Virtual International Scientific Conference on

"Applications of Chemistry in Nanosciences and Biomaterials Engineering"

NanoBioMat 2022 – Winter Edition

24-26 November 2022

Program

The program will be published on the official webpage of AOSR and UPB on 21.11.2022, as well as in the TEAMS Class. The link for the TEAMS Class will be provided in due time, on or before 21.11.2022.

The topics for the conference include, but are not limited to:

- novel materials;
- surface chemistry;
- air and soil bioremediation;
- composite materials and biomaterials;
- applications of natural compounds and chemical products;
- nanomaterials and bionanomaterials for the controlled release of biologically active molecules;
- bionanoproducts for tissue engineering and regeneration;
- advanced techniques for material processing.

Deadlines:

1. Registration: 15.10.2022
2. Extended registration: 06.11.2022
3. Abstract submission: 07.11.2022
4. Acceptance Notification: 15.11.2022
5. Final Program announcement: 21.11.2022
6. Conference: 24-26.11.2022

Registration:

Registration should be done using the link: https://nanobiomat.eu/registration/.

Registration is free for all students and postdoctoral researchers (or equivalent).

Abstract submission:

Abstract should be submitted in MS Word document using the link https://nanobiomat.eu/registration/ on or before 07.11.2022. The abstract should be 150 – 300 words and it must contain the title, authors, and their full affiliation.

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Access Links

Meeting first day:

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Meeting third day:

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Program

Thursday, 24 November 2022

10:00-10:15 – **Opening Ceremony**	Chair: Ecaterina ANDRONESCU
10:15-12:00 – **Plenary Session (I)**	Chairs: Christophe EGLES, Anton FICAI
12:00-13:00 – **Lunch Break**	
13:00-14:00 – **Poster Session (I)**	Chairs: Carlos MARQUES, Denisa FICAI
14:00-16:35 – **Session I.** Advanced Techniques for Material Design and Synthesis	Chairs: Serguei SAVILOV, Ovidiu OPREA
16:35-17:00 – **Coffee Break**	
17:00-18:45 – **Plenary Session (II)**	Chairs: Domenico LOMBARDO, Ioana DEMETRESCU

Friday, 25 November 2022

10:00-12:00 – **Session II.** Biomaterials for Tissue Engineering and Regeneration	Chairs: Viorel NACU, Lenuța PROFIRE
12:00-13:00 – **Lunch Break**	
13:00-15:30 – **Session III.** Materials and Nanomaterials for Antimicrobial and Anticancer Applications	Chairs: Cem Bulent USTUNDAG, Carmen CHIFIRIUC
15:30-17:50 – **Session IV.** Applications of Smart Materials	Chairs: Jorg OPITZ, Maria TOMOAIA-COTISEL

Saturday, 26 November 2022

10:00-12:30 – **Session V.** Materials for Advanced Applications	Chairs: Oguzhan GUNDUZ, Maria GAVRILESCU
12:30-13:30 – **Lunch Break**	
13:30-14:30 – **Poster Session (II)**	Chairs: Luigi CALABRESE, Radu Claudiu FIERASCU
14:30-15:00 – **Closing Ceremony**	Chair: Ecaterina ANDRONESCU

24 November 2022

10:00-10:15 – OPENING CEREMONY

Chair: Ecaterina ANDRONESCU

Prof. Ecaterina ANDRONESCU – President of the Scientific Committee

Prof. Adrian-Alexandru BADEA – President of The Academy of Romanian Scientists

Prof. Tudor PRISECARU – President of the University Politehnica of Bucharest Senate

10:15-12:00 – PLENARY SESSION (I)

Chairs – Christophe EGLES, Anton FICAI

10:15-10:45 – *Contribution of Additive Manufacturing Techniques to the Design of Personalized Implants. Application to Reparative Hand Surgery*. A. Lerebours, **Christophe Egles**

10:45-11:15 – *Features of the Carbon Nanostructures Formation*. **Serguei V. Savilov,** Anna D. Krot, Ekaterina A. Arkhipova, Stepan N. Kalmykov

11:15-11:45 – *Environmental Contamination Assessment Using Nanomaterial: Sustainable Analitical Approaches*. **Bárbara Socas-Rodríguez**, Ruth Rodríguez-Ramos, Álvaro Santana-Mayor, Antonio V. Herrrera-Herrera, Adrián Conde-Díaz, Miguel Ángel Rodríguez Delgado

11:45-12:00 – Q & A Session

12:00-13:00 – LUNCH BREAK

13:00-14:00 – POSTER SESSION (I)

Chairs – Carlos MARQUES, Denisa FICAI

1. *Serum Malondialdehyde Level: Oxidative Stress Marker in Pulmonary Drug-Susceptible and Resistant Tuberculosis*. **Evelina Lesnic,** Valeriana Pantea
2. *Acoustic Properties of Bio-Polyol and Unsaturated Fatty Acid- Modified Fillers Enhanced Integral Skin Polyurethane Foams in Automotive Industry*. **Aykut Aykac,** Cem Yigit, Ethem Gokhan Ozcelik
3. *The Integration of Oxide Nanoparticles with Carbon Materials for the Development of Nanocomposites with Applicability in Biotechnology*. **Vasilica Ţucureanu,** Cosmin Alexandru Obreja, Cristina Pachiu, Oana Brâncoveanu, Alina Matei
4. *Influence of Process Parameters for Biogenic Synthesis of Zinc Oxide Nanoparticles*. **Alina Matei,** Gabriel Crăciun, Cosmin Romaniţan, Cristina Pachiu, Vasilica Ţucureanu
5. *Composite Systems for Bone Tissue Regeneration*. **Alina Florentina Vladu,** Ludmila Motelica, Roxana Trusca, Anton Ficai

6. *Application of Phosphate Materials Enhanced with Different Metals with Potential Antimicrobial Properties on Different Types of Bricks.* **Toma Fistos,** Roxana Ioana Matei, Anda Maria Baroi, Irina Fierascu, Lia-Mara Ditu, Valentin Raditoiu, Radu Claudiu Fierascu
7. *Application of Phosphatic Nanomaterials on Polluted Water Decontamination – Case Study.* **Roxana Ioana Matei (Brazdis),** Sorin-Marius Avramescu, Irina Fierascu, Anda Maria Baroi, Toma Fistos, Radu Claudiu Fierascu
8. *Film-Forming Properties of Different Starch Products Present on The Romanian Market*. **Andra-Ionela Ghizdareanu,** Alexandra Banu
9. *Pollen Grain Evolution After Nanomaterials Application*. **Daniela-Ionela Sărdărescu,** Diana E. Vizitiu, Radu C. Fierăscu, Irina Fierăscu, Liliana C. Soare, Camelia Ungureanu, Anda M. Baroi, Alin C. Din
10. *Development and Optimization of Nose-To-Brain Delivery of Thermoreversible In Situ Gel Incorporating Aripiprazole Loaded Nanostructured Lipid Carriers.* **Kamini Sharma**, Manish Kumar
11. *Current Review of Nanocarriers in Cosmetic Science*. **Pragya Bharti**, Vaishnavi Chauhan, Manish Kumar
12. *pH-Sensitive Controlled Release Nanostructured Lipid Carriers of Prednisolone Acetate as Ocular Drug Delivery System Development: Ex Vivo Transcorneal Permeation And In Vivo Ocular Irritation.* **Sheetal Devi**, Manish Kumar
13. *Review On Antimicrobial Natural Compounds: Open-Source Alternatives Against Antibiotic Resistant Bacteria*. **Marian Rașcov**, Anton Ficai, Ovidiu Cristian Oprea, Otilia-Ruxandra Vasile, Ecaterina Andronescu
14. *Weathering Evidences Of The Banloc Castle (Romania)*. **Alina Moșiu**, Lorena Iancu, Ramona Marina Grigorescu, Anca Irinagheboianu, Marius Moșoarcă, Rodica-Mariana Ion

