine ring in either peripheral or nonperipheral position has a great effect on the optical and electrical properties and sensing ability of the resulting polycarbazole derivatives. P(n-ZnPc) has the highest optical contrast among the phthalocyanine based conducting polymers. Besides, the sensor platforms have been successfully established using these polycarbazole derivatives and analytical optimizations have been performed. P(n-ZnPc-co-TP/GOx based sensor platform has been ranked first in the literature among the phthalocyanine/conducting polymer based sensor platforms in term of sensor response and stability. In conclusion, non-peripheral substitution has a more substantial influence for sensing properties than peripheral substitution since non-peripheral substitution of the phthalocyanine ring has improved the optical and electrical properties of the resulting structure. Acknowledgements This work was supported by BAGEP Award of the Science Academy

References

Optimization and Characterization of Magnetic Nanogels for Enhanced Stability Properties of Immobilized Enzyme

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Due to the advantages of magnetic nanoparticles and magnetic polymers such as observable nature and high surface area, they have been investigated for many applications. Magnetic nanogels, a class of these structures, are a popular topic for research in recent years. In the submitted study, Fe₃O₄ magnetic nanoparticles were coated by pHHEMA. The Fe₃O₄-pHEMA nanogels were synthesized by photopolymerization. The operational parameters of nanogels were amount of Fe₃O₄ nanoparticles (5-15 mg) and % HEMA concentration (0.5; 1; 2%). The effect of operational parameters was investigated for optimizing the morphology and structure of the magnetic nanogels by scanning electron microscopy (SEM), fourier transform infrared spectroscopy (FTIR), thermal gravimetric analysis (TGA) and atomic force microscopy (AFM). According to our results, the magnetic nanogels were successfully formed as core-shell structure and the most appropriate operational parameters were found as 10 mg Fe₃O₄ and % 2 HEMA. Also, we studied magnetic featured urease systems using magnetic nanogels for removal of urea effectively. The thermal stability (4-70°C), pH stability (4.0-9.0) and reusability (14 times) were studied for characterization of the immobilized urease. The importance of this work is enhancement stability of immobilized urease by magnetic nanogels for the industrial application based on removal of urea.

Keywords: Magnetic Nanogels, Enzyme, Immobilization,

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1. Introduction

Scientists have a growing interest in magnetic materials especially ferri- and ferromagnetic materials due to their chemical and physical properties. They have been used in the area of bioscience, medicine and industrial applications like purification, separation, immunoassay, drug delivery, magnetic resonance imaging, tissue engineering, diagnosis, hyperthermia, biomolecule immobilization, biosensor, toxic elements removal from industrial waste water [1-3]. These materials offer important advantages: controllable particle size, monitoring, non-toxicity and easily separation. The surface properties of magnetic nanoparticle allow functionalizing magnetic nanoparticles by various functional groups for a range of applications. In recent years, scientists are interested in design of new magnetic polymeric materials with different magnetic nanoparticles [4]. Magnetic polymeric materials have different sizes, different shapes and different surface area, they are porous or non-porous materials. Generally, the magnetic polymers comprise of a magnetic centre and polymeric coating. The structure of the polymeric material can be varied due to the aim of the application. A variety of polymers such as pullulan, polystyrene, polyacrylamide, poly(N-isopropylacrylamide), poly(L-lactic-co-glycolic)acid, albumin, cellulose have been used for preparation of these magnetic polymeric materials [5,6]. Emulsion polymerization, photochemical polymerization, in situ polymerization, dispersion polymerization, precipitation polymerization, suspension polymerization and radical polymerization have been investigated for preparation of magnetic polymeric materials [7,8].

2. Materials and Methods

Synthesis of magnetite (Fe₃O₄) nanoparticles The co-precipitating ferric and ferrous salts method which was given at Koneracka et al [1] was used for preparing Fe₃O₄ magnetic particles with some modifications. 8 g of Fe₂(SO₄)₃·H₂O and 2.8 g of FeSO₄·7H₂O were dissolved in 100 ml deionised water. The solution was mixed with 75 ml of 8 M NH₃ solution with stirring at room temperature. The mixture was incubated at 80°C for 30 min. The magnetic particles were separated and washed several times with deionised water. Then, the particles were dried at incubator at 70°C. Preparation of Fe₃O₄ -pHEMA magnetic nanojets Photopolymerization was used to prepare the magnetic nanojets. 50 ml of aqueous solution containing 1% 2-hydroxyethyl methacrylate (HEMA) and 5 mg MBA was stirred in a nitrogen atmosphere for 30 minutes. 1 ml of Fe₃O₄ magnetic nanoparticles at a concentration of 5 mg / ml were added. Photopolymerization reaction was then carried out under UV light for 10 minutes. The shaped magnetic nanojets are washed several times. Here the HEMA concentration is 0.5%; 1 and 2; Concentration of Fe₃O₄ magnetic nanoparticles 5; 10 and 15 mg / ml. Preparation of immobilized urease systems The using values of urease immobilization on magnetic nanogels were initial enzyme concentration (1.5 mg/ml), amount of magnetic nanogels (25 mg), adsorption time (20 min).
and glutaraldehyde concentration (3 % v/v). For this purpose, urease enzyme was added to 1 ml of pH 7.0 phosphate buffer solution (50 mM) and stirred until all the urease was dissolved. The magnetic nanogels were added to this solution and stirred for 15 min at the room temperature. To cross-linking, different amount of glutaraldehyde was added to the solution, stirred for 15 min. Then, the urease immobilized magnetic nanogels were washed with distilled water several times. Influence of temperature was determined by varying temperature 20-70°C. While all the other reaction conditions were constant, pH stability was studied at varying pH in the range 4.0-9.0. Citrate, acetate, phosphate and Tris-HCl buffer solutions (50 mM) were used for adjusting reaction pH. For the both parameters, incubation time was 1 hour. The determination of reusabilities of encapsulated urease systems were repeated 18 times under standard assay conditions. The reaction time for each activity measurement was 10 min and then the particles were separated and washed with pH 7.0 (50 mM) phosphate buffer. After each activity assay, the encapsulated urease systems were reintroduced into a fresh medium.

3. Result and Discussion

4. Conclusion

In this study, we suggested urease immobilization applications of magnetic nanogels.. The preparation of magnetic nanogels and immobilization method were simple, safe and low cost. This method offers an effective process for removal of urea. Also, the magnetic properties of nanogels facilitate their separation from the reaction medium by a magnetic field. The characteristic properties (optimum temperature, optimum pH, kinetic parameters, thermal stability, pH stability, operational stability and reusability) of immobilized urease was compared with soluble urease and this stability properties were improved after immobilization of urease. Immobilization of the urease with magnetic material may permit dispersed the urease molecules, the active center is not limited, so the activity of urease is highly protected. The urea-removal systems protected their activity 50-60% relative activity at 70°C, 58 % activity after 5th run. These nanogels showed at least 40% activity at the all pH values (4.0-9.0). The results show clearly that the magnetic nanogels are effective and easily applicable for immobilization of urease. The importance of this work is improving of stability properties of urease for the industrial applications. Acknowledgements This work was supported by a grant from the The Scientific And Technological Research Council Of Turkey (TÜBİTAK)-National Postdoctoral Research Scholarship Programme (2218) ND Muğla Sıtkı Koçman University Scientific Research Project (No: 18/032).

References

The main focus of research for understanding the resurrection ability from desiccation of the Balkan endemic plant *H. rhodopensis* and its immune-related activities are concentrated on lipophilic and polyphenolic compounds, as from the water-soluble molecules predominantly antioxidant enzymes are studied. Thus, the aim of the present study was to investigate the chemical diversity of water-soluble polysaccharides in the leaves of *H. rhodopensis*, which might be involved in its biological activities. After removal of most of the lipophilic compounds and pigments, the leaves were extracted twice with boiling water and as a result a water-extractable polysaccharide complex (WEPSC) with 73.7±2.5% total sugar content was isolated. WEPSC was obtained with yield of 5.4% on dry leaf basis and it contained high-methoxylated and low-acetylated pectins (anhydrouronic acid content of 49.1±0.5%). It was fractionated on a DEAE-Sepharose CL-6B column, as one neutral (WEPS-1) and two pectic fractions (WEPS-2 and -3) were obtained. The highest in yield WEPS-2 was further purified and fractionated on a Sephacryl S-300 column, as two sub-fractions were recovered (WEPS-2.1 and -2.2). The
homogalacturonan fragment in WEPS-2.2 was digested by a combination of pectin methylesterase (PME) and endo-polygalacturonase (EPG), as the enzyme digest was fractionated on a Sephacryl S-300 column into 3 sub-fractions (WEPS-2.2-EM1-1, -2 and -3). In parallel, a simultaneous release of the homogalacturonan fragment and some arabinose-containing side chains in the pectic rhamnogalacturonan I of WEPS-2.2 was done by combining PME and EPG with arabinose-releasing enzymes. Similarly, the hydrolyzate was fractionated into WEPS-2.2-EM2-1, -2 and -3 fractions. The monosaccharide composition and Mw of all native pectins and enzyme-obtained rhamnogalacturonan regions were studied. The glycosidic linkage composition and the main structural fragments of mother and enzyme-modified fractions were also analyzed by GC-MS, FT-IR and 2D NMR. In vitro NO production of murine macrophages treated with respective fractions was also evaluated.

**Keywords:** Haberlea rhodopensis, Pectic Polysaccharides, Enzyme Modification, GC-MS, NMR, Macrophages

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Effects of Different Irrigation Water Salinity Levels on Germination of Guar Gum (Cyamopsis tetraganoloba)

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Guar gum is a novel agrochemical processed from endosperm of cluster bean. The guar plant is a pod-bearing, nitrogen-fixing legume; seeds of the plant are composed of the hull (15%), germ (45%), and endosperm (40%). Guar gum is produced by milling the endosperm after removal of the hull and germ. A typical analysis of gum guar is galactomannan 78-82%, moisture 10-15%, protein 4-5%, crude fibre 1.5-2.5%, and ash 0.5-0.9%. The most commonly used ten sectors are textile industry, oil & gas well drilling, cream & cosmetics, frozen foods, beverages, tobacco industry, dairy products, pet food and toothpaste. Industrial applications of guar gum are possible because of its ability to form hydrogen bonding with water molecule. Thus, it is chiefly used as thickener and stabilizer. Guar is a hot climate plant and also has a higher resistance to stress than other plants. This study was aimed to determine the resistance limits of guar against irrigation water salinity which is an important stress factor for plants. Sodium Adsorption Ratio (SAR) of Irrigation water was less than 3 and different irrigation water salinity (ECi = 0, 6, 8, 10, 12, 15 dS / m) were prepared. Adaptation studies conducted in Turkey has been chosen as plant material which is the guar genotypes. Under the laboratory conduction, selected plant genotypes were planted in petri dishes. Then, saline irrigation water was added in petri dishes. After the 7 days, all parameter measurement. The data obtained from the study, Biplot analysis was performed to 90% of the data. At the end of the Biplot analysis, some of the genotypes were affected from 8 dS/m for ECi and the other genotypes were resistant to 12 dS/m for ECi. In all irrigation water salinity levels, genotypes 10, 65 and 69 were determined as the best genotype.

Keywords: Germination, Guar, Irrigation water salinity,

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Aryldiazonium Chemistry Meets Surfaces - Formation of the Covalently Bonded Nano-polymeric Films

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Surface modification of polymers, metals, oxides, etc. using aryldiazonium salts has developed to a standard tool for designing the interface properties of these materials through the covalent attachment of organic moieties (small organic functional molecules to proteins, metal complexes, etc.). There are numerous classes of molecules that are considered as suitable candidates for surface modification such as thiols, silanes, phosphonic acids, carboxylic acids, etc. Although these molecules are very important, yet in comparison to the aryl diazonium salts, they have numerous problems ranging from surface selectivity (they do not form films with all surface types i.e thiols are good candidates for SAMS formation onto noble metals, phosphonic acids, silanes or carboxylic acid require oxo/hydroxylated surfaces); chemical/electrochemical layer stability; synthetic routes of particular molecules are complicated, etc. The topic will present the: mechanism of aryl diazonium reaction to surface modification, the different methods used to perform such surface modification (electrochemical, photochemical, sonochemical, etc), the surface techniques used for characterizations of the boned layers and some applications of the created surfaces by this type of chemistry.

Keywords: Aryldiazonium, Surface Modifications, Chemical Stability, Nano-polymeric, Thin films, Electrochemical Modification
Electrochemical Sensors/Biosensors Using Nanomaterials/Polymer Modified Pencil Graphite Electrodes

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Recently, pencil leads have been extensively used as an electrode material which is generally dominated as pencil graphite electrode (PGE) or graphite pencil electrode in the development of electrochemical sensors/biosensors. The reason of widely using of PGEs is that this electrode has several advantages over the other carbon or metal based electrodes, including high electrochemical reactivity, ease of surface modification, high stability, low cost, disposable electrode material, and avoidance of time-consuming polishing procedures [1-3]. Although bare or pretreated PGEs have been widely used in electrochemical sensor/biosensor studies, these electrodes generally offers the poor sensitive and selective results for the detection of many analytes due to their low electrocatalytic activities. In order to obtain more sensitive and selective results, PGE surface has been modified with a suitable electrocatalyst or electron mediator as crucial step toward the fabrication of electrochemical sensors/biosensors. In this study, we described the use of metal nanoparticle, quantum dots, electroactive polymer modified PGEs in the sensing and biosensing analysis, especially oxidase and dehydrogenase based electrochemical biosensors. Moreover, in our studies modified PGEs were used in flow injection analysis (FIA) system for the first time. It was concluded that, the integration of PGEs with FIA offers the development of cheap, sensitive, selective, disposable and faster electrochemical sensors/biosensors of various analytes. References 1- Torrinha, Á., Amorim, C.G., Montenegro, M.C.B.S.M., Araújo, A.N., Talanta, 190, (2018) 235-247. 2- Akanda, M.R., Sohail, M., Aziz, M.A., Kawde, A.-N., Electroanalysis, 28(3), (2016) 408-424. 3- Kawde, A.-N., Baig, N., Sajid, M., RSC Advances, 6(94), (2016) 91325-91340.

Keywords: Electrochemical Sensors And Biosensor, Pencil Grahithe Electrode, Nanomaterial Modified Electrodes, Polymer Modified Electrodes
Enzyme Immobilized Cholesterol Biosensor Prepared by Conducting Polymer Composites

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Amperometric enzyme sensors are simple, cheap, environment-friendly and sensitive electroanalytical devices. In this study, amperometric cholesterol biosensor with immobilized cholesterol oxidase was developed as a cholesterol determination method. Especially determination of blood cholesterol is important since it is a significant parameter used in the diagnosis and treatment of various illnesses. For this purpose, 6-(4,7-bis(4-hexylthiophen-2-yl)-2H-benzo[d][1,2,3]triazol-2-yl)hexan-1-amine was synthesized as the monomer of Donor-Acceptor Donor (DAD) type conducting polymer and it was polymerized over the electrode surface electrochemically in order to form the matrix where the enzyme is covalently attached to. Characterization and optimization of the designed biosensor were studied and found that the linear working range is 0.05 ? 15.0 ?M. Sensitivity and detection limit is 0.46?A/?M and 0.049 ?M respectively. Response time was found to be 10 second. Kinetic parameters, Kmapp and Imax were obtained as 3.05 ?M and 2.58 ?A. Biosensor developed in this study is an alternative to other cholesterol determination methods due to its sensitive and reproducible response range, lower detection limit and its advantages of being durable, cheap and practical.

Keywords:  Conducting Polymer, Enzyme Biosensor, Cholesterol, Cholesterol Oxidase, Dad Type Polymer,

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Ionene-based Polyelectrolytes and Their Electrochemical Application in Smart Windows

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Recently, the utilization of ionic liquids (ILs) as electrolytes for electrochemical devices is enhancing their performance, security, speed, cyclability and long term stability [1]. However, intrinsically, ILs are liquids which presents some challenges that are not easy to overcome such as the need of complete encapsulation resulting from leaks [2]. This study is aimed at substituting liquid electrolyte with safer and more mechanically stable material but still demonstrating exceptional electrochemical characteristics. Herein, we synthesized special type of polyelectrolyte based on triazole-containing ionene. Ethylene glycol (EG)-based monomers containing azide and alkyne functional groups were initially synthesized and underwent copper(I) catalyzed azide-alkyne cycloaddition (CuAAC) reaction to yield ionenes. Activation of the cationic moiety was conducted by quaternizing the triazole group with alkyl groups such as methyl and butyl. Subsequently, quaternized ionenes underwent anion metathesis yielding a series of polyelectrolytes with various counteranions. These unique polyelectrolytes exhibit a very remarkable ionic conductivity which is at par or if not exceeds the best ionenes in literature. Furthermore, they exhibit good mechanical and thermal stability. With these, we were able to fabricate an all-solid state electrochromic device (ECD) which efficiently switches from a transparent state to a colored state. The development of these new ionenes with excellent physical and thermal properties is promising for the design of no-leak smart windows and other potential electrochemical devices. References: [1] A.S. Shaplov, R. Marcilla, D. Mecerreyes, Recent Advances in Innovative Polymer Electrolytes based on Poly(ionic liquid)s, Electrochim. Acta. 175 (2015) 18?34. [2] V. K. Thakur, G. Ding, J. Ma, P. S. Lee, X. Lu, Hybrid Materials and Polymer Electrolytes for Electrochromic Device Applications, Adv. Mater. 24 (2012) 4071-4096

Keywords: Electrochromic, Ionic Liquid, Ionene, Polyelectrolytes, Smart Windows, Electrochemical
Impact of Seawater Aging on Interlaminar Fracture Performance of Halloysite Nanotube Modified Epoxy/Basalt Fiber Hybrid Composites

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The seawater aging consequences on interlaminar fracture performance of basalt fiber (BF) reinforced epoxy (Ep)/halloysite nanotube (HNT) hybrid composites were investigated experimentally. For this, we filled various amounts of HNTs into the Ep matrix, and the HNTs/Ep was used to impregnate basalt fabrics. The prepared hybrid composites were subjected to fracture tests. Besides, the hybrid composites were immersed in seawater for 1, 3 and 6 months. The hybrid composites exhibited remarkably improved aging performance compared to the neat basalt-epoxy composites in fracture toughness. The SEM micrographs showed relatively less number of cracks, micro-voids and better interfacial bonding in 2wt% HNTs modified basalt/epoxy hybrid composite specimens in comparison to the neat counterpart, similarly conditioned in all cases.

Keywords: Halloysite Nanotube, Basalt Fiber, Seawater Aging, Fracture Toughness, Mechanical test,

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1. Introduction

The chemical and mechanical performance of fiber reinforced polymer composites (FRPs) under harsh environmental conditions generally satisfactory with respect to other traditional materials [1]. However, composite laminates are known to be sensitive to delamination due to their relatively weak interlaminar strength [2]. Long-term seawater exposure can lead to unexpected interlaminar failures of marine composites. The seawater with alkaline nature could likely have an enormous impact on polymer composites [4, 5]. The alkaline moisture is absorbed by the polymer matrix and/or diffused through the fiber-matrix interface which impairs the mechanical properties and lead to premature failure of the composites structure through a combination of mechanisms ranging from pitting, hydroxylation, hydrolysis, plasticization, and leaching [6], along with conventional failure modes such as matrix-cracking, fiber-fracture, debonding, and delamination [7]. Therefore, it is necessary to understand the causes for the formation of damage due to long-term aging in seawater and improving the damage resistance characteristics of FRPs. Matrix modification with nanoparticles is a widely utilized method used to enhanced delamination resistance of advanced composite materials [6-8]. This method provides as well as increasing the plastic zone ahead of the crack tip also may provoke a number of toughening mechanisms including particle bridging, crack pinning, crack path deflection and microcracking [9]. Halloysite nanotubes (HNTs) have recently become the subject of research attention as a new type of cheap nanofiller for enhancing the mechanical performance of polymers, particularly for strengthening and toughening epoxies. Herein, we focused on fracture performances of basalt fiber reinforced epoxy composites modified with HNTs after aging in a seawater environment. The effectiveness of nanofiller with different loadings o fracture performances and their micro/nano toughening mechanisms were proposed by adopting SEM analysis on fracture and impact surfaces.

2. Materials and Methods

MGS® L 160 low viscosity epoxy resin and MGS® H 160 curing agent were used as matrix material (supplied by Momentive Hexion Inc). The matrix modification was performed using halloysite nanotubes (HNTs) which are 20-40 nm diameters and 98% purity (provided by Eczacibasi Group ESAN Company). Basalt woven (purchased from Tila Kompozit) fabric with 300 g/m2 areal density was used as fiber reinforcement to the production of laminated composites. A certain amount of HNTs (0-3 wt %) were first dispersed in acetone and stirred with ultrasonic mixing for 15 min. The dispersion was then introduced into the epoxy resin and stirred for 1 h. After degassing to remove the remaining acetone, hardener was added and mechanically mixing. Vacuum assisted resin infusion method was utilized to produce basalt fiber (BF) reinforced epoxy multi-scale laminates. Teflon film was inserted into the middle plane of the stacked fibers as the initial crack for the Mode I.
interlaminar fracture toughness tests. The infused preforms were cured at 70 °C for 1 h and post-cured 120 °C at 4 h. Double cantilever beam (DCB) specimens were prepared according to ASTM D5528.13. DCB tests were performed at a constant crosshead rate of 2.5 mm/min. Tensile and flexural tests were also conducted according to ASTM D3039 and ASTM D7264, respectively. The seawater aging of the test specimens was performed at room temperature by immersing into an artificial seawater which was prepared by mixing the 6 wt% sea salt (salt concentration about twice the average concentration in an ocean) [10] and distilled water.

3. Result and Discussion

As regards the tensile and flexural tests, typical experimental curves before seawater aging are reported in Fig. 1. The strength and strain values obtained from the 2 wt% HNT modified nanocomposites showed higher mechanical performance compared to neat. Furthermore, the broad load carrying region observed in the bending curve of the 2 wt% HNT included specimen, particularly a sign of increasing the fiber-matrix interface strength by the HNTs adding. Detailed results for all tests are documented in Table 1. It can be observed that the tensile and flexural load carrying capacity of epoxy-basalt composites increased significantly by about 35.2% and 31.8%, respectively when 2 wt% HNT was added. It can also be observed that the tensile and flexural deformation capacity of epoxy-basalt composites increased by 17.5% and 55.1%, respectively after the addition of 2 wt% HNT. Similar trends are observed for all seawater aged specimens in Fig.2, a decrease in modulus and a large drop in failure strength. However, the decline in neat specimens appears relatively sharper than those of HNT modified specimens. Two groups of DCB specimens as neat basalt-epoxy and 2 wt% HNTs modified basalt-epoxy hybrid composite were tested for each immersion periods. Interlaminar fracture toughness in Mode-I (GIC) was calculated using compliance calibration method. In order to understand the static evolution of interlaminar delamination, the values of GIC were represented as a function of the crack length for each period in Fig. 3. The energy release rate for HNT modified and neat specimens depends on aging period. The toughness both aged group are in general lower than those dry specimens. Mode I fracture toughness was improved for dry conditions about 18% by the HNT modification of epoxy. The greater GIC value for 2 wt% HNT modified laminates can be determined about 34% higher compared to neat epoxy composites after 6 months seawater aging. The decrease in GIC for the delamination region of both composites is attributed to the weakened fiber/matrix interface. In order to discuss both enhancements of the delamination resistance of HNT added hybrid composites and degradation of the delamination resistance of seawater aged specimens, delamination surface images were monitored using SEM. It is understood that 2 wt% HNT added hybrid composites have good interlaminar adhesion with observed increasing roughness on interlayer regions. This figure reveals that seawater aged specimens have smooth surfaces both of pulled out fibers and their delamination surfaces’ than dry specimens have much rougher fracture surfaces. These results of SEM observation coincide with the experimental results that the calculated fracture toughness’s of 2 wt% HNT added and dry specimens higher than that of neat and aged. After seawater aging, probable water inlet voids and water canal formation with void coalescence in the epoxy are seen in Fig.5a-b. The penetrated water in to the composites may cause the matrix swelling, cracking, and damage of fiber-matrix interface by capillary action through microcracks or interlayer delaminations [12]. During immersion, water molecules and soluble ions of salt can penetrate into the matrix and react with the fiber. At the same time, there are some elements leak from the fiber and these leaked elements may form a hydrate layer at the interface. As a result, the cracks are consequently formed, leading to the breaking of fibers in the mechanical test [10]. Fig.5c-d show the rust formation on the fiber surfaces after the water reaches by diffusion of water in epoxy. Eventually, all these effects deteriorate the properties of composites.
Effects of Humic Acid Treatments on the Tunnely White Nectarine (Prunus persica cv. Bayramiç Beyazı) Nutrition

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Various organic-inorganic fertilizers and soil amendments have recently been used to improve yield and quality of several agricultural products. Humic acid is an extraction substance obtained from crude lignite and similar products with quite high organic matter contents. Turkey is quite rich in crude lignite sources. Humic acid thus is a local product of Turkish Coal Enterprises (TKİ-Hümas). This study was conducted to investigate the effects of TKİ-hümas on nutrition of tunnely white nectarine (Prunus persica cv. Bayramiç Beyazı) which is a local registered cultivar of Çanakkale province of Turkey. Humic acid was applied to young trees at 4 different doses (K0: control without humic acid treatments, K1: Half of recommended dose, K2: Recommended dose, K3: Twice of recommended dose) and fruit yield parameters and leaf macro-micro nutrients were investigated. Leaf samples were taken before the treatments. Micro-micro nutrient analyses revealed that while there were significant differences in P, K, Ca and Mn contents, the differences in Mg, Na, B, Fe, Cu and Zn contents were not found to be significant (p<0.05). Leaf samples were taken also after the humic acid treatments and there were significant differences in some nutrient contents (P<0.01). As fruit yield parameters, fruit width, fruit length, single fruit weight and yield per tree were assessed and it was observed that humic acid treatments did not have significant effects on fruit yield parameters. Besides macro-micro nutrients, further research is recommended to include the effects of humic acid treatments on quality and aroma of Bayramiç Beyazı fruits.

Keywords: Prunus persica, Bayramiç Beyazı, Yield, Humic Acid, Plant Nutrients, Soil

Acknowledgement: This study was derived from the Graduate Thesis of Ferhat Anamur entitled as Effects of Humic acid Treatments on nutrition of Tunnely White Nectarine (Prunus persica cv. Bayramiç Beyazı) supplied for partial fulfillment of the Masters Degree at Soil Science and Plant Nutrition Department of Natural and Applied Sciences Institute of ÇOMÜ. The study was financially supported by ÇOMÜ Scientific Research Projects Department with the project number of FLY-2018-2467.
This study emphasized the impact of seawater immersion on the mechanical properties of basalt fiber reinforced epoxy composites and the contribution of halloysite nanotube introduction on enhancing the barrier properties of HNTs modified basalt fiber/epoxy hybrid composites. Tensile, flexural and SENB fracture tests revealed that mechanical performance of basalt/epoxy composites was remarkably enhanced due to the modification of epoxy matrix with 2 wt% HNTs. Acknowledgements This project was supported by the Selcuk University Scientific Research Projects under grant number 18101001. Technical support from the Selcuk University Advanced Technology Research & Application Center is much appreciated.

References

Extraction of Polysaccharide from the Green Algae Codium tomentosum

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Lately, there have been so many efforts for extraction and determination of the types and properties, investigating the various biological activities of the polysaccharides extracted from the cell walls of the green seaweeds. Among these green algae species, Codium tomentosum contains sulfated polysaccharides as well as the others such as Ulva rigida, Enteromorpha intestinalis, Codium fragile. In the literature, there have been only a few studies on extracted polysaccharide of the Codium species. Therefore, in this study, we mainly aimed the extraction and characterization of the water-soluble polysaccharide from Codium tomentosum. The alga was collected from the Kepez district (Çanakkale/TURKEY). NMR and FTIR were used for the characterization of polysaccharide contents.

Keywords: Polysaccharide, Codium tomentosum, Green Algae, FTIR, NMR,

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Exploiting Spiroconjugation in the Design of Building Blocks for Organic Magnetic Materials

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Recently, there has been a lot of interest in designing electronic, optical, and magnetic molecular devices (switches, relays, diodes, etc) based on molecular building blocks. The design of molecular devices and new materials depends on the preparation of molecules with predictable and tunable electrical, optical and magnetic properties. For organic compound to have magnetic properties it must possess unpaired electron(s). Most organic molecules are diamagnetic, but there are some that exist as triplets in the ground state. The crucial step towards the design of organic molecular ferromagnets is thorough understanding of the spin-spin interactions in the basic building block i.e understanding the factors that influence the singlet-triplet energy gap in diradicals. There are very few systems with an option of singlet-triplet tunability and a potential to be used as a high-spin building block for organic magnetic materials. An overview of the most promising organic high-spin building blocks will be given with special emphases on the utilization of the phenomenon of spiroconjugation for design of such building blocks. Spiroconjugation, i.e., the ability of two perpendicular -systems to interact, allows implementation of modular approach to the preparation of new structures, where the components can be electronically coupled in various combination, giving new -networks of increased dimensionality.

Keywords: Spiroconjugation, Organic Compounds, High-spin Building Blocks, Increased Dimensionality
Synthesis and Application of Amphiphilic Graft Copolymers

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PSf is an engineering polymer with high Tg (191°C) that has numerous applications from membrane production [1] to the design of bio-artificial organs [2]. High mechanical strength, thermal stability and chemical resistance of PSf draw attention for the fabrication of membranes especially for pressure driven processes such as microfiltration (MF), ultrafiltration (UF) and nanofiltration (NF) [3,4]. PSf based membranes have been widely used by various industries from food processing to biotechnology [5]. However, PSf surfaces suffer from fouling which causes limited permeability, shortened life cycles and pollution [6]. Herein, various polysulfone (PSf) based amphiphilic copolymers were synthesized via ATRP to understand the effect of the hydrophilic segment and grafting parameters on the specified properties. Although PSf based amphiphilic copolymers have been investigated for membrane modifications, they also appeared as smart polymers with shape memory behavior. Amphiphilic copolymers (PSf-g-PEGMA) with the tunable thermal transition (Tg,Tm) and surface properties were obtained. It was shown that the characteristic of copolymers can be tuned by altering the topology and the ratio of soft/hard segments. The melting transition (Tm) of soft segments was shown to be an effective stimulus to achieve shape memory behavior. [1] H. Susanto, M. Ulbricht, J. Membr. Sci. 327 (2009) 125-135. [2] Y. X. Ma, F. M. Shi, J. Ma, M. N. Wu, J. Zhang, C. J. Gao, Desalination 272 (2011) 51-58. [3] J. Y. Park, M. H. Acar, A. Akthakul, W. Kuhlman, A. M. Mayes, Biomaterials 27 (2006) 856-865. [4] X. R. Chen, B. X. Tang, J. Q. Luo, Y. H. Wan, Micropor. Mesopor. Mat. 241 (2017) 355-365.[5] S. Zhao, Z. Wang, X. Wei, X. X. Tian, J. X. Wang, S. B. Yang, S. C. Wang, J. Membr. Sci. 385 (2011) 110-122. [6] M. Z. Yunos, Z. Harun, H. Basri, A. F. Ismail, Desalination 333 (2014) 36-44.

Keywords: Polysulfone, Atrp, Pegma, Polymer Membranes, Antifouling, Shape Memory

Acknowledgement: This work was supported by the Research Foundation of Istanbul Technical University (Project Grant Number: 41240).
Ropes Reinforced Wood Plastic Composites

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This Wood Plastic Composites (WPC) extrusion technology relates to a wood plastic composite extrusion system and a method for production of ropes reinforced profiles wherein the system comprises of three extruders and complex head with profile forming die. This new invention includes methods and apparatus for continuously extruding wood plastic composites mixture, co-extruding long fibers and thermoplastic materials composition mixture together with reinforcing ropes and straps as outer layer onto profile surface and co-extruding forcibly reinforcing ropes and straps together with long fibers and thermoplastic materials composition mixture inside the profile by forming intermediate filaments and at the same time surrounding the ropes and straps. Wherein co-extruded mixture plastic melt promotes bounding of reinforcing ropes and straps with wood plastic composites mixture.

Keywords: Plastic, Composite, Extrusion, Wood, Profile, Recycle

Acknowledgement: When compared with solid wood materials, WPCs have lower mechanical properties in strength, stiffness, and creep resistance. Therefore, there is a need for increasing physical properties of thermoplastics-based wood filled composites (WPC) which can be processed during manufacturing and with the need for complex extrusion process, head and die arrangements to feed ropes into extruded materials to increase flexural properties, impact resistance and tensile properties of extruded profile.
Probiotics at Clinical Practice

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Human gut is home of numerous microorganisms that make our microbiota. The development of microbiota is affected too many factors like form of birth, gestational age (preterm or term), antibiotic use, breastfeeding and nourishment. Decreased diversity of the gut microbiome is a recurring theme in a variety of conditions that are potentially related to dysbiosis, including chronic IBD, chronic diarrhea and necrotizing enterocolitis. Probiotics are live microorganisms that are intended to have health benefits. Probiotics have a major role at clinical practice at the present time. Especially in pediatrics treatment of acute viral gastroenteritis or antibiotic associated diarrhea probiotics are given as routine. Allergic diseases, necrotizing enterocolitis, depression and mood disorders, diabetes, cancer and much more disease probiotics strengthen the treatment. Many studies are proved that probiotics are very safe. The major observed adverse effects of probiotics are sepsis, fungemia and GI ischemia. In this presentation we make mention of probiotics and their clinical use and side effects.

**Keywords:** Probiotic, Microbiota, Disease, Clinical Practice

**Acknowledgement:** This research received no external funding. None of the authors has a direct or indirect conflict of interest in the publication of this paper.

1. Introduction

   Human gut is natural reservoir for numerous species of microorganisms. Development of microbiota occurs in infancy and influenced by birth form (vaginal/caesarean section), gestational age (prematurity/full term), and antibiotic use in perinatal period (1,2). Decreased gut microbiome diversity is recurring theme in variety of conditions that are potentially related to dysbiosis, including diarrhea and necrotizing enterocolitis (3). In 1995, Gibson et al. defined prebiotics, a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or limited number of bacteria in colon (4). These bacteria influence homeostasis of intestinal cells and inhibit growth of pathogenic bacteria (5).