14:00 - 16:35 – SESSION I. ADVANCED TECHNIQUES FOR MATERIAL DESIGN AND SYNTHESIS

Chairs – Serguei SAVILOV, Ovidiu OPREA

14:00-14:20 – *Nanostructured Photocatalysts Integration in Composites for Environmental Applications.* **Mirela Petruta Suchea**, Ioan Valentin Tudose, Petronela Pascariu, Cosmin Romanitan, Oana Brincoveanu, Cristina Pachiu, Emmanouel Koudoumas

14:20-14:35 – *Improving Corrosion Resistance and Biocompatibility of GO/Ser Modified Ti_6Al_7Nb Alloy by Electrophoretic Deposition*. **Aysel Oktay,** Cem Bülent Ustundag

14:35-14:50 – *Fabrication of Electrospun Polylactic Acid/Polyhydroxybutyrate/Silk Fibroin Nanofibers To Obtain Retinal Nerve Fiber Layer*. **Sureyya Elif Celik,** Songul Ulag, Ayse Ceren Calikoglu Koyuncu, Oguzhan Gunduz

14:50-15:05 – *Ethosuximide Loaded Alginate/Polyethylene Oxide 3D-Printed Scaffolds for Epilepsy Treatment.* **Aysim Cisen Akyol**, Hatice Karabulut, Songul Ulag, Banu Aydin, Rezzan Gulhan, Oguzhan Gunduz

15:05-15:20 – *Maple Functionalization of Medical Surfaces Based on Sustainable Natural Resources*. **Anita Ioana Visan,** Socol Gabriel, Rodica Cristescu, Gianina Pelin Popescu, Luiza Izabela Jinga, Consuela Elena Matei, Marcela Popa, Mariana Carmen Chifiriuc

15:20-15:35 – *The Structural, Morphological and Electrochemical Stability Characterization of Two Chromium Coatings Deposited on Zy-4 Alloy for Generation IV Reactors*. **Diana Diniasi,** Florentina Golgovici, Manuela Fulger, Ioana Demetrescu

15:35-15:50 – *Improving Corrosion Resistance of 310 H Stainless Steel Candidate for Generation IV Reactors by Deposition of Chromium Nitride Ceramic Layers*. **Aurelia Elena Tudose,** Ioana Demetrescu, Florentina Golgovici, Manuela Fulger, Alexandru Anghel, Oana Brincoveanu

15:50-16:05 – *Hybrid Alignment of Liquid Crystal for Higher Electro-optic Applications.* **Ashok Chaudhary**

16:05-16:20 – *Development of Janus Microbubbles with Varied Morphologies by the Effect of Different Solvents.* **Tugce Yesilyurt,** Sumeyye Cesur, Cem Bulent Ustundag, Oguzhan Gunduz

16:20-16:35 – *Functionalized Ferroelectric Coating of Potassium Sodium Niobate on Nickel Substrate by Using Electrophoretic Deposition Technique*. **Muhammad Salman Habib**, Muhammad Asif Rafiq, Adnan Maqbool,Huraira Hashim, Ali Raza, Mohsin Ali

16:35-17:00 – BREAK

17:00-18:45 – PLENARY SESSION (II)

Chairs – Domenico LOMBARDO, Ioana DEMETRESCU

17:00-17:30 – *Meniscal Tissue Engineering – A Novel Approach to the 3D Bioprinted Meniscal Implant.* **Jakub D. Rybka**

17:30-18:00 – *Global Warming Due to Biomaterials? Can Nanomaterials Be the Answer?* **Thomas J. Webster**

18:00-18:30 – *Intelligent Material Design.* **Marius Stan**

18:30-18:45 – Q & A Session

25 November 2022

10:00 - 12:00 – SESSION II. BIOMATERIALS FOR TISSUE ENGINEERING AND REGENERATION

Chairs – Viorel NACU, Lenuța PROFIRE

10:00-10:15 – *Vitamin E Particles Coated on PLA/PMS-MK Based Scaffold for Wound Healing.* **Nasma Anjrını,** Songul Ulag, Oguzhan Gunduz

10:15-10:30 – *3D-Printed Cardiac Patches Based on Fabrication and Characterization of Fucoidan Loaded Chitosan/Silk Fibroin/PANI Scaffolds.* **Armaghan Moradi,** Kudret Irem Deniz, Songul Ulag, Oguzhan Gunduz

10:30-10:45 – *Fabrication and Characterization of Electrospun Polylactic Acid/B-KerMA Nanofibers for Wound Dressing Applications*. **Zekiye Akdag,** Elif Nur Yildiz, Hilal Calik, Rabia Cakir Koc, Songul Ulag, Oguzhan Gunduz

10:45-11:00 – *Production and Characterization of Drug-Loaded Tissue Healing Fiber Dressing for Corneal Ulcer Treatment*. **Rabia Betul Sulutas,** Sumeyye Cesur, Elif Ilhan, Ewa Kijeńska-Gawrońska, Oguzhan Gunduz

11:00-11:15 – *Production of Biofunctional Wound Dressing for Wound Healing Applications.* **Kaan Danis,** Burcak Bulut, Sule Ilgar, Songul Ulag, Cem Bulent Ustundag, Oguzhan Gunduz

11:15-11:30 – *Keratin Loaded PVA/Silk Fibroin Electrospun Nanofibers for Wound Dressing Applications*. **Tufan Arslan Tut,** Sumeyye Cesur, Oguzhan Gunduz

11:30-11:45 – *Promoting Effect of Nano Hydroxyapatites and Vitamin D3 on the Osteogenic Differentiation of Osteoblasts and Bone Regeneration.* **Alexandra Avram,** Teodora Mocan, Aurora Mocanu, Gheorghe Tomoaia, Sorin Riga, Maria Tomoaia-Cotisel

11:45-12:00 – *Hydroxyapatite Functionalized with Essential Oils*. **Alexandra-Cristina Burdușel,** Robert Grigore, Ecaterina Andronescu