**PROBIOTICS AT CLINICAL PRACTICE**

Gastroenteritis in children Certain probiotics, reduce the duration and intensity of symptoms. European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Working Group (WG) on Probiotics and Prebiotics provide recommendations to probiotic use for the treatment of AGE in previously healthy infants and children (6). Selected probiotic strains (*Lactobacillus rhamnosus* GG, *Saccharomyces boulardii*) can be considered in children with AGE, as an adjunct to ORS (7). Antibiotic associated diarrhea in children The probiotic use reduces by 50% the risk of antibiotic-associated diarrhea (8). Prevention of *Clostridium difficile*-associated diarrhea (CDAD) Based on meta-analysis of 31 RCTs including 8672 patients, suggests that probiotics are effective for preventing CDAD (9). Prevention on Allergic Disease The most recent meta-analysis comprised 17 RCTs covering 4755 children and showed that probiotic use, decreased the risk of atopic
dermatitis, especially if combination of probiotics was used. However, no significant difference in terms of preventing asthma, wheezing, rhinoconjunctivitis was found (10-11). Necrotizing enterocolitis(NEC) at infants Probiotics have been extensively studied in preterm infants, with trials to date enrolling over 10,000 infants. However, studies have utilized wide variety of bacterial strains, most commonly *Bifidobacterium*, *Lactobacillus* or a combination of the two. Despite clinical heterogeneity,meta-analysis of studies show a strong treatment effect of probiotics in the reduction of NEC (12,13). Depression and mood In a RCT; results show that intake of multispecies probiotics for 4-week period significantly reduced overall cognitive reactivity to depression and aggressive and ruminative thoughts (14). In children with autism spectrum disorder, a daily dose of *L. plantarum* WCFS1(4.5 × 1010 CFU/day) led to an improvement in school records and attitude towards food (15). Szajewska et al. reported that autism spectrum and attention-deficit/hyperactivity disorders in children could be prevented by *L. rhamnosus* administration to the mother at 4 weeks from expected delivery (16). Insulin resistance and diabetes studies have shown that intestinal microbiota is associated with the development of metabolic diseases, as obese and diabetic subjects present perturbations in the proportions of Firmicutes, Bacteroidetes, Proteobacteria (17). Children with Type 1 diabetes mellitus (T1D) showed higher *Clostridium*, *Bacteroides*, *Veillonella* counts, followed by lower *Bifidobacterium*, *Lactobacillus* counts, than healthy children (18). Another study reported in T1D increased *Bacteroides ovatus* counts and decreased *Bacteroides fragilis* (19). Intestinal microbiota compositional changes have also been investigated in patients with T2DM. Researchers have found that abundance of Firmicutes and Clostridia was significantly reduced, while relative *Bacteroidetes* and Betaproteobacteria proportion was increased in diabetic group compared with control group. However, Zhang et al. (20) found that Firmicutes and Clostridia proportion were higher in patients group with T2DM compared to normal glucose group. Patients in pre-diabetes and T2DM groups had significantly increased Betaproteobacteria level compared with normal glucose group (17,21). Probiotics as Anti-carcinogens *Lactobacillus* and Bifidobacteria are the most common microbes types used as probiotics, and are also considered as stability markers of human intestinal microbiota. Against a huge amount of data suggesting role for probiotics in colorectal cancer prevention (22-24). It has been reported that some lactobacilli and bifidobacteria induce increased activity of anti-oxidative enzymes or modulate circulatory oxidative stress protecting cells against carcinogen-induced damage (25). *Lactobacillus* and *Bifidobacterium* strains can be used along with many other natural anti-oxidant substances in cancer prevention. Anti-oxidant properties of these strains can be also considered in cancer treatment as some cancer therapies are based on a specific ROS overproduction in cancer cells (26,27).

**SIDE EFFECTS OF PROBIOTICS**

The major observed adverse effects are sepsis, fungemia, GI ischemia. Generally, critically ill patients in intensive care unit (ICU), sick infants, and patients with immune-compromised complexity are the most at-risk populations (28). The most commonly reported single event is fungemia, with at least 33 reports of presence of *Saccharomyces cerevisiae/Saccharomyces boulardii* in blood cultures of patients who had consumed probiotic *S. boulardii*. At least eight cases of bacteremia associated with Lactobacilli have been reported, including *Lactobacillus acidophilus*, *Lactobacillus casei*, *Lactobacillus GG*. Nine cases of overt sepsis have been reported, associated with *S. boulardii*, *Lactobacillus GG*, *Bacillus subtilis*, *Bifidobacterium breve*, or combination. Endocarditis events due to both *Lactobacillus* and *Streptococcus* probiotics have been reported (29).
RESULTS

Probiotics are live microorganisms that are intended to have health benefits. Probiotics have a major role at clinical practice. Especially in pediatrics, AGE or antibiotic associated diarrhea treatment, probiotics are given routinely. Not only gastroenteritis in children but also many diseases like NEC, diabetes etc. probiotics are used frequently and given impressive results. RCTs are proved that probiotics are safe nearly all ages. Although their safety range is wide, side effects are seen. Especially critically ill patients in ICU, immune-compromised and geriatric populations have high risk to be seen side effects. Studies on probiotics are still ongoing, and studies are continuing to give new results day by day.

DISCUSSION

Probiotics are vital for microbiota. Especially for pediatrician, they have major roles for some diseases. For treatment AGE, prevent antibiotic associated diarrhea and NEC we use routinely. Using probiotics at NICU can help prevention fatal diseases like NEC, sepsis and reduce mortality (-25)

REFERENCES

Covalent Attachment of Poly(ε-caprolactone) to the Gelatin/Collagen/
Elastin Surface by In-Situ Polymerization

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The hybrid materials constituted of Poly(ε-caprolactone) and extracellular matrix proteins (collagen, elastin, gelatin) became very popular in tissue engineering because of these materials are completely biodegradable and biocompatible, suitable for cell attachment and having desired mechanical properties. In the process of preparations of such hybrid materials, generally the surface modifications such as ozone treatment, peroxide treatment, aminolysis process or post-modifications (crosslinking with carbodiimide agents, glutaraldehyde, EDC, NHS) has been needed before the linking poly-caprolactone and extracellular matrix proteins with covalent bonds in order to achieve block copolymers with desired structure and physical properties considering the material strength, elasticity and stability in the aqueous environments. In our study, we aimed to propose a new preparation method based on direct polymerization of caprolactone on the gelatin-collagen-elastin surface alternative to the conventional reaction routes includes pre-modifications or post-modification. For this purpose, gelatin-collagen-elastin containing nanofiber material was prepared via electrospinning technique. Then the ring-opening polymerization of caprolactone was carried out on the surface of the nanofiber to obtain poly (ε-caprolactone/gelatin-collagen-elastin hybrid material. The chemical structure was characterized by Raman spectroscopy. After characterization, the chemical structure, stability in the aqueous media was tested. The results showed that the grafting was successfully achieved and the hybrid material can remain stable without the need of crosslinkers.

Keywords: Collagen, Elastin, Caprolactone, Nanfber, Electrospinning, Graft Copolymer
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ORAL
PRESENTATIONS
(Type II)
Speech Time: 10 minutes.
3D Molecularly Imprinted Sponge: New Generation of Transducer for Highly Sensitive Electrochemical Detection of Cancer Biomarkers

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On-chip sample concentration and detection of several cancer biomarkers in biological samples are challenging tasks for lab-on-a-chip (LOC) systems. It involves complex matrixes and normally a large amount of sample must be processed in order to detect low levels of targets of interest. Existing sample concentration and preparation technologies are either hard to realize in LOC systems, or complicated to fabricate and difficult to integrate with other microfluidic modules. Our aim is to examine the feasibility of using 3D- printed electrodes as new generation of transducers for the electrochemical detection of cancer biomarkers in biological fluids. In this work, we present a novel concept for on-chip sample concentration and detection. Three dimensional (3D) printed molecularly imprinted sponge structures, behaving as working electrode, were employed to specifically concentrate the target of interest from the raw sample, as well as to electrochemically detect it. The conductive sponge, which was similar to the scaffolds for tissue engineering, was formed by 3D printing (Additive manufacturing). Then, a layer of molecularly imprinted polymer was grafted by electropolymerization. After washing away the template, cavities complementary to the target were created on the 3D sponge surface. When the raw sample was passed through the 3D sponge, the targeted analytes were recognized and captured by the cavities on the 3D sponge, and the binding leded to changes in electrochemical signal, which was used for quantification of the target. In this study, the 3D sponge was effectively used for accurate quantification of cancer biomarkers. Due to its higher surface area, compared to conventional glassy carbon electrode or dropense electrode, a limit of detection of 1E-12M was reached with high selectivity and significantly reduced response time.

**Keywords:** Additive Manufacturing, Molecularly Imprinted Polymers, 3D Sponge, Cancer Biomarkers
Many complexes with ligand containing coumarin core are shown to have citotoxic activity and their anti-proliferative role towards different cancer cell lines is proven. Based on this, the aim was to synthesize new complexes with biologically active (E)-3-[2-(thiazol-2-yl)hydrazinylidene]chroman-2,4-dione, synthesized by coupling reaction of 4-hydroxycoumarin and diazotated 2-aminothiazole. Furthermore, the complex was prepared by adding an aqueous solution of ferrum acetate to a dioxane solution of the ligand in amounts equal to metal:ligand molar ratio 1:2. Deep green to brown precipitate was formed as a result of the reaction. The product was characterised by UV/Vis and IR spectroscopy, and also its redox behavior was investigated by cyclic voltammetry. Crystals suitable for X-Ray diffraction were obtained with recrystallization from DMF. The crystal structure of the complex revealed that the ferrum ion is coordinated in a disorted octahedral geometry with a NNO donor atom set from the ligand.

**Keywords:** Synthesis, Coumarin, Ferrum Complex, Structure, Spectra, X-Ray Diffraction
Discovery of the lysin specific demethylase enzyme, LSD1, occurred in the last quarter-century revealed that despite the common idea methylation reaction, which is responsible for epigenetic modifications, was reversible. After the discovery, it has been shown that LSD1 plays role in initiation and evolvement of cancers. Nowadays, LSD1 is seen as a key point for developing pharmacological inhibitors due to the expression in high levels in human tumours. Most of the LSD1 inhibitors are derivatives of other FAD-dependent oxidase inhibitors, therefore these inhibitors are not specific to LSD1 enzyme. For the treatment of multiple diseases such as cancer, neurodegenerative disorders and viral infections, it is crucial to find LSD1-specific inhibitors. In this research, several LSD1-specific molecules, designed by Yosuke Ota et al., optimised with Spartan14 then affinity values are obtained by Autodock program for LSD1 enzyme (PDB code: 2DW4). Different descriptors obtained from Spartan14, ALOGPS 2.1. and Preadmet programs are used for MLR analysis with SPSS program to see which descriptors are relevant for affinity value. By adding functional groups multiple molecules are derived and affinity value is increased to -12.3 kcal/mol from -11.4 kcal/mol. Additionally, based on the work of Yosuke Ota and colleagues, crystal X-ray structure of ILK enzyme (PDB code: 3REP) is also used for docking because its role in cell proliferation in A549 cell line. By docking results and viewed amino acid ligand interactions by using Discovery Studio Visualizer, some molecules are considered as potential LSD1-specific inhibitors also might be used for the treatment of small lung cancer in A549 cell line.

**Keywords:** LSD1-Specific Inhibitors, Docking, MLR Analysis, Structure-based Drug Design
Influences of Various Combinations of Flame Retardants on the Properties of Poly(vinyl chloride)

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Poly(vinyl chloride) (PVC) is a widely used polymer especially in electrical and communication cables as a covering insulation and in domestic uses such as in window frames, doors, gutters, and house sidings. It has a high level of combustion resistance on the other hand, PVC is not a safe-material because of smoke and toxic gas (chlorine compounds, benzene and other aromatics) production characteristic while burning. PVC actually retards fires both from starting and from spreading because of its flame-retardant nature however, the higher level of "processing aid" and "impact modifier" addition to PVC causes the less flame-resistancy in the formulation. The elements which are interrelated to flame-retardancy of polymers are boron, aluminium, phosphorus, antimony, chlorine and bromine. The usage of these elements in polymers may remarkably affect the thermal, mechanical and electrical properties of the mixture. In our study, various amounts of zinc borate (ZB), alumina trihydrate (ATH) and magnesium hydroxide (MH) were added as flame-retardants to PVC, the mixture was prepared using a co-rotating twin-screw extruder. Temperatures of extrusion were increased to 180-185-1900C respectively, and 50 rpm screw speed was applied. At each formulation PVC composites with a sheet thickness of 1.2±0.1mm were obtained with the mold located at the end of the extruder. Individual and synergistic effects of the flame-retardant combinations to composites were determined in terms of Limiting Oxygen Index (LOI), mechanical properties and thermal stability. According to the outcomes of the study, 5% ATH and ZB-MH combination provided better tensile strengths to PVC composites comparing to neat PVC sample. Besides, composites prepared with the individual, binary and triple combinations of flame-retardants showed higher thermal stabilities. Finally it can be concluded that, LOI values of the samples were positively affected from the presence of ZB, ATH and MH in poly(vinyl chloride).

Keywords: Poly(vinyl Chloride), Flame-retardant, Limiting Oxygen Index, Thermal Stability, Mechanical Property,
pH-Sensitive Liquid Marbles

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A liquid marble is defined when a micro/nano sized powder was coated on a liquid drop and its synthesis and industrial applications are the subject of intensive research for the last 15 years with the development of nano/micro technology. Liquid marbles do not wet the solids and also do not allow the transfer of the encapsulated liquid onto the substrates. A gas or a liquid can diffuse into a liquid marble through the coated hydrophobic micro/nano sized porous layer whereas the solution in the marble is not in direct contact with the gas/liquid. The aim of this study is the synthesis and application of new (original) liquid marbles to be used as a pH sensitive mini reactor in industry. The liquid marbles was obtained by using the hydrophobic perfluoro(met)hacrylate powder which were previously used to synthesize the liquid marbles as reported in the literature. The particle size of the copolymers will be controlled to vary between 2-10 micrometers. Several sizes of liquid marbles will be formed by using these micro powders by means of a syringe and a needle. We will also form liquid marbles by using suitable indicator solutions to test the pH sensitivity by color change. The stability and pH sensitivity of liquid marbles will be tested on solutions having different pH values where the color change occurs by liquid or gas diffusion.

Keywords: Liquid Marble, pH Sensitive, Floroacrylate Powder,

Acknowledgement: This work was supported by Canakkale Onsekiz Mart University The Scientific Research Coordination Unit, Project Number: FYL-2018-2687
1. Introduction

A "liquid marble" is defined when a micro/nano sized powder is coated on a liquid drop [1]. The synthesis and application of liquid marbles is a new research field and was developed in the last 20 years parallel to the development of nano/micro technology [1]. Liquid marbles do not wet the solids and also do not allow the transfer of the encapsulated liquid onto the substrates [1-7]. Fluorine containing polymeric hydrophobic powders was mostly used in the formation of the liquid marbles as reported in the literature [1-4]. Floating of liquid marbles on a water/air interface was reported in several works [1-5]. Generally, if a liquid marble floats on water, there are two possible outcomes: the liquid marble either bursts or shrinks after buckling [4]. The destabilization time is defined as the time required for the liquid marbles to either burst or buckle after transfer onto the water surface [3,4]. Dupin et al indicated the destabilization time of the pH sensible liquid marbles made of polyacid macromonomer stabilized polystyrene particles [3]. The life time is reported as 130 min when pH values is below 4. Increase in the pH values as 5.5 resulted in immediately bursting of liquid marbles [3]. In addition, Fujii et al also reported the long life time (over 90 min) on floating on water at pH values is 8 by using poly-[2-(diethylamino) ethyl methacrylate] - PS microbeads coated liquid marbles [8]. Liquid marbles made of 5-9 μm PTFE microparticles were found to float on water surface for several minutes [9]. In this work, the perfluoroacrylate (PFA) polymeric particles having diameters of around 8 micrometers was used as a previously synthesized by radical polymerization in a homogeneous scCO2 medium in literature [10].

2. Materials and Methods

Liquid marbles were formed by using the PFA micro-powders that was fabricated previously study by means of a syringe and a needle using 10 micro liter of water drops. These liquid marbles remained intact after transfer onto a glass slide or onto the surface of liquid water placed in a Petri dish. Partial buckling of the liquid marbles gradually occurred on time scales of several hours for water at pH 6 to 12. The effect of varying the solution pH on the stability of individual liquid marbles placed at the air water surface was examined.

3. Result and Discussion

The PFA powders was used preparing previously study [8]. In this study the PFA polymer dissolved in scCO2 at 250 bar was sprayed in 1:3 v/v methanol/water mixture. The 8 mm particle size of PFA were collected the upper part of the methanol/water mixture [8]. In this study, we used this PFA particles to obtained liquid marbles. Individual liquid marbles were prepared by rolling a 10 micro liter droplet of de-ionized water over dried the PFA powders. The PFA powders immediately coated the water droplet and rendered it both
hydrophobic and non-wetting. These liquid marbles remained intact after transfer onto a glass slide and floating on water similar to the literature [8]. The effective surface tension of PFA liquid marble is found as 71 mN/m as compared with literature values [8]. The effective surface tension was calculated by measuring the puddle height via contact angle measurements [8]. The adsorbed PFA powders at the air water surface of the liquid marbles prevents diffusion of water between the marble interior and the bulk liquid. Two different phenomena are occurred for PFA powders liquid marbles after being placed at a planar air-water interface: the liquid marbles either burst or shrink. The solution pH was underlying liquid water varied by using a series of aqueous buffers to examine its effect on the long-term stability of individual liquid marbles placed at the air/water interface (Figure 1). In this figure indicated that the enhanced stability (min several minutes) were obtained above pH 5. It was determined that liquid marbles life-times were very short and marbles disappeared only by bursting bellow pH = 5. After this pH values the liquid marble is stable and the shrink type destabilization was occurred. However, the burst type destabilization was delayed 30 min late at pH=5. At this pH values, the liquid marble life times is about lasted 30 min due to the evaporation of water in PFA encapsulated liquid marbles. After 30 min. the burst type destabilization happened. The shrink type destabilization was continued depending on the pH values due to slow evaporation of water from their interior after pH = 5. However, burst type destabilizing was occurred on the water surface when the pH values below 4 with disintegration occurring within a few second (Fig 1). The longer life time occurred above pH 8 showed the partial destabilization of the liquid marbles because of the slow water evaporation. On the other hand, burst type destabilization of liquid marble was observed at lower pH. Moreover, pH responsive behavior of liquid marble is shown the weakly basic nature: they remain stable for hours when placed on liquid water at neutral or alkaline pH but immediately disintegrate on addition of acid.