12:00-13:00 – LUNCH BREAK

13:00 - 15:30 – SESSION III. MATERIALS AND NANOMATERIALS FOR ANTIMICROBIAL AND ANTICANCER APPLICATIONS

Chairs – Cem Bulent USTUNDAG, Carmen CHIFIRIUC

13:00-13:15 – *Synthesis of PVA/Chitosan/Fucoidan Nanofibers for Skin Cancer Melanoma Treatment through Electrospinning Mechanisms*. **Eray Altan,** Songul Ulag, Oguzhan Gunduz

13:15-13:30 – *Fabrication of Chitosan/Collagen Membranes Coated with Polyvinyl Alcohol/ Amoxicillin Nanofibers for Dental Applications*. **Ayca Aydin,** Songul Ulag, Cem Bulent Ustundag, Oguzhan Gunduz

13:30-13:45 – *Investigation of Antimicrobial and Biofilm Properties of 3D Alginate/Polyethylene Glycol/Phenethyl Alcohol Scaffolds*. **Sena Nur Aslan,** Eray Altan, Songul Ulag, Oguzhan Gunduz, Gulgun Bosgelmez Tinaz

13:45-14:00 – *Fabrication of 3D Scaffolds with Antibacterial and Antibiofilm Properties for the Treatment of Chronic Wounds*. **Furkan Canli,** Turac Ozan Anilir, Yagmur Zeynep Demir, Sule Ilgar, Songul Ulag, Gulgun Bosgelmez Tinaz, Oguzhan Gunduz

14:00-14:15 – *Chicoric Acid of Taraxacum Officinale Leaves as a Potential Agent Against Glioblastoma*. **Ala Fulga**, Valeriana Pantea

14:15-14:30 – *Fabrication and Characterization of Antibiotic-Loaded GelMA Microneedle for Transdermal Drug Release*. **Huseyin Erkus,** Tuba Bedir, Oguzhan Gunduz, Cem Bulent Ustundag

14:30-14:45 – *Fabrication and Characterization of Naringenin-loaded Poly(Lactic Acid) (PLA) Nanofibrous Scaffolds.* **Zeynep Erdağ**

14:45-15:00 – *Miconazole and Neomycin Non-Pressurized Topical Spray*. **Neelam Pawar**

15:00-15:15 – *Magnetite Nanoparticles in Oncotherapy.* **Paul Adrian Tărăbuță,** Anton Ficai

15:15-15:30 – *Encapsulation of Anti-Cancer Drug (Tamoxifen Citrate) Conjugated with Magnetite Nanoparticle for Targeted Drug Delivery*. **Emmellie Laura Albert,** Dalila Alias, Che Azurahanim Che Abdullah

15:30 - 17:50 – SESSION IV. APPLICATIONS OF SMART MATERIALS

Chairs – Jorg OPITZ, Maria TOMOAIA-COTISEL

15:30-15:50 – *Emerging Biological Application of Smart Materials*. **Rupak Kumar**

15:50-16:05 – *Functionalized Mesoporous Silica Materials Loaded with Ferulic Acid*. **Gabriela Petrisor**, Ludmila Motelica, Denisa Ficai, Roxana Doina Trusca, Adrian Vasile Surdu, Georgeta Voicu, Ovidiu Cristian Oprea, Anton Ficai

16:05-16:20 – *The Coatings of Iron Oxide Nanoparticles using Polyethylene Glycol for Biomedical Application*. **Siti Nor Hanis Nor Halim**, Emmellie Laura Albert, Che Azurahanim Che Abdullah

16:20-16:35 – *Biogenic Synthesis and Optimisation of Gold Nanoparticles Using Roselle Extract for Biomedical Application*. **Nur Iffah Auni Mohamed**, Emmelie Laura Albert, Siti Nadiah Zulkifli, Che Azurahanim Che Abdullah

16:35-16:50 – *Plant Derived Triterpenoids as Potential Anticancer Agents*. **Nidhi Gupta**

16:50-17:05 – *Development of QCM-Based Biosensors by Determining Antibacterial Properties of Silver Nanoparticle Graphene Oxide Quantum Dots*. **Büşra Oktay**, Azime Erarslan, Ahmet Altindal, Cem Bülent Üstündağ, Esma Ahlatcioğlu Özerol

17:05-17:20 – *Management of Non-Melanoma Skin Cancer by Binding of Tretinoin Loaded Miceller Gel With α-β-γ Retinoic Acid Receptor*. **Navneet Mehan**, Manish Kumar

17:20-17:35 – *Eggshell Membrane as an Efficient Bioadsorbent for Removing Heavy Metal Ions from Wastewater*. **Hamza Badamasi**

17:35-17:50 – *Antimicrobial Effect of Silver Nanoparticles Applied on Stone Substrates.* **Liliana Marinescu,** Anton Ficai, Denisa Ficai, Alina-Maria Holban, Ovidiu Oprea, Roxana Trusca, Motelica Ludmila, Ecaterina Andronescu

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10:00 - 12:30 – SESSION V. MATERIALS FOR ADVANCED APPLICATIONS

Chairs – Oguzhan GUNDUZ, Maria GAVRILESCU

10:00-10:15 – *In Vitro Testing of Influence of Some Copper Coordination Compounds, Thiosemicarbaside Derivates on the Level of Malondialdehyde.* **Valeriana Pantea,** Evelina Lesnic, Sardari Veronica, Ala Fulga, Veaceslav Popa

10:15-10:30 – *Can High Entropy Alloys Be Used as Structural Nuclear Materials for Future Nuclear Applications?* **Radu Nartita,** Manuela Fulger, Ioana Demetrescu

10:30-10:45 – *Microparticle-Coated Microneedle Scaffolds for Transdermal Drug Delivery*. **Esra Pilavci,** Sumeyye Cesur, Oguzhan Gunduz

10:45-11:00 – *Piezoelectric Polymer-Based Electrospun Fiber Design for Advanced Arthritis Treatments*. **Beyza Topçu,** Elif İlhan, Dilek Kazan, Orkun Pınar, Oğuzhan Gündüz

11:00-11:15 – *Retinoids: New Approach to Decrease Their Side Effects While Increasing Their Effectiveness*. **Ioana Lavinia Lixandru (Matei)**

11:15-11:30 – *Eco-Friendly Magnetic Nanomaterials for Dye-Contaminated Aqueous Solutions*. **Iolanda-Veronica Ganea,** Alexandrina Nan, Calin Baciu

11:30-11:45 – *Morphological Changes of Human Erythrocyte During the Interaction with Deferoxamine. An AFM Study*. **Gertrud-Alexandra Paltinean,** Gheorghe Tomoaia, Sorin Riga, Aurora Mocanu, Maria Tomoaia-Cotisel

11:45-12:00 – *Low-Cost Adsorbent for the Removal Xenobiotic pollutant Morpholine: A Proof of Concept.* **Rupak Kumar**

12:00-12:15 – Development and Evaluation of Prednisolone Acetate Containing Polymeric Micelles Loaded In Situ Gel for The Treatment of Ocular Inflammation. **Nikita Kaushal**, Manish Kumar

12:15-12:30 – *Electrochemical Anodization as a Nanostructuring Tool for Biomedical Applications*. **Anca Mazare**, Patrik Schmuki

12:30-13:30 – LUNCH BREAK

13:30-14:30 – POSTER SESSION (II)

Chairs – Luigi CALABRESE, Radu Claudiu FIERASCU

1. *Ferrostatin Loaded Polylactic Acid/Tricalcium Phosphate Microparticles for Bone Tissue Engineering*. **Adrian Moraru,** Nicoleta Florina Labonc, Ana-Maria Pușcașu, Eray Altan, Songul Ulag, Anton Ficai, Oguzhan Gunduz
2. *Fabrication of Vitamin E Loaded 3D-printed Sodium Alginate/Xanthan Gum Scaffolds for Wound Healing Applications*. **Nicoleta Florina Labonc,** Ana-Maria Pușcașu, Adrian Moraru, Eray Altan, Songul Ulag, Anton Ficai, Oguzhan Gunduz
3. *Evaluating The Photo-Oxidation Effciency of an Organic Water Contaminant Through a Cost-Effective Ecotoxicity Method*. **Maria Paiu,** Lidia Favier, Raluca-Maria Hlihor, Mădălina Sîrbu, Maria Gavrilescu

4. *Assessment of the In Vitro Toxicity Induced by Rare Earth-Doped Phosphor Nanoparticles on Human Lung Fibroblast Cells*. **Sorina N. Voicu,** Ionela C. Voinea, Miruna S. Stan
5. *The Potential of Bee Products in Dermal Tissue Engineering*. **Corina Dana Dumitru**, Ionela Andreea Neacșu, Ecaterina Andronescu, Alexandru Mihai Grumezescu, Denisa Ficai
6. *Skin Regeneration: Highly Porous Materials and Their Properties*. **Daniela Alina Ionita,** Ecaterina Andronescu, Ionela Andreea Neacsu, Vasile Adrian Surdu, Alexandru Mihai Grumezescu
7. *Black Phosphorus-Based Materials for Bone Regeneration*. **Andra-Maria Sîrmon,** Ecaterina Andronescu, Ionela-Andreea Neacșu, Vasile-Adrian Surdu, Alexandru-Mihai Grumezescu
8. *Latest Research in Green Synthesis of Metal Oxide Nanoparticles Applied in Tissue Engineering.* **Denisa-Maria Radulescu,** Ecaterina Andronescu, Alexandru-Mihai Grumezescu, Ionela Andreea Neacsu, Adrian-Ionut Nicoara
9. *Latest Developments of Calcium Phosphate Synthesis from Natural Sources Applied in Bone Tissue Engineering.* **Diana-Elena Radulescu,** Ecaterina Andronescu, Alexandru-Mihai Grumezescu, Ionela Andreea Neacsu, Otilia Ruxandra Vasile, Adrian Vasile Surdu
10. *Antimicrobial Platforms Based on Natural Polymers for Drug Delivery Applications*. **Angela Spoială,** Cornelia-Ioana Ilie, Ludmila Motelica, Denisa Ficai, Roxana Doina Trușcă, Ovidiu Cristian Oprea, Anton Ficai, Ecaterina Andronescu
11. *Investigation of Universal Stress Protein from Mycobacterium Tuberculosis.* **Onyewuchi Njoku**
12. *Natural Polymer Based Hydrogels: An Accelerator in Wound Healing*. **Neeti Angaria**, Rajesh Kumar
13. *Incorporation of iron compounds in MCM-41 structure.* **Dan Adrian Vasile**, Ludmila Motelica, Ovidiu Oprea, Adrian Vasile Surdu, Roxana Trusca, Anton Ficai
14. *Relative Interdistance Distributions Between Er^{3+} And Yb^{3+} Dopant Ions in Some Crystal Matrix Hosts Used for Upconversion Luminescence*. **Liviu Dudas**

14:00-14:30 – CLOSING CEREMONY

Chair: Ecaterina ANDRONESCU

Book of Abstracts

Plenary Lectures

Contribution of Additive Manufacturing Techniques to the Design of Personalized Implants. Application to Reparative Hand Surgery

Cristophe Egles, A. Lerebours

CNRS Unit 6270, PBS: Polymères, Biopolymères et Surfaces, Université de Rouen Normandie, France

ABSTRACT

Osteoarthritis is a pathology causing degeneration of joint surfaces. In the particular case of the trapezio-metacarpal joint, osteoarthritis irreversibly deforms the trapezoid bone causing loss of mobility and loss of grip force coupled with pain at the base of the thumb. Conventional therapeutic solutions are not satisfactory with limited functional recovery resulting in a loss of quality of life for the patient. In the case of the hand, the customization of the implants seems to be relevant because of the great variability of the articular mechanical characteristics and the musculoskeletal characteristics.

This seminar focuses on the methodology for producing a patient-specific trapezo-metacarpal implant, based on the potential of additive metal fabrication technologies. More generally, it involves developing, analyzing and validating the stages of production of an implant with any complex geometry, from medical imaging to implantation.

Features of the Carbon Nanostructures Formation

Serguei V. Savilov, Anna D. Krot, Ekaterina A. Arkhipova, Stepan N. Kalmykov

Chemistry Department of M.V. Lomonosov Moscow State University

ABSTRACT

Carbon nanomaterials, e.g. carbon nanotubes, graphene, nanofibers, flakes, onion-like structures, have been extensively used in microelectronics, energy storage devices, sensors, chemical industry etc. Present work describes their main physicochemical features and stress the molecular nature allowed the surface modification by reaction, typical for organic substances. For most cases this fact is responsible for their application. Depending on the structure CNMs can be divided into one-, two-, and three-dimensional models. Anyway graphene planes play the important role within them. According to XANES (X-Rays Absorption Near Edge Structure) and EXAFS (Extended X-Ray Absorption Fine Structure) data this layered structure demonstrate the affinity to the Fe single-atoms that are intercalated during their formation and stabilized between the planes. It is also important, that even for the almost ideal structure of highly oriented pyrolytic graphite (HOPG) X-Rays photoelectron spectroscopy (XPS) show the difference between composition of the surface and bulk material. It is expressed in oxygen-containing surface groups, playing the key role for understanding the properties of carbon nanostructures. They provide intermediate or quasi-molecular position between solid state matter and molecule, allowing to combine their properties. Chemical properties are expressed in surface modification that mostly determined by surface groups. For most of applications the additional acidic treatment is required, which normally performed by nitric acid. Using carbon nanoflakes XANES and EXAFS technique show that only structural changes in Fe local environment occur during this procedure without affecting the oxidation state of the metal. This process began after prolongated treatment by the acid and leads to partial destroy of the fine layered structure. Even being finished, Fe atoms can be detected between the rest of the graphene structure.