4. Conclusion

When micron-sized particles of an ultra-hydrophobic powder such as PFA is used to encapsulate a water liquid marble, the increase in the pH of the water float in a increase in the life time. In addition, liquid marbles placed on the surface of water immediately disintegrated on addition of acid, since the weakly basic nature of the PFA core confers pH-responsive behavior.

Acknowledgements: This work was supported by Canakkale Onsekiz Mart University The Scientific Research Coordination Unit, Project number: FYL-2018-2687

References

3D Molecularly Imprinted Sponge: New Generation of Transducer for Highly Sensitive Electrochemical Detection of Cancer Biomarkers

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On-chip sample concentration and detection of several cancer biomarkers in biological samples are challenging tasks for lab-on-a-chip (LOC) systems. It involves complex matrixes and normally a large amount of sample must be processed in order to detect low levels of targets of interest. Existing sample concentration and preparation technologies are either hard to realize in LOC systems, or complicated to fabricate and difficult to integrate with other microfluidic modules. Our aim is to examine the feasibility of using 3D-printed electrodes as new generation of transducers for the electrochemical detection of cancer biomarkers in biological fluids. In this work, we present a novel concept for on-chip sample concentration and detection. Three dimensional (3D) printed molecularly imprinted sponge structures, behaving as working electrode, were employed to specifically concentrate the target of interest from the raw sample, as well as to electrochemically detect it. The conductive sponge, which was similar to the scaffolds for tissue engineering, was formed by 3D printing (Additive manufacturing). Then, a layer of molecularly imprinted polymer was grafted by electropolymerization. After washing away the template, cavities complementary to the target were created on the 3D sponge surface. When the raw sample was passed through the 3D sponge, the targeted analytes were recognized and captured by the cavities on the 3D sponge, and the binding leded to changes in electrochemical signal, which was used for quantification of the target. In this study, the 3D sponge was effectively used for accurate quantification of cancer biomarkers. Due to its higher surface area, compared to conventional glassy carbon electrode or dropsense electrode, a limit of detection of 1E-12M was reached with high selectivity and significantly reduced response time.

Keywords: Additive Manufacturing, Molecularly Imprinted Polymers, 3D Sponge, Cancer Biomarkers
Surface Modification of Hydroxyapatite with Enzyme Catalyzed Reaction and Effect of Temperature on the Modification Reaction

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Hydroxyapatite (HAP) is attracted because of its chemical properties close to basic inorganic component of teeth and bone. Due to its high biocompatibility, non-toxicity and bone conductivity, it has been widely used as biomedical material. But its low toughness is one of the most serious barriers for its wider applications. Surface modification of inorganic nanoparticles is a useful method because it produces excellent integration and an improved interface between nanoparticles and polymer matrices. Enzymes have been used for many years to improve the properties of natural polymers. Enzymes accelerate reactions as potent biocatalysts, and thus allow reactions to take place in mild conditions. In addition, the amount of chemical waste in the reactions with enzymes is much less than the chemical surface modification methods. However, enzymes show optimum activity and stability at certain temperatures. Therefore, optimum conditions should be investigated to make the reactions more efficient. In this study, surface modification of HAP was performed by binding of methacrylic acid (MAA) with enzyme catalyzed reaction to HAP surface and then this reaction was carried out at different temperatures and the effect of temperature was investigated.

**Keywords:** surface modification, enzyme, hydroxyapatite,
Crystallographic Structural Determination and Electrochemical Behavior of the New Complex of Fe(II) with Hydrazinylidene-Chroman-Dione

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Many complexes with ligand containing coumarin core are shown to have citotoxic activity and their anti-proliferative role towards different cancer cell lines is proven. Based on this, the aim was to synthesize new complexes with biologically active (E)-3-[2-(thiazol-2-yl)hydrazinylidene]chroman-2,4-dione, synthesized by coupling reaction of 4-hydroxycoumarin and diazotated 2-aminothiazole. Furthermore, the complex was prepared by adding an aqueous solution of ferrum acetate to a dioxane solution of the ligand in amounts equal to metal:ligand molar ratio 1:2. Deep green to brown precipitate was formed as a result of the reaction. The product was characterised by UV/Vis and IR spectroscopy, and also its redox behavior was investigated by cyclic voltammetry. Crystals suitable for X-Ray diffractometry were obtained with recrystallization from DMF. The crystal structure of the complex revealed that the ferrum ion is coordinated in a distorted octahedral geometry with a NNO donor atom set from the ligand.

Keywords: synthesis, coumarin, ferrum complex, structure, spectra, X-ray diffractometry
Development of Potential LSD-1 Inhibitors by Structure Based Drug Design

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Discovery of the lysine specific demethylase enzyme, LSD1, occurred in the last quarter-century revealed that despite the common idea methylation reaction, which is responsible for epigenetic modifications, was reversible. After the discovery, it has been shown that LSD1 plays role in initiation and evolvement of cancers. Nowadays, LSD1 is seen as a key point for developing pharmacological inhibitors due to the expression in high levels in human tumours. Most of the LSD1 inhibitors are derivatives of other FAD-dependent oxidase inhibitors, therefore these inhibitors are not specific to LSD1 enzyme. For the treatment of multiple diseases such as cancer, neurodegenerative disorders and viral infections, it is crucial to find LSD1-specific inhibitors. In this research, several LSD1-specific molecules, designed by Yosuke Ota et al., optimised with Spartan14 then affinity values are obtained by Autodock program for LSD1 enzyme (PDB code: 2DW4). Different descriptors obtained from Spartan14, ALOGPS 2.1. and Preadmet programs are used for MLR analysis with SPSS program to see which descriptors are relevant for affinity value. By adding functional groups multiple molecules are derived and affinity value is increased to -12.3 kcal/mol from -11.4 kcal/mol. Additionally, based on the work of Yosuke Ota and colleagues, crystal X-ray structure of ILK enzyme (PDB code: 3REP) is also used for docking because its role in cell proliferation in A549 cell line. By docking results and viewed amino acid ligand interactions by using Discovery Studio Visualizer, some molecules are considered as potential LSD1-specific inhibitors also might be used for the treatment of small lung cancer in A549 cell line.

Keywords: LSD1-Specific Inhibitors, Docking, MLR Analysis, Structure-based Drug Design
Isolation and Culture of Neural Stem/Progenitor Cells from Rat Subventricular Zone for Use in Neural Tissue Engineering

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With the increase in the aging population, the diagnosis of age-related neurodegenerative diseases is assumed to enhance 12% by 2030. Therefore, there is a need to develop better and novel treatments for disorders caused by Alzheimer's, Huntington's, Parkinson's diseases and neural damage. Because these neurodegenerative diseases have traditionally led to the progressive loss of neurons, treatment strategies have generally focused on replacing neurons lost during disease progression. For this reason, neural stem/progenitor cells (NSPCs) that exist in the adult brain are thought to be contributing to the treatment of damaged and/or lost neurons due to their self-renewing and multipotent features. Initially, NSPC transplantation has been proposed as a valuable tool for the replacement of cells in central nervous system diseases that result in cell loss. However, novel researches on the beneficial effects of NSPCs used for the treatment of neurological diseases in different animal models show that these cells transplanted into patients can reduce harmful inflammation, while at the same time protecting the central nervous system from degeneration and improving endogenous healing processes. According to the results of the literature, it was noticed that the information about the isolation and culture of neural stem cells differed from each other, and these differences at the mentioned techniques have affected the quality of cells such as proliferation, growth, etc. that are crucial for cell-based therapy in neural tissue engineering. In this study, we aimed to optimize the isolation and culture of NSPCs from rat subventricular zone (SVZ).

Keywords: Neural Progenitor/Stem Cell Isolation, Neural Progenitor/Stem Cell, Neurosphere Culture, Neural Tissue Engineering, Regenerative Medicine
1. Introduction

Treatment methods developed for nerve regeneration contain the principles of tissue engineering. This situation increases the interest in neural therapy and provides a different perspective on new treatments (Subramanian, Krishnan, & Sethuraman, 2009). The limited nature of the self-renewal of neural cells has led scientists to find easy-to-use treatment methods with NSPCs with potential for self-renewal (Crosetto, Bienko, & Oudenaarden, 2012). NSPCs are immature cells, and they are located in the subventricular and hippocampal dentate gyrus zone of the central nervous system of adult mammals, where they are divided and transformed to the new neurons (Lee, Scientist, Louis, & Reynolds, 2015). The most basic properties of these cells can be listed as; the potential for self-renewal, the ability to differentiate neural tripotency (i.e., differentiation into all neural lines: neurons, astrocytes, and oligodendrocytes) and in vivo regeneration. Thanks to these properties, they provide a strong opportunity for basic research, tissue engineering and regenerative medicine studies (Blurton-Jones et al., 2009). Isolation and in vitro analysis of NSPCs have proven to be an important method for deciphering the cellular and molecular mechanisms underlying neurogenesis and for optimizing stem cell-based therapy of neurological disorders and injuries (Guo, Patzlaff, Jobe, & Zhao, 2013). Considering all of these; NSPCs are expected to play a major role in the treatment of neurodegenerative diseases. In this study, we aimed to perform the isolation and culture of NSPCs. In the next stages, it will be focused on to use these cells in nerve tissue engineering applications.

2. Materials and Methods

Wistar albino rats were provided from the Canakkale Onsekiz Mart University Experimental Research Application and Research Center, and their brains were harvested by surgical operation after obtaining ethical permission by Canakkale Onsekiz Mart University, Animal Experiments Local Ethics Committees (permission number: 2018/05-03). Briefly, they were cut at an angle of 90° from the region of the optic chiasm. Then, the thin tissue layer surrounding the lateral wall of the ventricles was cut and placed in a cold Hibernate A solution containing the high concentration of antibiotic. The cut pieces of this tissue were minced thoroughly in a petri dish with a fine tipped scalpel. In petri dish tissue fragments were taken to 15 mL centrifuge tube and digested for 7 minutes at 37°C by adding a pre-warmed 0.05% 1 mL trypsin-EDTA solution for one SVZ. To stop the enzymatic incubation, 0.125 mg/ml trypsin inhibitor containing 0.01 mg/ml DNase I, which is equal in volume with trypsin, was added to the centrifuge tube. After achieving enzymatic inhibition, centrifugation was performed several times at 300g for 5 minutes to wash the cells, and the cells are resuspended with Neural Basal media (Gibco ? Neurobasal ? Medium, USA). Cell strainer was used to separate NSPCs from undigested tissues and other undesirable cells. After this step, 2% B-27, 1% N-2, 1% (1X) GlutaMAX, 2?g/mL heparin, 1% Penicillin-Streptomycin, 20 ng/mL Epidermal Growth Factor (EGF) and 10 ng/mL Basic Fibroblast Growth Factor (bFGF) were added to the neural basal medium to support expansion and growth of cells. Cells are centrifuged at 300g for 5 minutes, and the supernatant was removed. Following this process, the cells were incubated for 7 days at 37°C, 95% humidity and 5% CO2 in an incubator (Telstar Bio II Advance, Spain) for neurosphere formation. Achieved neurospheres were transferred to growth medium without growth factors (differentiation medium) and were seeded in chamber slides previously coated with poly-D-lysine. For neural differentiation, the cells were incubated at same conditions in the incubator. Inverted phase-contrast microscopy (Zeiss, Primovert, Germany) was used to display of differentiated cells, microscopically. Finally, differentiated cells were washed several times with phosphate buffered saline (PBS, pH 7.4), fixed with 4% paraformaldehyde (PFA) and stored at 4°C.

3. Result and Discussion
Effective strategies should be developed due to the difficulties of isolation and growth of NSPCs. It should be identified the necessary molecules and mechanisms to overcome these difficulties and treat damaged nerve tissue properly. These difficulties are generally caused to the following reasons; the limited number of neural stem cells located in the SVZ, the lack of homogeneity of the cell population isolated from this region and the high number of cells lost during isolation. Also, these cells exhibit low viability and proliferation rate in the culture medium. In the literature, it is observed that both neurosphere and adherent cultures have been used for NSPCs maintenance and expansion. These two methods have pros and cons compared to each other. However, neurosphere culture has been more extensively used as they can mimic the three-dimensional natural niche of stem cells. There are different methods to dissociate neurospheres into single cell suspension including mechanical and enzymatic methods. Though the mechanical technique is the actual neurosphere dissociation method, it needs a lot of experience and its efficiency changes depending on the operator. This method can also lead to significant cell death and damage when administered by an inexperienced individual, also may reduce the truth of analyzes based on neurosphere dissociation. On the other hand, enzymatic dissociation with trypsin-EDTA has some advantages and also disadvantages. The enzymatic dissociation of the neurospheres is simple, efficient and reproducible if realized for the proper time period and on the right sized neurospheres. Moreover, long exposure of neurospheres (particularly for the large overgrown neurospheres) with trypsin-EDTA may lead to critical damage to cell surface receptors, cell digestion and possibly cell death. Overexposure with trypsin-EDTA may also prevent sphere formation and cause cells to adhere to the substrate and differentiate. We should also note that in vitro culture will alter the properties of isolated cells. When both EGF and bFGF are used at the same time, they enable the growth of neurospheres in the culture. They also do not alter the self-regeneration and multipotent properties of NSPCs in the long-term culture of neurospheres. Nevertheless, Vukicevic et al. have shown that the treatment of NSPCs with EGF and bFGF changes the cell cycle length and cell division behavior (Vukicevic et al., 2010). So, the long-term cultures of NSPCs still need to future studies for understanding the cellular mechanisms.

Acknowledgements
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References
Microhardness of Al-Mg-Si Aluminium Alloys for Different Temperatures and Aging Times

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Aluminium is a widely used material in different technological applications, especially its alloys. This research work presents the effect of heat treatment on microhardness of the aluminum alloys 6063 and 6060. The thermal treatment given to aluminum alloys is called age-hardening or precipitation hardening. The experimental study includes artificial ageing of the alloys upon which the temperature is varying between 100 °C to 260°C. Another parameter observed is the variation of the ageing time between 1h to 8h for the value of T=180°C. The Vickers hardness test is used to evaluate the microhardness of the aluminum sheet samples before and after aging process. The results of the hardness test measurements are presented graphically. The study leads to conclusion that the variation in time and temperature has improved the microhardness of the alloys. The optimum aging temperature is 180°C for about 6h. This is due to a large amount of small and uniformly distributed precipitants that appear. After overcoming this value of temperature the alloys are considered over-aged and this causes decreasing of the microhardness. In over-aging of the alloy the size of the individual particle increases, but the number of particle decreases. This causes barriers to the movement of dislocations, therefore the microhardness decreases.

Keywords: Aluminum Alloy, Age-Hardening, Precipitation Hardening, Hardness Test, Microhardness
Investigation the Effect of Apricot Kernel Oil on Adipocytes Differentiated from Human Adipose-Derived Mesenchymal Stem Cells

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Plants have been used for therapeutic purposes since ancient times. Nowadays, because of the side effects caused by synthetic drugs, medicinal and aromatic plants have gained importance pharmacologically. The fact that apricot is rich in nutrient elements and provides many positive benefits to human health, the interest in these plant species increases. The aim of this study is to investigate the effect of apricot kernel oil on differentiated adipocytes from human adipose-derived mesenchymal stem cells (hAMSCs). In the scope of the research, cell culture studies were carried out to investigate the effect of apricot kernel oil extracted from the kernels of the apricot beans collected from the region of Çanakkale (Kepez) on the adipocytes differentiated from hAMSCs. The extraction of apricot kernel oil was fulfilled using Rotary-evaporator, and hexane was used as solvent. The yield of the extracted oil, acidity and GC-FID analysis were performed. Then, the hAMSCs were examined by following appropriate procedures, and the effect of apricot kernel oil on mature adipocyte cells was investigated by differentiating hAMSCs into adipocytes. At the end of the experiment, the inverted phase contrast microscope images of the cells were taken. In order to investigate cell viability and cytotoxic effect of the apricot kernel oil, XTT analysis which is one of the tetrazolium tests was performed. Hematoxylin and Eosin (H&E) and Oil red O were used for histological analysis. In addition, Oil red O results were confirmed by colorimetric measurements. The data were evaluated with statistical analysis. As a result, apricot kernel oil has shown no cytotoxic effect on mature adipocyte cells differentiated from hAMSCs and increased cellular growth.