The present study was funded by Russian Science Foundation, project 18-13-00217. Authors are grateful to Prof. Dr. Kristina Kvashnina and PhD Elena Bazarkina for their assistance in XAS measurements at the ESRF.

Environmental Contamination Assessment Using Nanomaterials: Sustainable Analytical Approaches

Bárbara Socas - Rodríguez[1,*], Ruth Rodríguez-Ramos[1], Álvaro Santana-Mayor[1], Adrián Conde-Díaz, Antonio V. Herrera-Herrera[2], Miguel Ángel Rodríguez-Delgado[1]

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ABSTRACT

Endocine disrupting compunds (EDCs) have gained special attention in the last yeards due to their negative effect on humans health. This group of contaminants are is constitute for a great variety of compunds including hormones, pesticides, platics additives, flame retardants, polychlorinated biphenyls, metals, etc. They present similar structures or moeties than endogenous compounds producing important disorders related to the endocrine system of mamalians organisms as for exampe developmental, reproductive, brain, immune, and other problems. However, limited scientific information exists on potential health problems in humans since people are ususally exposed to multiple endocrine disruptors at the same time through the diet, skin, water, so that, assessing public health effects is difficult[1].

Despite the lack of knowledge about the role and behavior of EDCs, it is known that those may be unsafe even at low doses, as it has been remaked by the European Union thought its Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) program[2]. For this reason it is esential that further studies were carried out to go deeper in this issue and novel analytical techniques more sensitive and robust were developed in order to guarantee the reliable assessmnet of this compounds in the enviroments.

Nanomaterials have been an important tool in field of analytical chemistry to perform efficient procedures that, in addition, accomplish the principles of sustainability of within the scope of Green Green Analytical Chemistry, the application of nanotechnology. The outstanding features of nanomaterials including their size-dependent properties and excellent surface activity, high mechanical, chemical, thermal, optical, electrical, or biological properties, simplifying the procedures, recuding times and costs which make them ideal to be used as sorbents in miniaturised extraction techniques[3].

In this work, different nanomaterials were appplied as sorbents for the extraction of endocrine disruptors from enviornmental matrices. Different sustainable analitycal methdologies were developed, validated and applied with this aim. Results, demonstrated the great efficiency of this materials and the their great versatility to be applied for the analisis of liquid ans solid samples.

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Meniscal Tissue Engineering – A Novel Approach to the 3D Bioprinted Meniscal Implant

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ABSTRACT

Our research focuses on 3D bioprinting, meniscus regeneration, tissue engineering, and most recently, COVID-19 diagnostics. Additionally, we are actively taking part in initiatives aimed at automating and roboticizing biotech labs. Our goal is to go beyond the realm of fundamental research and link scholarly discoveries with practical applications. To promote innovation in biotechnology, we work to forge strong alliances with both academic and commercial organizations.

The protection, cushioning, and stress distribution of the articular surface are all crucial functions of the knee meniscus. 66 to 70 meniscus injuries occur annually per 100,000 people, making them very common. The meniscus's ability to regenerate is somewhat modest due to its limited vascularization and is only available in its most vascularized outer areas. The most frequently used form of treatment is suturing or partial or complete meniscectomy. However, meniscectomy dramatically raises the contact pressure on the tibial plateau, which increases the risk of osteoarthritis (OA) later in life. In between 10 and 20 years following a meniscal injury, 50% of individuals experience OA. The mechanical characteristics of the meniscus should therefore be preserved or mimicked in ideal treatment solutions.

Using bioinks, which are mostly made of biocompatible hydrogels, 3D bioprinting enables the imitation of the spatial features of biological structures. Precision cell deposition is made possible by 3D bioprinting, which also offers ideal conditions for cellular development and proliferation. In contrast to monolayer cell cultures, this approach is appropriate for the production of several models that more accurately replicate the tissue environment. Additionally, 3D bioprinting as a component of cutting-edge tissue engineering techniques provides a way to restore an organ's physiological functioning without the use of artificial implants. Our main goal is to regenerate meniscus via 3D bioprinting.

Keywords: applied biotechnology, bionanotechnology, 3D bioprinting, tissue engineering, mesicus regeneration

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Global Warming Due to Biomaterials? Can Nanomaterials Be the Answer?

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ABSTRACT

Biomaterials are composed of some of the same materials as those used in non-medical applications (such as automobile, aerospace, consumer goods, etc.). While these other fields have moved away from using materials that are not environmentally friendly (such as those which contribute to greenhouse gases, are not environmentally degradable, have a large carbon footprint, etc.), the medical device community continues to use non-environmentally friendly plastics, metals, and other materials throughout medicine. This is despite the fact that numerous agencies have found that medical devices contribute to a large component of waste causing greenhouse gases. This is also despite the fact that plastics have been predicted to contribute 2.8 gigatons of CO2 emissions by 2050, up from 850 million metric tons of greenhouse gases in 2019 with only 16% of plastics currently being recycled. This presentation will highlight the current failures of the medical device industry in promoting the environmentally safe production as well as the use of products that can decrease greenhouse emissions. It will also highlight recent research on the use of natural nanomaterials as well as biodegradable nanomaterials for a wide range of medical applications. Most importantly, it will highlight that we need a paradigm shift in all fields, not just non-medical fields but most importantly in medical fields, to reduce greenhouse emissions to reduce global warming.

Intelligent Material Design

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ABSTRACT

Designing improved materials and processes requires a comprehensive evaluation of data and model quality. With the volume, variety and rate of data generation continuously increasing, human analysis becomes extremely difficult, if not impossible. In this talk, the concept of "intelligent software" is discussed. The software includes elements of Artificial Intelligence such as machine learning and computer vision, coupled with reduced-order modeling and Bayesian statistics. The value of the approach is illustrated using examples of material design at nano-scale for energy storage (battery electrodes) and electronics (computer memory). The results show that the intelligent machine learning algorithm reduces the electronic structure calculation time and effort by a factor of 10 – compared to Density Functional Theory (DFT) – while maintaining accuracy. The intelligent program finds the optimal inter-atomic potential and crystal structure in hafnia (HfO_2) leading to improved properties of the material. Furthermore, a discussion of current and future applications of AI demonstrates that the human-machine partnership changes science, technology and society for the better.

Poster Session (I)

Serum Malondialdehyde Level: Oxidative Stress Marker in Pulmonary Drug-Susceptible and Resistant Tuberculosis

Evelina Lesnic, Valeriana Pantea

ABSTRACT

The authors did not agree to publish their abstract.

Acoustic Properties of Bio-Polyol and Unsaturated Fatty Acid-Modified Fillers Enhanced Integral Skin Polyurethane Foams in Automotive Industry

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ABSTRACT

Under the aegis of unique properties, Polyurethane has always been an immutable material for plenty of industries. Polyurethane has numerous advantages namely; light weight, noise reduction, impact resistance, durability and cost efficient fabrication. Polyether based Integral polyurethane foam parts are widely used in automotive industry due to alpha plus performance in absorbing sound waves and transmission loss properties of material. Fillers play large role to enhance specific properties of materials and make the product profitable. As a filler Calcium carbonate ($CaCO_3$), is one of the most widely used filler in polymer industry because it is feasible, allows cost efficiency and improves mechanical properties. On the other hand, it is notable that when $CaCO_3$ is cooparetes with water, $CaCO_3$ particles prefer to aggregate during compounding with the polymer matrix due to hydrophilic nature of $CaCO_3$. In this study $CaCO_3$ particles were modified from hydrophilic to hydrophobic with oleic acid (monounsaturated omega-9 fatty acid) treatment to prevent agglomeration and increase dispersion quality of fillers in polymer matrix. Integral skin polyurethane foam synthesized with pentane compatible polyether polyol and %10wt rapeseed oil based biopolyol mixture. Acoustic properties of polymer matrix which contains %4wt Oleic Acid modified $CaCO_3$ and magnesium hydroxide ($Mg(OH)_2$) mixture is investigated and compared with polyurethane with no filler and polyurethane composite which contains non-modified $CaCO_3$ and $Mg(OH)_2$. Additionally FTIR, DSC and TGA of samples are investigated. Results revealed that polyurethane composite with oleic acid modified $CaCO_3$ and $Mg(OH)_2$ performed enhanced sound absorption and transmission loss properties instead of the rest of the sample groups.

The Integration of Oxide Nanoparticles with Carbon Materials for the Development of Nanocomposites with Applicability in Biotechnology

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ABSTRACT

Nanostructured composites based on carbonaceous materials and transition metals have become a topical area with multiple applications. Sensors based on nanomaterials offer a class of fast, reliable, selective, etc. detectors at a low cost. Additionally, carbonaceous materials have begun to be used more and more in the development of electrodes for various applications due to their unique structure and extraordinary electronic properties. These materials have a large surface area, significant mechanical strength, high electrical conductivity and efficient electrocatalytic activity. Yttrium oxide nanoparticles are chemically stable and have a narrow bandgap that allows electron transfer and provides excellent electrochemical sensitivity. It is well known that the attachment of inorganic nanoparticles on carbonaceous materials can inhibit aggregation and significantly improve the persuasive effect on electrochemical properties. When choosing a nanomaterial synthesis method, we must consider the quality of the obtained product (defined by the lack of defects or purity), the size, the porosity, the amount of the obtained product and the complexity of the method (required from the perspective of industrial synthesis). In this paper, the technological stages are detailed, which include: (i) the synthesis of yttrium oxide by using the sol-gel process based on acetyl acetone in the presence of dimethyl sulfoxide, ethylene glycol and non-ionic surfactant, stages of maturation, centrifugation, decantation, washing and the final thermal treatment at maximum temperature of 900°C; (ii) reduced graphene oxide using Hummer's method, which involves the oxidation of graphite with sulfuric acid solution in the presence of sodium nitrate and potassium permanganate; (iii) the integration of oxide nanoparticles with the carbonaceous material through an ex-situ method. The developed materials were analyzed from the morphological and structural point of view using FTIR and Raman spectroscopy, SEM microscopy and the wetting capacity was determined by contact angle goniometry.

Keywords: Y_2O_3-RGO, nanocomposite, yttrium oxide, reduced graphene oxide

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Influence of Process Parameters for Biogenic Synthesis of Zinc Oxide Nanoparticles

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ABSTRACT

The development of nanoparticles based on plant extracts attracted special attention due to their ability to improve the quality of life, by human health protection and low effect on the environment. Biogenic method is considered an alternative approach due to the presence of naturally reductants from the extracts with major effect on physio-chemical characteristics, toxicity and stability of nanoparticles. ZnO is a multifunctional material, which has demonstrated their effectiveness in combating multidrug-resistant bacteria and preventing the formation of biofilms, improved durability, high UV absorption capacity and good photocatalysis.

This paper presents an efficient and eco-friendly method for the synthesis of ZnO nanoparticles from aqueous extracts of aerial parts of Hibiscus rosa-sinensis (from *Malvaceae family*) and Echinaceea (from *Asteraceae family). Zinc acetate dihydrate (*$Zn(CH_3COO)_2$ $2H_2O$) was used aa source of Zn^{2+}, and the extracts of leaves/flowers petals were used as reducing and stabilizing agents.

In our study for the synthesis of ZnO NPs, a rigorous control of the process parameters (such as the concentration of zinc salt, stoichiometric ratio between the ionic salt and extracts, pH, time and temperature of the reaction medium) was performed. The properties of the synthesized materials by FESEM microscopy, EDX analysis, X-ray diffraction (XRD), FTIR and RAMAN spectroscopy were examined. SEM and XRD studies showed the spherical morphology and crystalline nature of ZnO NPs with the size in the range of 18-35 nm, depending on the extract used. Also, the EDX analysis indicated a maximum elemental distribution of zinc and oxygen. The FTIR and RAMAN spectra confirmed the presence of Zn-O bonds and various functional groups from the extracts used for the fabrication of ZnO NP.

The results demonstrated the synergetic effect of parameters on the physico-chemical properties of ZnO NPs, with the impact on technological performances with a considerable potential of applicability in materials science, biomedical, biotechnology, food and environmental industry.

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Composite Systems for Bone Tissue Regeneration

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ABSTRACT

The authors did not agree to publish their abstract.

Application of Phosphate Materials Enhanced with Different Metals with Potential Antimicrobial Properties on Different Types of Bricks

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ABSTRACT

A universally known lesson is that nothing lasts forever. Based on this idea, any object belonging to the cultural heritage, movable or immovable, is subject to degradation. The causes are multiple, uncontrollable such as natural phenomena or controllable such as anthropogenic factors. With the aim of slowing down or stopping the degradation of cultural heritage, numerous scientific fields have been developed in the research and development of different materials to preserve and conserve these objects to prevent destruction or irreparable damage. Following this direction in the last decade, numerous consolidating materials have been developed to achieve the desired goal, with different costs and different degrees of difficulty in obtaining them. A general conclusion reached was that the consolidating material must be easy to synthesize, cheap and as effective as possible without affecting the heritage objects. These criteria are fulfilled by the phosphatic materials, more precisely by hydroxyapatite, which is one of the best representatives of this class. After numerous studies, it was concluded that the properties of hydroxyapatite are improved if it is substituted with different heavy metals and if the granules of the obtained compound are on the nano scale [1-4].

In this study, we synthesized different apatite materials substituted with different metals in different molar ratios by co-precipitation method. Confirmation of obtaining the compounds of interest was based on different analytical methods: XRF, XRD, FTIR, and the antimicrobial properties were verified by qualitative and quantitative tests. In order to verify the efficiency of the materials obtained on different inorganic supports, we manufactured different types of bricks on which we applied the synthesized compounds and performed color tests and multiple freeze-thaw cycles.