Keywords: Apricot Kernel Oil, Histology, Medicinal Plants, Mesenchymal Stem Cells, XTT,

Acknowledgement: This study was supported by Canakkale Onsekiz Mart University Scientific Research Projects Coordination Unit (project no: FYL-2018-2518). We would also like to thank the Canakkale Onsekiz Mart University, Science and Technology Application & Research Center for their support regarding the GC-FID and fatty acid determination analysis.
1. Introduction

The use of medicinal and aromatic plants started with the Sumerians and Assyrians (5000-3000 BC) and perhaps with the history of humanity. The benefit in the use of these plants is chemical substances synthesized by plants. After these chemicals are metabolized, they result in various positive effects. Today, with the increase of studies in the field of biotechnology, synthetic and chemical drugs are replaced with medicinal plants. Turkey, thanks to its geographical structure, climatic conditions and endemic plant richness, it is the gene center of many plants, and it has a very important place in the world especially for the medicinal and aromatic plants. In addition, Turkey is one of the most important countries in the world for medicinal plants trade [1]. A total of 3.7 million tons of fresh apricots are produced yearly, around the world. Turkey takes the lead of production with about 750 thousand tons of apricots which is 20% of the world’s production. Because apricot (Prunus armeniaca L.) contains biologically active compounds and every part of its fruit can be used for various purposes, it is a very important plant in terms of food value. Apricot kernel contains vitamins A, B, C and E, potassium, iron, protein, pectin, ?-carotene and unsaturated fatty acids (linoleic and oleic acid) [2]. In addition, it has an anti-tumor characteristic because of the amygdalin substance which is still used for active pharmaceutical ingredient at the present time [3]. The discovered properties of the active ingredients of medicinal and aromatic plants also accelerate the in vitro cell culture studies based on these plants. Although various cell lines are used in cell culture studies, mouse-derived 3T3-L1 pre-adipocyte cells are frequently used for investigating the effect of kernel oil on adipocytes. However, it is believed that the use of human cell lines can give the better results instead of animal-origin when investigating the effect of kernel oil on the studies related to obesity. On the other hand, mesenchymal stem cells have the ability to differentiate into adipogenic, chondrogenic and osteogenic lineages, which are also proven by many successful experiments [4,5]. And also, differentiated cells can easily be characterized by histological staining [5]. Although there are many sources to isolate MSCs such as bone marrow, cord blood, etc., the most preferred one is adipose tissue in vitro and clinical studies because of easy isolation, cell abundance, etc. The main goal of this study was to investigate the effects of apricot kernel oil on mature adipocytes differentiated from hAMSCs, which is important to understand the potential mechanisms underlying the obesity.

2. Materials and Methods

The apricots (Prunus armeniaca L.) were collected from Canakkale in seasonably, and kernels were removed from fruit and shell by hand. Then, they were ground, evenly spread and dried in an incubator (Memmert, UN55, Germany) for 3 days at 55 °C. Kernels were kept in + 4 °C until analyses at refrigerator. Apricot kernel oil was extracted in hexane using Rotary evaporator (Buchi-Rotavapor-R-210). In order to characterize
extracted apricot kernel oil, % yield, acidity and GC-FID (Thermo Finnigan trace GC Ultra) analyses were performed. Dimethyl sulfoxide (DMSO) was selected as the solvent for preparing homogeneous mixing of the medium used in cell culture studies and apricot seed oil. The cytotoxic effect of DMSO on mouse-derived 3T3-L1 pre-adipocyte cell line was evaluated using XTT assay, and IC50 value was determined. Then, the hAMSCs were cultured in a commercially available adipocytes differentiation medium (Gibco, StemPro® Adipocyte Differentiation Kit, USA). After differentiation, apricot kernel oil was mixed with adipocyte nutrition medium at ratios of 0-20-60-100 µg of apricot kernel oil/well. At the end of the experiment, the inverted-phase contrast microscope (Zeiss, PrimoVert, Germany) images of the cells were taken. Hematoxylin and Eosin (H&E) and Oil red O were used for histological analysis by following routine procedures. In addition, Oil red O was re-extracted with isopropanol from the cell culture plate, and Oil red O in isopropanol was measured @ 492 nm by semi-quantitatively.

3. Result and Discussion

GC-FID, a very widespread analytical technique to identify the chemical composition of kernel oil, was conducted. When investigating the GC-FID results, it has been seen that apricot kernel oil contains 45.9% oleic acid and 19.8% linoleic acid. On the other hand, the acidity of the apricot kernel oil was found to be 1.041 in terms of KOH/g and 0.524 in terms of oleic acid. In the literature, the density of apricot kernel oil was given to be 0.92 g/cm³. When using this value to determine the % yield of the extraction process (w/w), % yield of apricot kernel oil was calculated as 31.09 ± 0.94% (n = 6). Following these characterizations, the effect of apricot kernel oil on mature adipocyte cells differentiated from hAMSCs was evaluated by microscopely and histological analyses. When figure 1 is investigated, it was seen that apricot kernel oil has no cytotoxic effect on the mature adipocyte, contrary to this, increase in the cell viability was observed, which was also proven by spectrophotometric measurement (Fig. 2). But, there are still experiments that need to be performed such as immunohistochemistry, Western Blot and Real-Time PCR analysis.

References

Static Analysis and Fabrication of 3D Printed Carbon Fiber Reinforced ABS Composites

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Last decade, additive manufacturing methods of fiber-reinforced thermoplastics have gained importance. The most commonly utilized printing technology is Fused Deposition Modeling (FDM) technology based on the principle of melting the polymer-based filament that passes through a nozzle by heating above the glass transition temperature. In addition to this, different types of fiber reinforcements with various concentrations are introduced into the polymer filaments to enhance their mechanical performance. However, in the case of carbon fiber, glass fiber, and Kevlar reinforced ABS or PLA thermoplastics are utilized to produce composite structures, they can still exhibit lower mechanical performance than the reinforced polymer composites produced by conventional methods. This indicates that the fabrication process of the additive manufactured polymer composites governs the mechanical properties of the whole product. Based on this motivation, the aim of this study is to model the mechanical behavior of composite samples produced using carbon fiber reinforced ABS filament by using FDM technology in ANSYS Workbench design/analysis program and to compare the analytic approach with the experimental results. The mechanical properties of composite structures were calculated using appropriate damage criteria and the composite structures were compared with the mechanical test results in accordance with the standards. In order to minimize the deviations between the calculated and measured values, the appropriate process parameters were selected for design and modeling. In this study, the sample parts are produced with 0.2 mm steel nozzle with 200 µm surface roughness. The tensile, bending and compression test results of the produced samples were with ANSYS Workbench program and mechanical analyzes were performed under different loading conditions. Studies have shown that the production stability of the FDM method significantly affects the mechanical performance of the sample, and the actual test results obtained with the theoretical model contain significant deviations.

**Keywords:** Additive Manufacturing, Composite, Thermoplastic, Modelling, Analysis, Process Optimization
Surface Covalently Grafted Pyridine Layers as a Complexing Interface for Heavy Metal Ions

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The evaluation of the complexation possibility toward the heavy metal ions onto the grafted heterocyclic moieties onto the surface of glassy carbon (GC) and platinum (Pt) was performed through the use of square wave voltammetry. In the first step, the "in situ" formation of the pyridine derivatives of diazonium salts (monitored by using UV-VIS and ATR spectroscopy) is accomplished from the reaction of the equimolar amounts of the aminopyridine derivative and sodium nitrite in acidic solution. Cyclic voltammetry was used to evaluate the grafting performance. This was mainly done by a) detecting the decrease of the signal (current) by each electrode cycle and b) through the use of the hexacyanoferrate (0.1 M KCl) as a redox probe. After accumulating the metal ions onto the grafted electrode surfaces, the electrodes signal through in the square wave voltammetry measurement served to discriminate the adsorbed heavy metal ions. Such measurements permitted as to show that the grafted pyridinic he ability to display complexing behavior toward some heavy metal ions. This strategy is important and can be applied to the construction of a wide number of different electrochemical sensors.

Keywords: Complexation, Heavy Metal Ions, Platinum, Diazonium Salts, Grafting
A Combined Monte Carlo/Molecular Dynamics and EIS Study of the Oxygen Formation and Its Adsorptive Comportment onto the Au (111)

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The Au(111)/O₂(molecules)/solvent/solute exemplifies an interesting interface that can provide fundamental insights toward the understanding of many essential surface phenomena. Apart the use of experimental studies on such interfaces, a crucial understanding how the formed oxygen molecules interact with the solvent or other ions at the surface vicinity of Au(111) can be deduced from the use Monte Carlo calculations and Molecular Dynamics simulations. Monte Carlo (MC) simulation (COMPASS II force field) were performed onto Au(111) slab model with a 40 Å space along C axis occupied by 10 to 40 water molecules and 10 to 40 oxygen molecules. The aim was to find the lowest energy configurational space for the Au(111) / solute/solvent interface. The most stable pose from MC calculations, are used further in Molecular Dynamics (MD) simulations (NVT ensemble coupled with NHL thermostat), run at a total simulation time of 300 ps (1fs time step) at T=298 K. The analysis of the frames from MD gave important details vis-à-vis the organization of O₂ molecules at the interface and the effect of the analyzed ions and water molecules on this arranging.

Keywords: Au(111) Surface, Molecular Dynamics, EIS, Monte Carlo, Oxygen, NVT Ensamble
Determination of AST, ALT, Total Bilirubin, Direct Bilirubin and Some Heavy Metals (Fe, Mg, Ca, Ca-ionizing, and P) among Patients which Lives in Industrial Area and in the Clear Area

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Blood is the only liquid body tissue. Although it appears like a thick and homogeneous fluid, except the water, blood contains cellular elements. Blood can be examined much better than the other tissues, because the results that come from its analysis, provide a lot of information about the present health state of a person. Blood components are: plasma and cells. Blood plasma is a viscous liquid. 90% of plasma is water, while 10% are dissolved particles as nutrients, respiratory gases, salts, hormones and proteins. Different electrolytes help keeping osmotic pressure of plasma and also normal pH of blood. For the right function of the body it is important to know the values of enzymes ALT and AST. Bilirubin total and direct are also very important. Our body needs seven macrominerale (calcium, phosphorus, potassium, sulfur, sodium, chlorine and magnesium) as well as a few micro minerals. In this work these macro minerals and micro minerals are examined blood samples of some patients from two areas. Patients aged 60-70 of two sexes. With these blood analysis we concude allocations: ALT, AST, total and direct bilirubin, calcium, magnesium, phosphorus, iron and ionised calcium

Keywords: Blod, Bilirubin, Alt, Ast, Electrolytes
Oxido-Reductive Reactions on Some Substituted Derivates of 4-Hydroxycoumarin

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4-hydroxycoumarin is a compound that has shown different physiological activities like anti-cancer, anti-HIV, anti-inflammatory etc. Hence, scientists were motivated to further study this molecule, and concluded that electrophilic attacks can be performed on the position C3, and the nucleophilic attacks can be performed on the position C4. Consequently new derivates were synthesized, with high physiological activities as well, and new paths for construction of several synthesis were found. While using Vilsmeier-Haack reactions, both attacks, nucleophilic and electrophilic attacks, can be performed at the same time, so than in position C4 chlorine or OH group can stand, and in C3 position carbonyl functional group can be incorporated. In this case, compounds 4-chloro-3-coumarincarbaldehyde and 4-hydroxy-3-coumarincarbaldehyde were synthesized. The compounds that were prepared under Vilsmeier conditions can be oxidized using different oxidizing reagent, like PCC, PCC/H$_2$IO$_6$, Jones reagent, and Jones reagent supported on silica gel. Oxido-reductive reactions with different oxidizing agents were undertaken in order to understand which of them will give best results in obtaining the corresponding carboxylic acids.

**Keywords:** Vilsmeier-Haack Reactions, PCC, PCC/H$_2$IO$_6$, Jones Reagent, Jones/SiO$_2$
Effects of Different Irrigation Water Salinity Levels on Germination of Cluster Bean (Cyamopsis tetragonoloba)

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The Guar or cluster bean (Cyamopsis tetragonoloba) is an annual legume and the source of guar gum. It is also known as Gavar, Guwar or Guvar bean. Guar can be eaten as a green bean, but is more important as the source of guar gum. Young, fresh cluster beans have a narrow and long body with tiny pods. The mature pods - the seeds are harvested to be dried and powdered to flour known as guar gum. Guar gum is used as thickening agent in commercial food preparations like ice creams etc. The cluster beans are not only low in calories but are also very effective in lowering the blood sugar and cholesterol levels. It is also beneficial in the control of many, health problems like diabetes, bowel movements, heart disease and colon cancer. This study was aimed to determine the resistance limits of guar against irrigation water salinity which is an important stress factor for plants. Sodium Adsorption Ratio (SAR) of Irrigation water was less than 3 and different irrigation water salinity (ECi = 0, 6, 8, 10, 12, 15 dS / m) were prepared. Adaptation studies conducted in Turkey has been chosen as plant material which is the guar genotypes. Under the laboratory conduction, selected plant genotypes were planted in petri dishes. Then, saline irrigation water was added in petri dishes. After the 7 days, all parameter measurement. The data obtained from the study, Biplot analysis was performed to 90% of the data. At the end of the Biplot analysis, some of the genotypes were affected from 6 dS/m to 15 dS/m for ECi and the other genotypes were resistant to 15 dS/m for ECi. In all irrigation water salinity levels, genotypes 84, 91, 99 and 100 were determined as the best genotype.

**Keywords:** Irrigation Water Salinity, Cluster Bean (Guar), Germination,

**Acknowledgement:** This work was supported by Çanakkale Onsekiz Mart University Scientific Research Coordination Unit. Project Number: FBA-2018-2477.
Using SRIM to Calculate Concentration Profiles of Carbon and Nitrogen Ions on Amorphous TiO$_2$ Thin Films

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The physical phenomena associated with the penetration of energetic ions into matter is primarily concerned with the quantitative evaluation of how ions lose energy into matter and the final distribution of these ions after they stop within the target. Also considered are the first order effects of the atoms on solids, particularly the electronic excitations of the atoms, the displacement of the lattice atoms by energetic collisions and the production of plasmons and phonons within the solid by the passing ions. In this work we will focus on TRIM TRANSPORT OF IONS IN MATTER which is an Monte Carlo computer program that calculates the interactions of energetic ions with amorphous targets. The specific science and mathematics behind the program are summarized. Furthermore we will present the use of TRIM to evaluate many different kinds of calculations. TRIM is contained in the programs called SRIM (The Stopping and Range of Ions in Matter). The concentration profiles of carbon and nitrogen on amorphous TiO$_2$ thin films, as calculated by SRIM, are used for optimising the implantation parameters of TiO$_2$ with carbon and nitrogen.

Keywords: Trim, SRIM, Concentration Profiles, TiO$_2$, Nitrogen
Antibacterial Ibuprofen-Loaded Nanofibers

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Ibuprofen is a hydrophobic and one of the most used non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs are effective for postoperative analgesia, antipyretic, and anti-inflammatory drug. In this work, electrospun membranes composed of polylactic acid/gelatin and ibuprofen were fabricated. And the efficacy of ibuprofen-loaded nanofibers for *Listeria monocytogenes*, *Staphylococcus aureus*, *Bacillus cereus*, and *Escherichia coli* was investigated. The ibuprofen loaded nanofibers showed significant antibacterial effects against Gram-positive strains. This study indicated the potential of the ibuprofen loaded nanofibers for use post-operative analgesia.

Keywords: Ibuprofen, Nanofiber, Antibacterial

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The Gas Sensing Properties of Poly (Sodium 4-Styrenesulfonate)-Decorated SnO$_2$ Nanoparticles

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In this study, the gas sensing properties of Poly (sodium 4-styrenesulfonate)-Tin Oxide (PSS-SnO$_2$) nanocomposite prepared by encapsulating SnO$_2$ nanoparticles with PSS were tested using volatile organic component (VOC) as target gases. The gas sensitivities of these samples against various VOC vapors (ammonia, ethanol, acetone, formaldehyde and chloroform) were examined by two probe techniques using electrometer at room temperature. It has been found that while SnO$_2$ nanoparticles exhibit high detection performance for ethanol gas with 75% sensitivity, PSS shows the detection performance for ammonia, ethanol, acetone, formaldehyde and chloroform gases with 94, 94, 89, 94 and 95% sensitivities, respectively. On the other hand, SnO$_2$ nanocomposites that were prepared by encapsulation with PSS detected ammonia, ethanol, acetone, formaldehyde and chloroform gases with 88, 92, 83, 88 and 90% sensitivities, respectively. As a result, it can be stated that the sensing properties of PSS-SnO$_2$ nanocomposite are significantly higher than that SnO$_2$ nanoparticles alone.

Keywords: Volatile Organic Component, Gas Sensing, Tin Oxide, PSS, Nanocomposite,

Acknowledgement: This work was supported by Cumhuriyet University Scientific Research Project (CUBAP), Project Numbered as M616.
Synthesize of a Novel Polycarbocxylate Superplasticizer by Copolymerization Method for Contaminated Concrete

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With the development of construction sector, concrete additives with better properties are needed. High-performance concrete (HPC) that includes high-fluidity and strength concrete only can be produced with advanced concrete admixtures. As a new generation of superplasticizer, polycarboxylate superplasticizer (PCE) possessing advantages of high water reduction, high slump retention and low dosage can be used for preparing high-performance concrete. In this study, a novel PCE was synthesized by copolymerization method for improving resistance in contaminated concrete. The effects of experimental temperatures and times on preparation of PCE were examined and PCE was prepared under the determined conditions for the best slump and compression strength. The effects of prepared PCE on the concrete such as slump, compressive strength and fluidity were investigated. Characterization of the PCE was carried out by NMR, FTIR and XRD techniques.

Keywords: Polycarbocxylate Superplasticizer, Concrete, Structural Characterization, Slump Retention

Acknowledgement: This work was supported by Cumhuriyet University Scientific Research Project (CUBAP), Project Number as M715
Polymeric gels are useful materials for drug delivery systems, artificial organs, actuators, on-off switches, separation operations in biotechnology, and processing of agricultural products. Despite this fact and considerable researches in this field, the design and control of the gel based devices still present some problems. For instance, the response rate of some conventional gels is not as fast as required. In order to increase the response rate of these gels, several approaches were reported, and preparation of macroporous gels is one of them [1]. There are mainly two techniques to obtain macroporous gels; phase separation technique and cryogelation method [2]. In this study macroporous gels were prepared by cross-linking of butyl rubber (PIB) in cyclohexane solutions, using cryogelation polymerization method. As a cross linker, we used sulfur monocroride, which is known as cold cross linking agent. Gels were prepared by using different cross-linker and monomer concentrations, their properties were examined and compared with each other. Swelling capacities of gels, pore volumes, and compressed gel resorption capacities were measured. Furthermore, DSC and SEM analyzes were performed. It was seen that these gels prepared at subzero temperatures are macroporous, have high toughness and were reusable. The gels also exhibit completely reversible swelling-deswelling cycles in toluene and methanol, respectively; they regain their original shape and mass after a short reswelling period.


Keywords: Polymer, Porosity, Cryogel, Swelling
Chemical and Spectra-Structural Study of Dolomite from Allchar - Republic of Macedonia

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Dolomite is a sedimentary mineral with chemical formula CaMg(CO₃)₂. It is an important material due to its use in various industries, as refractory, ramming and fettling material in steel melting, in the glass industry especially in sheet-glass manufacture. Dolomite subject in this research has been collected from the Allchar location and has been characterized by ICP-MS, FTIR and XRPD analysis. From a physico-mechanical point of view, represents a white colored and soft rock, whereas the specific density was 2.71 g/cm³. The ICP-MS analysis of dolomite shows the following chemical composition: Al₂O₃ 0.37%, Fe₂O₃ 0.198%, MnO 0.00075%, TiO₂ 0.22%, CaO 30.653%, MgO 20.84%, K₂O 0.09%, Na₂O 0.24%, P₂O₅ 0.032% and LOI 47.2%. From the infrared analysis of dolomite characteristic signals were obtained at these maximums: 727.95 cm⁻¹, 877.88 cm⁻¹, 1429 cm⁻¹, as a result of the carbonate group stretching and bending vibrations. The results from the XRPD shows the following dolomite peaks (2θ): 24.07 (d 3.69), 29.35 (d 3.03), 30.92 (d 2.88), 33.51 (d 2.67), 35.18 (d 2.54), 37.40 (d 2.40), 41.20 (d 2.18), 44.90 (d 2.01), 50.74 (d 1.79), 51.29 (d 1.78).

Keywords: Dolomite, ICP-MS, XRPD, FTIR
Synthesis and Characterization of Poly (1-vinylimidazole) for Environmental Applications

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Poly(1-vinylimidazole) (PVI) has a unique ability to bind heavy metal ions such as Pb(II), Cd(II), Zn(II) because of the nitrogen atoms existed in its chemical structure. Nanofiber membranes have a high specific surface area, so that feature provides to them absorb metals very efficiently. In the literature, polymerization of 1-vinylimidazole by type I photopolymerization and the issue, PVI nanofibers for the absorption of heavy metals has not been reported. Therefore, in this study, the PVI was synthesized by using type I photo-initiator benzoin and optimum condition was determined. PVI nanofibers were prepared via electrospinning technique, the effect some parameters on nanofiber morphology were evaluated. Chemical structure was characterized by Fourier-transform Infrared Spectroscopy and PVI nanofibers were characterized via optical microscopy and Scanning Electron Microscopy analysis.

Keywords: Vinylimidazole, Photopolymerization, Nanofiber, Heavy Metal Absorption, Nanofiber Membrane
Gamaspectroscopic, XRPD and FTIR Analysis of Coal and Slag from "Osllomej" Power Plant

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Under normal conditions, most of the natural resources contain traces of natural radionuclides. Exploitation, technological processes and usage of various raw minerals leads to a spatial redistribution and concentration of radioactive elements that can change the radioecological balance in the environment. Coal is the main energy source in many countries. One of the problems associated with the production of energy from coal is the so-called "energy waste", such as fly-ash and slag, which are incombustible and unburnt residue from combustion of coal. Fly-ash and slag if they are released into the environment an increase and/or redistribution of natural radionuclide content can occur. To determine the potential impact of "energy waste" on the environment, samples of coal and slag from thermal power plant "Osllomej" near Kicevo, Macedonia, were analyzed. The measured concentrations of natural radionuclides, uranium and thorium series and 40K, in samples of coal as well as in slag produced by combustion of coal are presented in this paper. Sealed samples were treated with IAEA TRS 295 standard method and measured with two semiconductor HPGe detectors from ORTEC. Results of FTIR shows that coal contain amounts of water giving broad band at 3500-2800 cm⁻¹ showing strong hydrogen bonds. Besides this it can be noticed that the coal possess amount of organic compound, aliphatic and aromatic as

Keywords: Coal, Slag, Natural Radionuclides, Energy-waste, Gamaspectrometry, FTIR
Removal of Remazol Black Dye from Aqueous Solution by Poly(ethylene)imine Modified Clay

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In recent years, pollution of dye has been mainly one of crucial problems all over the world. Textile dyes such as Remazol Black (RB) commonly pollutes water sources and this contamination harms living organisms in these ecosystems. Among various methods, adsorption is one of the simplest and efficient technique to remove dyes from wastewaters. Nowadays, polymers have been used for adsorption of dyes from wastewaters. In this study, poly(ethylene)imine (PEI) polymer was chosen as a modifier for bentonite clay. The adsorbent was prepared by modification of bentonite clay with PEI. The effects of pH, adsorbent amount, initial dye concentration, contact time, and amount of PEI were investigated. The optimized conditions for adsorption of RB were determined. The batch adsorption experiments were carried out at optimized conditions and experimental data was then modeled by several kinetic and isothermal models to investigate adsorption capacity of PEI-clay adsorbent. The modelling results indicated that PEI modification to bentonite clay effected the adsorption properties of clay and increased removal ability of RB. In conclusion, PEI modified clay as adsorbent is proposed as novel material to remove dyes such as RB from aqueous solution.

Keywords: Remazol Black, Poly(ethylene)imine, Bentonite, Adsorption, Removal
The Synthesis of Quinone Compounds and Investigation of Their Antimicrobial Effects

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Quinonic compounds are of great importance to understand different processes that are related to biology. Quinone-containing thio-crown ethers represent a coupled system in which two mechanisms mutually influence each other, and which might add to our understanding of the analogous biologically active compounds. Naphthoquinones have been used to treat burns, cuts, and a variety of skin diseases worldwide. Sulfur-containing naphthoquinones have been the subject of much interest for a number of years due to anti-inflammatory, antibacterial, antifungal, and antiviral biological activities. It is also well known that quinone-bearing macrocycles have great potential as antibiotics and antitumor agents. Using techniques in this study: Column chromatography and crystallization for purification, Micro analysis, 1H-NMR, 13C-NMR, FT-IR, UV-vis, Fluorescence Spectroscopy, MS, X-Ray Single Crystal Diffraction techniques. The synthesized compounds were screened for their antioxidant capacity and free radical scavenging activity using the cupric reducing antioxidant capacity method and DPPH method, respectively.

Keywords: Quinones, Antifungal Activity, Antibacterial Activity, Spectroscopy, Biological Activity
The Effect of Different Commercial Crosslinkers on Adhesion Performance of Polyurethane Adhesive

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Adhesives have largely replaced mechanical fastening procedures in the shoe industry such as sewing, nailing and riveting. Adhesives are used for bonding all parts of the shoes including the outsoles insoles and uppers. Many kinds of materials can be used in footwear manufacturing, including leather, fabrics, rubber, polyurethane (PU), PU coated fabrics, PVC coated fabrics, PVC, EVA rubber, PU and many other synthetic materials. DENLAKS TP 3100, is a solvent based, high strength, polyurethane resin adhesive for bonding PVC, polyurethane, thermo, synthetic or natural rubber shoe soles to very kind of uppers. It is used in the production of footwear for bonding leather, artificial leather and textured fabrics of PVC, PU, TR, natural rubber, synthetic rubber, thermo rubber, leather, neolite, EVA, microlight rubber and TPU sole. We used DENLAKS TP-3100 which is a solvent based polyurethane adhesive. Three different commercial crosslinkers were used to investigate and improve the effect of TP-3100 on different interfaces. Desmodur® RE is a highly effective crosslinker for adhesives, natural or synthetic rubber with special adhesion on rubber materials. Desmodur® RFE is a crosslinker with very universal suitability for adhesives, natural or synthetic rubber with special adhesion on rubber materials. Desmodur® RN is suitable for crosslinking adhesives, natural or synthetic rubber, especially pale-colored adhesives used to bond rubber materials. The use of suitable adhesives yields bonds which undergo minimal discoloration on exposure to light. After these applications, the peel strengths of interfaces were measured and results were compared with each other.

Keywords: Adhesive, Polyurethane, Crosslinker, Shoe Industry, Footwear Industry
Method Development for thorough Characterization of Surface Modified Polymeric Particles Used in Anion Exchange Chromatography

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Ion chromatography (IC) is widely used for determination of organic and inorganic anions. An important key to a successful IC is the control of selectivity, which is determined by both the mobile and stationary phase chemistry. In recent years, core shell particles have been increasingly used as stationary phase for highly efficient separation with fast flow rate and relatively low back pressure. The aim of this project was to develop, evaluate and verify quality control methods for prototype ion chromatography materials and columns developed by Diduco AB. Polymeric core-shell material with epoxy functionality and the same material functionalized with two different quaternary amines for strong anion exchange properties was characterized by these methods. As the surface of the prototype material contains epoxy groups, a backtitration method was developed for epoxy determination. In this work, a mechanical stability test of the prototype material was developed by measuring the back pressure vs. flow rate of different batches of core-shell particles. Method for determine capacity with high sensitivity and signal to noise was also developed by the saturation and elution of nitrate ion on anion chromatographic column. For pH stability testing, basic mobile phase was used to expose the core-shell particles to drastic conditions of pH (10-12). Four columns, two packed with prototype A material (A1 and A2) and two others packed with prototype B material (B1 and B2) were used to develop characterization methods for retention, selectivity and efficiency. For IC evaluation, 7 inorganic anionic species and 8 organic anionic species were used. To compare retention and selectivity of the two prototype columns, the retention properties had to be matched by the columns capacity.

**Keywords:** Anion Exchanger, Ion Chromatography, Inorganic/organic Anions, Epoxy Titration, Ion-Exchange Capacity, Column Characterization
Physical Properties and Infrared Characterisation of Honeys from Western Macedonia

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The principal physical characteristics and behavior of honey are due to its sugars, but the minor constituents such as flavoring materials, pigments, acids, and minerals are largely responsible for the differences among individual honey types. Some physics properties (surface tension, density, water content, refractive index, color, dielectric parameters, viscosity, pH and conductivity) were determined and analyzed for a number of honey samples from North-Western part of Macedonia to evaluate their global behavior and comparison with other honey samples. The water content and brix degree varied within the range of (12.75-18.59%) respectively (80.52-85.33). The pH increased with increase in water content and the conductivities of the samples had correlation with proportion of mineral constituents in the honey samples. Water content in the honey samples was also determined by FT-IR analysis using the thin film technique between two KBr pallet mirrors at 3490-2750 cm⁻¹. Also, the deformation band of the water molecule is clearly assigned at 1638 cm⁻¹ and the very weak but characteristic combination band at 2111 cm⁻¹. Because honey is mostly consisted from saccharides the stretching vibrational mode of the OH groups are very broad and shifted towards lower frequencies as a consequence of many hydrogen bonds. Also, stretching vibrations (both, antisymmetric and symmetric) of the backbone of the saccharides (consisted from CH and CH₂ groups) can be noticed at 2936 and 2850 cm⁻¹. Furthermore, very characteristic fingerprint of honeys is registered in the region from 1417 cm⁻¹ till 900 cm⁻¹ with a high intensive maximum at 1057 cm⁻¹.

Keywords: Honey, Viscosity, Surface Tension, Water Content, pH, FTIR
Immunostimulatory and Immunomodulatory Activities of Subphthalocyanine Derivatives on the Mammalian Macrophages

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Our group has been creating and characterizing new generation subphthalocyanines and their derivatives. Our previous studies suggest that these new derivatives have great potential in solar cells as photosensitizers [1]. Their ability to generate and transfer electrons upon delivery of photons at different wavelengths with substantially high efficiencies, makes them great candidates in energy systems. But in this study, we focused on their biological activities. Due to their electron transfer capacities we hypothesized that they could also interfere electron transfer processes within the cells and therefore alter cellular activities. We examined three SubPc derivatives in the current study. These derivatives have differences at axial positions and they were Cl substituted SubPcs. Their stimulatory and regulatory effects on the activity of the macrophages were delineated based on the changes in the inflammatory cytokine production levels. Macrophages are the main cell type of the immune system that can regulate the inflammatory processes as well as the systemic immune response by their unique abilities both in terms of a vast plethora of cytokine production and regulation of other immune system cells as well as in antigen presentation after phagocytosis and further activation of the immune cells against certain danger associated antigens [2]. Overall, SubPc derivatives that we used exerted activity changes in the function of the in vitro stimulated mammalian macrophages and they are promising immunostimulatory and immunomodulatory drug candidates for medicinal applications. Our findings support that these unique molecules are not only effective in solar cells but also in the biological cells and open a new venue of application for these materials. References: [1] M. Urbani, F. A. Sari, M. Grätzel, M. K. Nazeeruddin, T. Torres, M. Ince," Effect of Peripheral Substitution on the Performance of Subphthalocyanines in DSSCs" Chem. Asian J. 11,1223 ?1231, 2016, [2] F. Ayaz, A. Yuzer, M.

Keywords: Macrophages, Inflammation, Immunotoxicology, Subphthalocyanine, Adjuvants, Anti-inflammatory Agents
Synthesis of Non-Aggregated Novel Phthalocyanine Derivatives for Dye Sensitized Solar Cells

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Undoubtedly, dye sensitized solar cells (DSSCs) is the most extensively studied organic solar cells. Ideal organic dyes as a sensitizer for DSSCs should efficiently absorb light throughout a large portion of the solar emission spectrum, especially in the red and the near-infrared regions. Nearly 50% of the solar energy lies in the near-IR, indicating that the development of photovoltaic devices capable of absorbing in this region could lead to great advances in the solar energy technology [1]. Phthalocyanines (Pcs) are planar 18 π-electron aromatic compounds constituted by four isoindole units linked by nitrogen atoms at the meso position. A considerable large π-delocalized surface gives rise to the strong light absorption capacity. Due to the outstanding properties of phthalocyanines (Pcs) including a high molar extinction coefficient in the red/near infrared region and high thermal/chemical stabilities, these compounds have been widely used as a light harvester components in DSSCs. However, the strong intermolecular π-π interactions of molecules produces higher aggregation which limits the effective electron or energy transfer in organic solar cell applications [2]. In this regard, we have synthesized novel Pc derivatives bearing bulky isopropylthiophenol groups at the peripheral positions of the macrocycles in order to suppress macrocycle aggregation onto the TiO₂ film. In addition, two different linkers have been used to connect the COOH group to the Pc ring for the purpose of investigating the effect of these linkers on photovoltaic performance. The photovoltaic performance of novel non-aggregating Pes in DSSC devices will be tested. REFERENCES 1. M. E. Ragoussi, J. H. Yum, A. K. Chandiran, M. Ince, G. de la Torre, M. Grätzel, M. K. Nazeeruddin, T. Torres, ChemPhysChem, 2014, 15,1033. 2. M-E. Ragoussi, M. Ince, T. Torres, Eur. J. Org. Chem, 2013, 6475-6489.

Keywords: Dye Sensitized Solar Cells, Phthalocyanine, Anchoring Groups

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Chemical and Structural Study of Diatomite from Mariovo - Republic of Macedonia

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The diatomaceous earth studied in this research is taken from the Mariovo region in the Republic of Macedonia. The materials represents a sedimentary rock of biogenetic origin, soft material which can be easily disintegrated, with white to grayish color. The diatomaceous earth has been characterized by ICP-MS, XRPD and FTIR. The ICP-MS of the raw material shows the following chemical composition: SiO2 86.338 %, Al2O3 3.01%, Fe2O3 2.8%, CaO 0.76%, TiO2 0.139%, K2O 0.687%, Na2O 0.191%, MnO 0.0006%, MgO 0.28% and P2O5 0.139 wt%. The X-ray powder diffraction of the diatomaceous earth shows amorphous behavior as well as presence of crystalline phases cristobalite (1,9885; 2,6285; 4,0368) and muscovite (3,34; 4,9787; 9,9496). From the infrared analysis of the diatomaceous earth characteristic signals were obtained at these maximums: 795 cm⁻¹ and 1060 cm⁻¹, and they are as result of the presence of silica, the wide band in the region 3200-3700 cm⁻¹ and the band at 1640 cm⁻¹ are due to the vibrations of the OH groups.

Keywords: Diatomaceous Earth, ICP-MS, XRPD, FTIR
Structural and Spectroscopic Studies of 2,6-Bisarylidenecyclohexanone Derivatives and their Potential Application as Fluorescent Markers

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In the last several decades, there has been a lot of interest in designing electronic, optical, and magnetic molecular devices (switches, relays, diodes, etc) based on molecular building blocks. One of the areas of interest is development of the organic materials with potential use in nonlinear optics and optoelectronics. First prerequisite is large macroscopic second-order nonlinear optical (NLO) susceptibility ($\chi^{(2)}$). In order to develop efficient second-order NLO organic crystal, it is necessary for the compound to have large second order molecular hyperpolarizability ($\beta$), which is easy to predict. The second requirement is the molecule to crystallize in a non-centrosymmetric form (to avoid cancelation of induced hyperpolarizabilities). Since the field of crystal engineering is still in its infancy i.e. it is difficult to predict how a certain molecule crystallizes in the lattice, structural information is needed to design (engineer) a material with a large coefficient. SHG (second-harmonic generation) organic crystals based on 2,6-bis(arylidene)cyclohexanone derivatives have been studied in the past (4-tert-butyl-2,6-bis(4-methylbenzylidene)cyclohexanone and 2,6-bis[(4-dimethylamino)benzylidene]cyclohexanone). In this study we have chosen the symmetrical 2,6-bisarylidenecyclohexanones due to synthetic accessibility, relative structural rigidit, simplified computations, wealth of single-crystal X-ray structures and established systems with intense fluorescene. These derivatives have been prepared in high yields by straightforward crossed aldol condensation between cyclohexanone or 4-tert-butylecyclohexanone and the corresponding substituted benzaldehyde under basic conditions. They were obtained in high purity usually by recrystallization from appropriate solvent (ethanol, methanol, methanol/CH₂Cl₂ and ethyl acetate). Also, in this study we have employed computational chemistry on these symmetrical derivatives with appropriate substituents with emphasis on electronic properties, torsional angle of the aryl group and especially the energies of the frontier molecular orbitals (HOMO and LUMO). These kinds of derivatives that are also biologically active and have a potential to be used as fluorescent markers.