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Application of Phosphatic Nanomaterials on Polluted Water Decontamination – Case Study

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ABSTRACT

For several decades, water pollution is considered one of the most serious problems that the entire world is facing. Some heavy metals are persistent in the environment, causing long-term health risks to humans and ecosystems. Unlike the organic pollutants, these types of contaminants are toxic and not biodegradable [1]. The development of new and cost-effective materials for water remediation represents a great challenge these days. Phosphatic nanomaterials, such as apatitic materials, showed good results in water remediation, due to their large specific surface area and environmental compatibility [2].

For this case study, two samples of water, raw and pretreated one in a wastewater treatment plant, were analysed through several analytical methods. Also, it was tested the hydroxyapatite's adsorption capacity on both water samples.

The results suggests that the apatitic material can be used in an integrated water treatment technology, acting both as a potential adsorbent towards the pollutants, as well as a final technological stage, in which the pollutants can be further diminished to reach the legally required levels.

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Film-Forming Properties of Different Starch Products Available on The Romanian Market

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ABSTRACT

In the last years different sources of starch have been studied in order to substitute the polymers derived from fossil sources. Biodegradable films that based on polysaccharides presents interest because of the specific characteristics and different film-forming properties depending on the starch source [1]. Other factors that influence the decision regarding the replacement for synthetic packaging material are the cheap price and frequency in nature [2]. As replacement in the food packaging industry, starch can have different applications such: plastic films, sheets or eventually substitute plastic foams. Starch-based films are odorless, taste-free, with good physical-chemical and mechanical properties [3].

The purpose of this study was to evaluate the film-forming properties of the commercial starches present on the Romanian market compared with the native corn starch. Solvent casting technique was performed to prepare the starch-based films with similar content of glycerol as plasticizer.

The obtained films were characterized in terms of morphological changes, physical-chemical and optical properties. The thickness, moisture adsorption, migration tests and water solubility of the films were determined by the methodology described in Narasagourdr S.S. et al. study [4]. The light transmittance and the opacity of the films were recorded using a spectrophotometric method, with air as the background correction, in the range of 200–800 nm. Water vapor permeability (WVP) was measured according with the protocol described by Liu F. et al. [5]. Fourier-transform infrared spectroscopy (FITR) analysis was carried out to in order to view the structural interactions among glycerol and starch molecules.

Results showed that the light transmittance and the opacity of films were similar. The thickness (0.175 mm), moisture adsorption (5.49 %) and WVP (0.445 g.mm/ m^2.h. kPa) of the corn starch films had smaller values than those obtained for potato or tapioca starch films. Among the three types of starch tested, native corn starch can be easily used in the food packaging industry due to its film-forming properties and it can be produced in large quantities in a highly controllable process, at a relatively low price.

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Evolution of Pollen Grains after the Application of Nanomaterials

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ABSTRACT

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Development and Optimization of Nose-To-Brain Delivery of Thermoreversible In Situ Gel Incorporating Aripiprazole Loaded Nanostructured Lipid Carriers

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ABSTRACT

Development of Aripiprazole (ARP) loaded Nanostructured Lipid Carriers (NLCs) thermoreversible *in situ* intranasal gel has been done for the management of Schizophrenia. Nose-to-brain administration has received a lot of attention recently as a non-invasive way to deliver drugs to brain tissue while bypassing the hepatic first pass metabolism and blood brain barrier. The blood brain barrier can potentially be penetrated by drug-loaded NLCs to treat brain diseases. The investigation was focused on development and optimization Thermoreversible *In situ* gel incorporating Aripiprazole loaded Nanostructured Lipid Carriers. The high-speed homogenization method was used to prepare Aripiprazole loaded Nanostructured Lipid Carriers. The 3^2 full factorial design was chosen to optimize the particle size and entrapment efficiency of NLCs by selecting Tween 80 as a Surfactant and Stearic Acid and Castor oil as solid lipid and liquid lipid respecively. The Aripiprazole loaded NLC thermoreversible *in situ* gel was prepared using Poloxamer 407 as phase transition agent and Carbopol 940 and PVP K30 as mucoadhesive agents. The prepared batches Z1- Z9 were further characterized for PS (Particle Size), % EE (% Entrapment efficiency) and % CDP (% cumulative drug permeation) studies; results of these parameters were found to be 150 nm, 93.41± 1.34 % and 75.45 ± 1.22 % respectively. The optimized Aripiprazole NLC formulation was characterized using DSC (Differential Scanning Calorimetry) and TEM (Transmission electron Microscopy) studies. Thermoreversible *In situ* gel was characterized using *ex vivo* drug permeation study, gelation temperature and gel strength; results of these parameters were found to be 67.21±0.97 %, 30 .1±1.01°**C** and 40±1 s respectively. It is concluded that the prepared thermoreversible *In situ* gel incorporating Nanostructured Lipid Carriers system has an excellent potential to be used as a delivery carrier for Aripiprazole.

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Current Review of Nanocarriers in Cosmetic Science

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ABSTRACT

In the creation of cosmetic sciences, nanotechnology finds new uses for formulation and nanocarriers. The use of conventional delivery systems has been superseded by novel nanocarriers such as liposomes, niosomes, nanoemulsions, and solid lipid nanoparticles. In order to manage the conditions of ageing, wrinkling, hair damage, inelasticity in the skin associated with ageing, and distributed hyperpigmentation, nano-sized cosmeceuticals have been extensively exposed for skin, nails, hairs, and lip care. Because they increase product effectiveness and customer happiness, nanocarriers have a significant impact on the cosmetics sector. It improves and promotes skin penetration, regulated and sustained medication release, higher stability, site-specific targeting, and dramatically increases the skin's ability to hold onto active ingredients in cosmetics for an extended period of time. It describes the advantages as well as any possible health and environmental dangers. In order to encourage the use of these products, this review aims to give readers an overview of nanocosmetics and how they are used in the cosmetics industry. Doing so may help them understand the advantages and potential dangers of using these products continuously and over an extended period of time.