Keywords: 2,6-Bisarylidenecyclohexanone, Optical Properties, Fluorescent Markers, Structural Tudiess
Preparation of Poly (Lactic Acid)-Phase Change Material Eicosane Film

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Phase change materials have been developing rapidly in recent years and have a large number of application areas. In this area, composite materials with different polymer types are prepared and used in many fields today. In order to be able to produce high value-added biomedical products, studies in this area are increasingly beginning to shift towards natural products. The naturalness of the ingredients used here makes these products important because of their advantages such as biocompatibility and biodegradability. In this study, polymer composites were prepared from the film samples which we aimed to develop a hybrid structure containing phase-changing material by using the phase-change material eicosane and a commercialized biopolymer Poly (Lactic acid). Polymer films were prepared via solution casting method as 50%, 40%, 30%, 20%, 10%, 5%, 2.5%, and 1% (w/w) phase changing material contained. The characterizations of those composites that are prepared in were completed. These films will be evaluated on the possible application areas.

Keywords: Phase-Changing Material, Eicosene, Poly (Lactic acid), Composites

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Ionic Liquids as Catalyst to Convert Carbon Dioxide into Dimethyl Carbonate and Carbon Nanofiber

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CO₂ is potential raw material which can be converted into value added chemicals such as DMC and carbon nanofiber. Synthesis of dimethyl carbonate (DMC) by using carbon dioxide (CO₂) and methanol is found to be the best and most reliable method to produce DMC. DMC possess high oxygen percentage with good blending property and is environmentally friendly in nature. DMC is useful for a wide range of applications such as fuel additives, chemical feedstock, electrolyte in Li-ion battery, and in polycarbonate synthesis. The major limitations pointed out in the direct DMC synthesis route are poor yield, low reaction rate, thermodynamic limitations and hydrolysis of produced DMC. Different catalysts such as metal oxide, polyphosphoric acid have been reported for the direct synthesis of DMC. Recently, Ru supported catalysts such as Ru-Al₂O₃, Ru-SiO₂ and Ru-ZSM-5 were reported for direct DMC synthesis. Ionic liquids (ILs) can be the promising catalyst materials because, of their high thermal stability, low vapor pressure, and easily tunable acidic/basic functionality. Addition of ILs into the reaction mixture can facilitate a significant increase of CO₂ concentration in solution. ILs can also act as water scavenger apart from a good CO₂ sorbent. This paper describes the similar approach of ILs modification for the synthesis of linear as well as cyclic carbonates, by employing bifunctional di-cationic ILs which contains Lewis acidic and basic functional groups. The concept of reactivity of superbasis (4-DMAP) with ILs (hydroxyl or amine functionalized) has also been investigated. The important challenges such as the role of dehydrating agent and major developing directions are also highlighted.

**Keywords:** Carbon Dioxide, Ionic Liquid, Dimethyl Carbonate, Carbon Nanofiber
Potential Probiotics and their Postbiotic Mediators for Periodontal Infections Control

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Periodontal diseases, comprising gingivitis and periodontitis, are the major public health problem that challenges health systems all around the world. Gingivitis known as gum inflammation, occurs depending on the accumulation of bacteria in the form of dental biofilms. If this biofilm is not removed, it may initiate an immune and inflammatory response that may affect other tissues of the periodontium and lead to periodontitis. Therefore, periodontal infection control is very important not only for oral health but also overall health during all stages of our life. The aim of this study is selection of most effective potential probiotic isolates and/or their postbiotic mediators against important oral pathogens such as *Streptococcus mutans* ATCC 25175 and *Candida albicans* ATCC 10231. 43 different potential probiotic bacteria isolated from bee-gut microbiota and pollens as bee-derived products, and their postbiotic mediators were used for the antimicrobial activity by spot on lawn method. Briefly, pathogenic microorganisms, grown in TSB for 24 h at 37°C were adjusted to Mc Farland 0.5, inoculated in soft agar and then pour plated on agar surfaces. Treatments were spotted on agar surfaces and incubated 24 h at 37°C. MRS medium was used as negative control. Following the incubation, the diameter of the inhibition zones around the spots was measured as mm. According to the results, maximum activity was obtained from the isolates of pollens with the inhibition zone ranges of 14-21 mm. Isolates of bee-gut microbiota also exhibited antimicrobial activity with the range of 9-11 mm. From the point of activity, no statistically differences between the viable cells and postbiotic mediators was observed. In conclusion, 15 pollen and 12 bee-gut isolates have been selected among 43 isolates, with their potential anti-microbial activity against all pathogens. Biofilm assays will be carried out next, for development of periodontal infection control strategies.

**Keywords:** Probiotics, Postbiotic Mediators, Periodontal Diseases, Infection, *Streptococcus mutans, Candida albicans*
Heterocyclic Synthesis of Isoxazoles and Characterization of their Structures

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In this study, the synthesis of several heterocyclic compounds of oxazol-4-one and 2-benzopiran-2-one are reported. With the condensation reaction, 4-chloro-2-oxa-2H-chromene-3-caraldehyde in the presence of POCl₃ and N, N-DMF, 4-chloro-2-oxa-2H-chromene-3-cardehyde was synthesized by reacting with hydroxylamine undergoing reflux reactions, 4-chloro-2-oxo-2H-chromene-3-carbonitrile was obtained. In the following series of reactions, under different reflux conditions, two different compounds are formed: a) 5- (2-Hydroxy-phenyl) -4,5-dihydroisoxazole-4-carboxylic acid ethyl ester and b) Chromeno [4,5-d] isoxazol-4-one by acidified hydroxylamine and sodium acetate The structural characterization of the synthesized products is done on the basis of spectrometric data.

Keywords: Hydroxylamine, Reflux, Cyclization, Characterization, Sodium acetate, Crystallization
Anti-biofilm Activities of Paracetamol and Ibuprofen

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This is significant because bacterial biofilms are resistant to common therapeutic approaches. Approximately 80% of the world's microbial biomass resides in the biofilm state. And it was estimated that upwards of 75% of microbial infections that occur in the human body are related biofilms. Antimicrobial concentrations necessary to inhibit bacterial biofilms can be up to 10-1000 times higher than those needed to inhibit the same bacteria grown planktonically. Paracetamol and ibuprofen are commonly used analgesics. In this study, the anti-biofilm activities of paracetamol and ibuprofen were determined by the crystal violet method for Pseudomonas aeruginosa and Enterococcus faecalis. Biofilm mass stained with crystal violet, and total biofilm formation was measured at OD570. Paracetamol and ibuprofen were significantly decreased biofilm biomasses by both P. aeruginosa, and E. faecalis. This study indicated the potential of paracetamol and ibuprofen as an inhibitory agent for use in P. aeruginosa, and E. faecalis biofilm related infections.

Keywords: Biofilm, Ibuprofen, Paracetamol, Pseudomonas aeruginosa, Enterococcus faecalis

Acknowledgement: This work was financially supported by a project no 5100-YL2-17 from Research Foundation of Suleyman Demirel University, Isparta, Turkey.
Extraction and Characterization of Polysaccharide from Ulva rigida

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Recently, green algae have become an important source of polysaccharide that can be used for the synthesis of chemicals and bio-based materials applied in medicine. Among the green algae Ulva rigida is rich in sulfated polysaccharides which are generally named Ulvan. In this study, the main aim is to extract and characterize the chemical properties of the polysaccharide from Ulvan rigida distributed in Çanakkale strait. For this purpose, first, the Ulvan rigida was collected from Kepez district (Çanakkale/TURKEY), cleaned from its epiphytes and dried at 30°C. Then the polysaccharide was extracted with distilled water. Chemical structure was characterized via FTIR and NMR analysis.

Keywords: Polysaccharide, Ulva rigida, Green Algae, FTIR, NMR

Acknowledgement: The authors thank the Çanakkale Onsekiz Mart University Science and Technology Application and Research Center for providing laboratory facilities for our experiments.
Evaluating the Adsorptive Properties of Graphene Oxide toward Lindane: A Combined Experimental and Molecular Mechanics Study

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Graphene oxide (GO) represents an interesting material with a huge potential for diverse applications ranging from adsorption to photovoltaics. The synthesis of this material in this work is achieved by using a well-established method of Hummers, that described briefly consist of controlled treatment of the graphite flakes by potassium permanganate in the concentrated sulphuric acid medium. After the synthetic step, the GO underwent structural characterization by using ATR spectroscopy (on the diamond crystal, 500 accumulations, and 2 cm\(^{-1}\) resolution). The lindane adsorption is performed from the solution with a concentration range from 25 up to 500 ppb using 15mg of GO. The GC-ECD served for analyzing the adsorbed concentration of lindane. Molecular insights regarding the interaction strength and geometry between the lindane and GO were obtained by employing Molecular Mechanics calculations using COMPASS II forcefield. The adsorption of lindane onto the graphene oxide is depended on the type of the surface functional groups of GO with the adsorption energies that are in the range of -30 to -35 kcal/mol.

**Keywords:** Graphene Oxide, Lindane, ATR Spectroscopy, Molecular Mechanics, Compass II, Adsorption
Removal of Lindane from an Organic Solution by using Graphene Oxide as an Adsorbent Material

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As graphene is expensive and relatively hard to produce, great efforts are made to find effective yet inexpensive ways to make and use graphene derivatives or related materials. Graphene oxide (GO) is one of those materials - it is a single-atomic-layered material, made from the powerful oxidation of graphite, which is cheap and abundant. Graphene oxide is an oxidized form of graphene, laced with oxygen-containing groups. It is considered easy to process since it is dispersible in water (and other solvents), and it can even be used to make graphene. GO can effortlessly be mixed with different polymers and other materials, and enhance properties of composite materials like tensile strength, elasticity, conductivity and more. The synthesized graphene oxide (using Hummers method) is applied for the adsorption of an organochlorine pesticide, specifically in lindane pesticide. The evaluation of the lindane adsorption onto this material is achieved through the use of gas chromatography (GC-ECD). Prior to the adsorption studies, the synthesized graphene oxide synthesis is analyzed by ATR spectroscopy (Attenuated Total Reflectance) using diamond crystal. The obtained spectra confirmed the presence of the functional groups corresponding to the graphene oxide structure.

**Keywords:** Graphene Oxide, Lindane, ATR Spectroscopy, Adsorption, Organochlorine Pesticide, Gas Chromatography
Due to the increasing demands especially in clinical diagnostics, developing motile biosensing platform seems to be a promising strategy to speed up the analysis time for ultra-fast and real-time diagnostics. A new elegant generation of sensors called "micro-motors" has attracted growing attention for obvious benefits. These small micro-engines could autonomously propel directly in the sample by catalytic motion. The continuous movement of these smart engines accelerates significantly the recognition binding in the real sample and leads to "on-the-move" testing. In this context, chemically propelled tubular micro-motors driven by catalytic decomposition of MnO2 were successfully developed via layer-by-layer strategy using template assisted electrodeposition technique. Compared to static biosensing approach, the developed swimming biosensing platform reduced remarkably the assay time (23-fold faster) and showed very good stability and a high sensitivity towards the target molecule in serum samples. Moreover, the high-speed (460 nm/s) highlights the promising applicability of these tiny sensors for a very fast in-vitro screening test.

Keywords: Motile Biosensor, Micro-Motors, On-The-Fly Biosensing
Oxidation of Aldehydes to Carboxylic Acids Utilizing Diatom from Macedonia as Solid Support for the Jones Reagents

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Traditionally, conversion of aldehydes to corresponding carboxylic acids has been realized by Jones reagents, oxone, potassium permanganate etc. But, unfortunately these methods fail to produce satisfactory results, because in general the reactions are slow, uncontrolled, time-consuming and a lot of number byproducts, that makes difficulties in the isolation of the main product. To avoid all of this, transformation of aldehydes to carboxylic acids was developed by oxidizing agents using solid supports. Solid supports have advantages over the traditionaly methods, they modify activity of the reagent, improve selectivity and the most important make product isolation easier. In objective of this study was the oxidation of aldehydes to carboxylic acids utilizing diatometicus earth from Macedonia as solid support for the Jones Reagents. Experimental parts have shown a successfully oxidation of benzylaldehyde to benzoic acids when used Macedonia diatometicus earth as solid support for Jones reagent, at room temperature for less than 30 min.

Keywords: Oxidation, Aldehydes, Carboxylic Acids, Jones Reagents, Solid Support, Diatometicus Earth from Macedonia
Decellularization of Bovine Spinal Meninges and Evaluating their Efficacy as a Regenerative Biomaterial

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Nerve injury is a serious clinical problem that has a direct impact on the quality of life. Neural diseases affect many activities of our body such as balance, movement, speech, breathing. In addition to these effects, neural injuries often lead to painful neuropathies due to decreasing in motor function and sensory perception. Translational medicine is both developing and promising fields and it aims to regenerate damaged tissues by combining cells from the body with highly porous biomaterial scaffolds, which act as a template for tissue regeneration by guiding the growth of new tissue. Biological scaffolds serve as a niche where cells are instructed to create a tissue and/or an organ in an extremely controlled way. The main duty of a scaffold is to guide cell behaviors such as migration, proliferation, differentiation, maintenance of phenotype and apoptosis by assisting sensing and responding to the environment through cell-matrix communications. Decellularization which is a novel technique provides the elimination of whole cellular components such as DNA, RNA, lipids, mitochondria and cytoplasmic proteins and cytoplasmic ingredients. Ultrastructures such as the fundamental matrix proteins and growth factors are protected, and the cells start to form tissue-specific properties on the decellularized matrix at in vivo or in vitro conditions. In this study, bovine spinal meninges were decellularized using Triton X-100 to obtain a biological scaffold that can mimic the micro-environment. Following, dsDNA content, glycosaminoglycans, and hydroxyproline content analyses were performed to understand the success of the decellularization process. As a result, the decellularized ECM is thought to be a novel biologic scaffold for tissue engineering applications.

Keywords: Bovine Spinal Meninges, Decellularization, Biomaterial, Regenerative Medicine, Tissue-Engineered Scaffold, Extracellular Matrix
Chemical and Structural Characterization of Dolomite from Dukat - Republic of Albania

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Dolomite rock is used as an ornamental and structural stone, and for extracting certain metals from their ores. It also finds use in the manufacture of mineral wool. It is useful in the chemical industry in the preparation of magnesium salts. The Dolomite subject in this research is obtained from Vlora region (Dukat, Republic of Albania). The characterization of the material is performed with ICP-MS, FTIR and XRPD analysis. From a physico-mechanical point of view, dolomite presents white colored material with specific density of 2.62 g/cm³. The ICP-MS analysis of dolomite shows the following chemical composition: Al₂O₃ 0.0763%, Fe₂O₃ 0.19044%, MnO 0.000394%, TiO₂ 0.075%, CaO 29.89%, MgO 22.1%, K₂O 0.072%, Na₂O 0.23587%, P₂O₅ 0.028872% and LOI 47.2%. From the infrared analysis of dolomite characteristic signals were obtained at these maxima: 728.08 cm⁻¹, 876.666 cm⁻¹, and 1424.3 cm⁻¹, as a result of the carbonate group stretching and bonding vibrations. The results from the XRPD shows the following dolomite peaks (2 theta): 24.07 (d 3.69), 29.44 (d 3.03), 31.11 (d 2.87), 33.70 (d 2.657), 35.463 (d 2.52), 37.59 (d 2.39), 41.33 (d 2.18), 45.09 (d 2.00), 50.74 (d 1.79), 51.29 (d 1.78).

Keywords: Dolomite, ICP-MS, XRPD, FTIR
Phase Transformations of Trepel at Temperature Range 800-1000°C

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Trepel, also known as diatomaceous earth, used in this research represents a grayish, soft, very light, weakly cemented, finely opal sedimentary rock. The material is taken from the Bitola region (Republic of Macedonia). Samples were treated at three temperatures (800, 900 and 1000°C) for a period of 1, 2 and 3 hours respectively. The diatomaceous earth thermally treated has been characterized by physical-mechanical analysis, X-ray powder diffraction and SEM analysis. From the physical-mechanical point of view the samples show a gradual change in color as the temperature and time of thermal treatment increases, as well as higher bulk density and compressive strength. The thermal treatment of the diatomaceous earth results in the reduction of the pores in the material. Scanning electron microscopy shows significant changes in the morphology of the material. X-ray powder diffraction results show presence of amorphous phase in the raw material which is as results of the presence of silica, as well as presence of crystalline phase mainly quartz and muscovite.

Keywords: Diatomaceous Earth, XRPD, SEM, Phase Transformation
Hybrid Constructs from Decellularized Plants: Candidate Scaffolds for Tissue Engineering

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Tissue engineering aims to repair regenerate or restore the tissues or their functions. Several strategies are followed including cells, scaffolds and/or biological factors. Decellularization is a rather new technique, which aims to maintain ECM and its components without effecting its composition while removing all cellular components. The first initiatives are sure performed with animal tissues, but here were propose to use a plant tissue. Succulents are drought resistant plants that can store water in their stem or leaves. This water storing ability transform the inner body to a gel like structure. Here in study, succulents were decellularized by a cocktail containing well-known detergents and surfactants. Decellularization efficacy was performed by DNA quantifications and total protein analysis. Later on, the decellularized content were mixed with 2% Collagen solution (in 0.1M Acetic acid; v/v) to prepare a hybrid construct. These constructs were then lyophilized and cross-linked with NHS/EDC carbodiimide chemistry. Evaluations shows that these constructs have proper pore structure as well as good swelling characteristics. Also, studies with mesenchymal stem cells shows that, these hybrid constructs can support cell attachment and growth that also may be candidate scaffolds for tissue engineering and regenerative medicine applications.

Keywords: Plant Decellularization, Tissue Engineering, Bone Regeneration, Collagen
Preparation of New Piperazine Derivatives from Quinone Including an Electron-withdrawing Group (EWG)

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Synthesis of new N-, N,N- possessing heterocyclic molecules is important recent years with the reason that they are biologically active substances. Especially, compounds with quinone moiety in their structure, show a wide range of pharmacological activity such as antibacterial, antifungal, anticancer etc. [1,2]. 2,3-Dichloro-1,4-naphthoquinone contains two ketone groups and two chlorine atoms as extremely important moieties, which are responsible for many biological activities and reactivity of nucleophiles because of their abilities to accept electrons. The reactivity of 2,3-dichloro-1,4-naphthoquinone with several nucleophiles containing nitrogen, oxygen and sulfur were investigated in many times at our laboratories. The 5-nitro-2,3-dichloronaphthoquinone is reported to be more reactive towards amines affording regio-isomeric mixtures of mono-substituted products. Next, we decided to investigated the role of electron withdrawing group NO₂ at quinone ring in this substitution. All new compounds were characterized on the basis of nuclear magnetic resonance spectroscopy (1H- and 13C-NMR), mass spectrometry (MS), and fourier transform infrared spectroscopy (FT-IR).

Keywords: Synthesis, EWG Group, Amines, 5/6-Nitro-Naphthoquinone
Sunbim: A Package for X-Ray Imaging of Nano- and Biomaterials using SAXS, WAXS, GISAXS and GIWAXS Techniques

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SUNBIM (supramolecular and submolecular nano- and biomaterials X-ray imaging)[1] is a suite of integrated programs which, through a user-friendly graphical interface, are optimized to perform a number of functions, such as: centering, q-scale calibration, two-dimensional (2D) to one dimensional (1D) folding of small- and wide-angle X-ray scattering (SAXS/WAXS) data, also in grazing incidence (GISAXS/GIWAXS); indexing of two-dimensional GISAXS frames and extraction of one dimensional GISAXS profiles along specific cuts; quantitative scanning microscopy. SUNBIM consists of five main programs (1) Calibration package, a set of functions (manual and automatic beam center extraction, sample-to-detector distance calculation, eccentricity correction) allow one to find all of the geometrical parameters needed to extract a one-dimensional profile out of a two-dimensional image; (2) Batch Script & 2D Mesh Composite, to prepare batch script files (ASCII files) to run a sequential acquisition of two-dimensional frames (in scanning mode) and to perform a composite of the as-collected two dimensional SAXS frames into a single image; (3) Multi-scan SAXS and WAXS data analysis, to fold each two dimensional frame of the mesh into a one-dimensional profile and extract all the relevant features of the sample with a multi-modal imaging approach [2]; (4) Single-scan (GI)SAXS and (GI)WAXS data analysis, to calibrate and fold the two-dimensional data, in order to extract relevant information from the experimental data (such as one or more vertical, horizontal or radial cross sections) and to fold 2D data into 1D profiles; (5) One-D Data Analysis Manager, to manage with one dimensional profiles and import, trigger, save and export plots. SUNBIM was used successfully to analyses different kind of materials [2 - 6] SUNBIM is developed in the MATLAB language and it is distributed free of charge to the academic user (download after a valid registration from the web site at the address http://www.ba.ic.cnr.it/softwareic/sunbim/).
Keywords: Sunbim, X-Ray Imagining, Nanomaterials, Biomaterials, Saxs, Waxes

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Resilience and Thickness of LLDPE Monofilaments

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Resilience of monofilaments has been the subject of several papers, as one of the most important properties for long standing of entirely system of artificial turf. This paper deals with the influence of thickness of LLDPE monofilaments on resilience. An industrial production line of monofilaments is used to produce samples with different thickness to gain information about this influence. In this paper it will be mainly discussed the thickness and the morphological structure of produced monofilaments at different rate of stretching. From the obtained results it seems that for stretching ratio around values of 5.5, thickness has not influence on the resilience. For samples stretched more the resilience is decreasing by increasing thickness and the opposite is happening for less stretched samples. From morphological analyses this behavior seems to be related with the presence of G and T structure phases present on the 3rd phase. The stretching is related with the decreasing of G-structure and the increase in thickness is related with the increase of amorphous phase and T-structure which influence on the resilience.

Keywords: Resilience, Thickness, Monofilaments,
Osteogenic Differentiation of Human Adipose-derived Mesenchymal Stem Cells on Decellularized Bovine Bone-based Matrices

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Bone tissue engineering displays promising approaches at recovering bone damages as using principles of engineering and biology. Basic components of bone tissue engineering are stem cells, scaffolds from synthetic or naturally-derived biopolymers, bioceramics, etc., and this approach has combined these components in order to repair damaged bone tissue caused by trauma, diseases, etc. There are lots of techniques to fabricate bone substitutes in bone tissue engineering applications. Decellularization, as an alternative to conventional ones, has emerged because of its novel approach. In the current study, bovine tibia was decellularized using Triton X-100 and DNA content analysis was performed to understand the success of the decellularization process. After being fabricated bone-derived matrices, human adipose-derived mesenchymal stem cells were seeded on these surfaces. Cellular behaviors such as adhesion, proliferation and also differentiation were determined using MTT assay, histological and immunohistochemical methods. As a result, human adipose-derived mesenchymal stem cells were successfully differentiated into osteogenic lineage onto these patches. It has been believed that decellularized bone-derived patches would be useful for repair of damaged periosteum layer of bone in regenerative medicine applications.

Keywords: Decellularization, Bovine Tibia, Periosteum, Adipose-derived Mesenchymal Stem Cells, Regenerative Medicine, Patches
Effect of Cinnamaldehyde with Different Weights, Times and Temperatures on the Crystallization Behavior and Dynamic Mechanical Properties of Poly(Lactic Acid)

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Polylactide (PLA) is one of the most promising biobased and compostable polymer which has a potential to replace petro-derived polymers due to its mechanical properties and chemical stability. The chemical stability and mechanical performance of PLA can be further improved by controlling its crystallinity grade by the aid of nucleating agents. Cinnamaldehyde is isolated from cinnamon. Cinnamaldehyde is used in fragrance industry, food industry and recently medicinal industry. The aim of this study is to investigate the effect of the nucleating agent as Cinnamaldehyde with variable weight amounts on the crystal structure of PLA. PLA films were prepared with 5% (w/w) and 30% (w/w) contained Cinnamaldehyde and pristine PLA via solution casting method. Moreover, the samples were conditioned in an oven for 6 h, and 18 h at room temperature, 60°C, and 90°C. Conditioned samples were investigated to morphological properties with polarized optical microscope. By means of polarized optical microscope investigation, the changing of crystal structures was observed.

Keywords: Polylactide, Cinnamaldehyde, Temperature, Crystallization
The Influence of the Grafted Aryl Groups on the Solvation Properties of the Graphyne and Graphdiyne - a MD Study

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Graphyne and graphdiyne represent two newest members of the very large family of nanocarbon allotropic materials [0D (fullerenes, quantum dots, graphene dots, carbon dots, onion-like carbon, nanodiamonds), 1D (single-walled and multi-walled nanotubes, nanohorns), 2D (graphene, multilayered graphitic sheets, graphene oxide) and 3D (graphite)]. Both of these structures are one-atomic thick materials composed of sp and sp2 atom, in which the adjacent benzene rings are linked in a huge network by one (in graphyne case) or two acetylenic groups (in graphdiyne) (Figure 1A). They are promising materials for diverse applications (gas separation, lithium storage, as a possible replacement material for silicon transistor technology, etc.) since they pose a number of remarkable properties (extreme hardness, very high electric conductivity, high thermal resistance, etc). As both of these materials are non-dispersible in aqueous solution, in this work through the use of Molecular Mechanics (MM) and Molecular Dynamics (MD) we explored the effect of the grafted substituted aryl groups derived from aryldiazonium salts onto the solvation properties of these materials.

Keywords: Graphyne, Graphdiyne, Grafting, Molecular Dynamics, Solvation, Aryldiazonium Salts
Aryldiazonium Chemistry Meets Surfaces - Formation of the Covalently Bonded Nano-Polymeric Films

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Surface modification of polymers, metals, oxides, etc. using aryldiazonium salts has developed to a standard tool for designing the interface properties of these materials through the covalent attachment of organic moieties (small organic functional molecules to proteins, metal complexes, etc.). There are numerous classes of molecules that are considered as suitable candidates for surface modification such as thiols, silanes, phosphonic acids, carboxylic acids, etc. Although these molecules are very important, yet in comparison to the aryl diazonium salts, they have numerous problems ranging from surface selectivity (they do not form films with all surface types i.e thiols are good candidates for SAMS formation onto noble metals, phosphonic acids, silanes or carboxylic acid require oxo/hydroxylated surfaces); chemical/electrochemical layer stability; synthetic routes of particular molecules are complicated, etc. The topic will present the: mechanism of aryl diazonium reaction to surface modification, the different methods used to perform such surface modification (electrochemical, photochemical, sonochemical, etc), the surface techniques used for characterizations of the boned layers and some applications of the created surfaces by this type of chemistry.

Keywords: Aryldiazonium, Surface Modifications, Chemical Stability, Nano-Polymeric, Thin Films, Electrochemical Modification
Effect of Adulteration in Physical Properties of Honey

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Nowadays, when we talk about honey quality and healthy food in general, honey adulteration is considered one of the biggest problems. The application of routine and inexpensive methods in analyzing the quality of honey and finding out its adulteration is a truly challenge. Adulteration of honey was obtained by the addition of four different materials (starch, glucose, molasses, and distilled water) with different concentrations (6, 12, and 24%). Physical characteristics of pure and adulterated honey samples were investigated. The samples were found to differ from each other in refractive index (RI), moisture content, total soluble solids (TTS), density, specific weight and pH. The obtained results show us that there is no significant difference between refractive index of the honey sample taken from Debar-Macedonia and the other adulterated honeys with different compositions. The adulterated samples of honey have higher composition of water and lower composition of solid and dissolved particles than the Debar sample. Whilst, except honey adulteration with molasses, in all other adulterated samples, density decreases with increasing the concentration of adulterated supplements (starch, glucose and distilled water). The adulterated samples have higher pH values in comparison to the pure sample.

Keywords: Honey Adulteration, Refractive Index, Water Content, Total Soluble Solids, Density, the Specific Mass and pH Value
Mechanical Performance of Graphene Modified Electrospun Nylon-6,6 Reinforced Carbon/Epoxy Composite Laminates

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In traditional fiber reinforced composites, mechanical properties are controlled by the direction of fibers; however, fiber reinforced composites are weak in their through thickness direction due to the lack of reinforcement in this direction. Nanoscale reinforcements are directly linked to reinforce interlaminar region as attributed “weak link” of laminated composites with continuous fibers composites. During service of the laminated composite, several mechanisms such as matrix cracking and debonding occur in the interlaminar region and leads failure of the composite laminates. Interleaving laminated composites with electrospun nanofibrous mats comes out as a micro-scale strategy to strengthen interlaminar regions. Graphene oxide flakes are one of the most promising candidates amongst nanofillers for reinforcing weakest link of fiber reinforced composites due to their unique mechanical and physical properties. The aim of this study is to produce graphene oxide and electrospun Nylon-6,6 nanofiber mat reinforced carbon/epoxy composites via scalable methods and to evaluate experimentally mechanical performance of the advanced laminated composites. Therefore, the synergetic contribution of nano- and micro-scale mechanisms on interlaminar delamination will be investigated. For this, Nylon-6,6 electrospun hybrid mats will be fabricated and utilized as interleaves within the interlaminar region of carbon/epoxy laminated composites. Graphene oxide flakes will be prepared via chemical routes using high purity graphite powders and mixed within epoxy resin homogenously, subsequently. Vacuum assisted resin infusion method will be utilized to impregnate carbon fabric preforms with graphene oxide reinforced epoxy resin. Double cantilever beam samples will be prepared for the fabricated laminated composites and Mode I fracture toughness values will be determined according to related ASTM standart. Fracture surface of the samples will be monitored by scanning electron microscopy to investigate failure mechanisms and interlaminar fracture toughness mechanisms of the laminated composites. Results will be compared with the literature to reveal synergetic contribution of electrospun PAN nanofibers and

Keywords: Electrospinning, Carbon Fiber, Epoxy, Graphene Oxide, Fracture,
Adsorption Properties of Graphene Toward Lindane - A Combined Experimental and Molecular Mechanics Study

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Graphene embodies a fascinating material with an enormous potential for various applications alternating from adsorption to photovoltaics. The synthesis of this material in this work is achieved from the reduction of graphene oxide (with ascorbic acid) obtained by using a well-established method of Hummers, that described briefly consist of controlled treatment of the graphite flakes by potassium permanganate in the concentrated sulphuric acid. The synthesized graphene is structurally characterized by using ATR spectroscopy (500 accumulations, and 2 cm⁻¹ resolution). The lindane adsorption is performed by the solution with a concentration range from 25 up to 500 ppb using a constant mass of 15mg of graphene. The GC-ECD served for analyzing the adsorbed concentration of lindane. The adsorptive properties of this materials are extraordinary reaching up to 93 % removal of lindane from hexane solution. Making it a serious candidate for practical applications for removal of pesticides from polluted waters. In the end, theoretical calculations were performed by using molecular mechanics to calculate the total energy of the systems by running optimization algorithms through the use of force-fields.

**Keywords:** Graphene, ATR Spectroscopy, GC-ECD, Lindane, Adsorption, Molecular Mechanics
Graphene as an Effective Adsorbent for the Removal of Lindane from Organic Solutions

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Since its discovery, graphene has been considered as the new material that has the potential to alter the future. Termed as a "supermaterial" because of its amazing physical, chemical properties, graphene has found application in various fields ranging from electronics to medicine. Furthermore, studies have evidenced that the potential applications of graphene can be extensively broadened by various modes of functionalization, including adsorption of molecules. The adsorption of lindane from hexane solution containing a different concentration of this pollutant is evaluated by GC-ECD. The obtained results are promising and point out to the practical application of graphene as an adsorbent for lindane and other organochlorine pesticides.

Keywords: Graphene, Lindane, Adsorption, Pesticide, GC-ECD, Organochlorine
Influence of Auxiliary Plasma Source on Photoactivity of TiO$_2$ Thin Films by MePIIID

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Due to its outstanding optical, electrical and chemical properties, titanium dioxide is versatile and widely used. As the high temperature rutile phase is preferred for biomedical applications due to its better biocompatibility and hemocompatibility, the anatase polymorph is commonly preferred for its photocatalytic activity. As commonly observed in physical vapour deposition, the phase formation in addition to and independent from the morphology itself is mainly determined by the temperature and the ion energy. The phase formation shows a transition from amorphous via anatase at intermediate conditions towards rutile for high temperature, respective of high particle energies. Using high voltage pulses in addition to hyperthermal ions present in vacuum arc deposition, a method known as metal plasma immersion ion implantation and deposition, allows an independent control of the ion energy even for large, non-at substrates. Additionally, the gas flow, respective of the background pressure leads to collisions, thus decreasing the flux from the metallic cathode and decreasing the average charge state. An alternative approach to vary or adjust the oxygen/titanium ratio within the deposited thin film is the use of an auxiliary plasma source to create an independent oxygen plasma, thus providing more active species for surface interaction between and during the voltage pulses. The photoactivity of TiO$_2$ thin films was examined by contact angle measurements (CAM) after exposing the samples to UV light, generated from an actinic tube with a spectral range of 300 nm - 460 nm with the maximum at 365 nm, at an intensity of 1 mW/cm$^2$, for up to 3 hours. As the contact angle of two liquids against the thin films was measured, it was possible to calculate the surface energy before and after illumination with UV light. No systematic differences were found before illumination, however a strong effect was found after illumination.

Keywords: TiO$_2$, MePIIID, Superhydrophilicity, CAM, Surface Energy,
Effect of Electrospinning Process on Total Antioxidant Activity of Electrospun Non-Fibers Containing Grape Seed Extract

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Electrospinning is a common technique used for the production of nanofibers, and it is based on the fact that the electrically charged liquid polymer is positioned in a continuous fiber form on a grounded surface. Grape seed is rich in phenolic compounds and can be used as a dietary supplement or as a natural antioxidant source in diet. In this study, grape seed extract of Burdur Dimrit variety (Vitis vinifera) was electrospun with gelatin, polyvinyl alcohol (PVA) and PVA/beta-cyclodextrin polymers to produce nanofibers with antioxidant activity. The aim of this study was to determine the effect of electrospinning process on the total antioxidant activity and total phenolic contents of electrospun polymers with grape seed extracts. Total antioxidant activity of samples (by ABTS and DPPH assays) and total phenolic contents (Folin-Ciocalteu method) were determined before and after electrospinning process of polymers with grape seed extract. Electrospinning with gelatin polymer decreased the antioxidant activity (ABTS assay) of nanofibers containing grape seed extract by 65% and their total phenolic contents by 7%. On the other hand, electrospinning treatment with PVA and PVA/beta-cyclodextrin had no effect on the total antioxidant activity (ABTS and DPPH) and total phenolic substance contents of grape seed extract nanofibers.

Keywords: Electrospinning, Grape Seed, Antioxidant Activity, Phenolic
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