Keywords: Nanotechnology, Cosmeceuticals, Nano-carriers, Nanoemulsions, Toxicity

pH-Sensitive Controlled Release Nanostructured Lipid Carriers of Prednisolone Acetate as Ocular Drug Delivery System Development: *Ex Vivo* Transcorneal Permeation and *In Vivo* Ocular Irritation

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ABSTRACT

Development of nanostructured lipid carriers (NLCs) for the treatment of ocular inflammation in order to overcome the limitations of topical administration, such as poor patient compliance, low stromal permeability, and significant adverse effects, increase precorneal residence time and efficacy, and control drug release at the target site. The aim of the studies was to create a nanostructured lipid carrier system of prednisolone acetate for ocular delivery. High pressure homogenization was used to create drug-loaded nanostructured lipid carriers. The entrapment efficiency, particle size, *in vitro* Precorneal permeability, *ex vivo* transcorneal permeation, and *in vivo* Ocular Irritation of the nanostructured lipid carriers formulations (PSA-NLCs1 to PSA-NLCs1) were all evaluated.A pH-sensitive PSA-NLCs loaded carbapol *in situ* gel was developed using an optimized nanostructured lipid carriers formulation (PSA-NLCs3) with the smallest particle size of 96.8 nm, the lowest polydispersity value of 0.186, the highest entrapment efficiency of 85.930.43%, and a cumulative percent drug precorneal permeation of 96.38±0.13% in 12h. When compared to market preparation and pure drug suspension, the optimized *in situ* gel (PSA-NLCs G4) demonstrated improved *ex vivo* transcorneal permeation, displaying 86.46±0.45% permeation with zero-order kinetics (r2 = 0.998) through goat cornea. Spherical NLCs trapped in the gel matrix were discovered using transmission electron microscopy. A number of trials demonstrated the gel formulation's hydration capabilities, non-irritancy, and safe handling features. A pH-sensitive controlled release ocular formulation capable of transporting the medication to the eye via topical delivery was successfully developed for the treatment of ocular inflammation.

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Review on Antimicrobial Natural Compounds: Open-Source Alternatives Against Antibiotic Resistant Bacteria

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ABSTRACT

The beginning of the last century also meant the beginning of the antibiotic era [1]. The "antibiotic" term was used for the first time in 1941 by Selman Waksman which he describes as a small molecule made of a microbe that antagonizes the evolution of the other microbial species [2]. The antibiotics represents the foundation stone of the modern medicine [3]. Among the first antibiotics discovered were salvarsan, prontosil and penicillin [1]. Today, these antibiotics and their successors have become almost useless due to the antibiotic resistance. It often happens that medical systems, even modern ones, are paralyzed by bacterial resistance. Thus, the permanent development of different antimicrobial defense mechanisms and strategies are required [3].

The main objective of this review is to present alternatives of antimicrobial natural compounds.

A promising, largely untapped source of antibacterial compounds is the chemical repertoire of plants. In the golden age of antibiotic discovery, medicinal plants did not interest researchers [4]. Compared to drugs obtained synthetically, antibiotics from plants have a higher degree of accessibility, lower toxicity, possess a potent activity, structural varieties and present different ways of acts. Natural antibacterial compounds impose themselves in front of multiples classes of antibiotics used in clinic, including β-lactams, tetracyclines, aminoglycosides and polypeptides [5].

The global spread of antibiotic-resistant pathogens has led researchers to search for new antibiotic candidates. Essential oils (EO) are known as antibacterial compounds with a wide spectrum of action, able to cross the bacterial cell membrane. Whether used alone or in combination with antibiotics, essential oils are effective against pathogens [6]. Essential oils as *Melaleuca alternifolia* (tea tree), *Rosmarinus officinalis* (rosemary), *Eucalyptus obliqua* (eucalyptus), *Lavandula angustifolia* (lavender), *Coriandrum sativum L.* (coriander), *Cuminum cyminum L.* (cumin), *Brassica nigra* (black mustard) could be used in medicine as natural alternatives to combat some pathogenic bacteria such as *Escherichia coli*, *Staphylococcus aureus*, *Salmonella Typhi*, *Citrobacter koseri*, *Micrococcus luteus*, *Listeria monocytogenes* or *Bacillus cereus* [7, 8].

According to the literature, resveratrol is a bioactive compound with antimicrobial potential. With low toxicity, antibacterial activity, antioxidant, cardioprotective, anti-diabetic, anticancer and antiaging properties, resveratrol can be an ideal candidate in food industry, as additive food. This polyphenolic compound was identified in many plants among which peanut, amole, senna or rhubarb [9].

Another example of the bioactive molecules with antibacterial and anti-infective properties are represented by quinine and artemisinin. These compounds were used to treat malaria [10, 11].

Due to the properties such as biodegradability, biocompatibility, non-toxicity, adsorption, antioxidant, humectant and antimicrobial activity, the chitin and chitosan biopolymers could be involved in tissue

engineering, wound healing, cosmetics or drug delivery applications. Antibacterial and antifungal activity recommends using of these biopolymers in biomedical applications. [12, 13]

The golden era of the antibiotics will come to the end if the researchers will not be able to found permanently new alternatives for replacement of the antibiotics which became ineffective over the time [1]. In the development of new antimicrobial strategies, the plants represent the most prolific source for natural antimicrobials. Internalization of the bioactive compounds into nanocarriers represents a viable and sustainable solution for therapeutic applications in the near future [7].

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Weathering Evidences Of The Banloc Castle (Romania)

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ABSTRACT

The authors did not agree to publish their abstract.

Session I. Advanced Techniques for Material Design and Synthesis

Nanostructured Photocatalysts Integration in Composites for Environmental Applications

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ABSTRACT

Human activities pollute the environment in many ways; several organic residuals originating from highly toxic pollutants can be found in water, consisting a serious health and environmental issue. Heterogeneous photocatalysis using TiO_2 and ZnO based semiconductors is a method for generating free radicals •OH using atmospheric air instead of O_3 or H_2O_2, significantly reducing processing cost. The process takes place in ambient conditions and leads to the complete decomposition of both liquid and gaseous pollutants. The greatest advantage of this method is the use of an environmentally friendly catalyst which is widely available, inexpensive, non-toxic, photo-stable with respect to other photocatalysts is readily available and readily regenerable for the purpose of reuse, maintaining equally high performance for a large number of catalytic cycles. Many studies have shown that titanium dioxide (TiO_2) is the most potent semiconductor for the oxidative destruction of organic compounds. The disadvantage of photocatalysis when the semiconductor is used in the form of a powder is the need to remove it after the end of the treatment. For this reason, worldwide efforts are focused on photocatalytic systems, where the catalyst is used in the form of a film on inert substrates to eliminate the stage of powder removal. The photocatalytic efficiency increases with effective surface area, and consequently a nanostructured photocatalyst is beneficial. The present contribution reports on recent fabrication of immobilzed photocatalyst composites. It should be noted that although there are several reports on 3D structures for novel environmental applications, there are only a few, in which custom-made filaments (with nanoparticles of inorganic materials into a polymeric matrix) are used in combination with FDM technology, for photocatalysis.

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Improving Corrosion Resistance and Biocompatibility of GO/Ser Modified Ti_6Al_7Nb Alloy by Electrophoretic Deposition

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ABSTRACT

The authors did not agree to publish their abstract.

Fabrication of Electrospun Polylactic Acid/Polyhydroxybutyrate/Silk Fibroin Nanofibers to Obtain Retinal Nerve Fiber Layer

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ABSTRACT

Retinal tissue consists of neural networks in the inner layer of the eye and is the region where the optic nerves connect to the brain. It affects directly visual ability. There are nerve fibers that caring blood tissues in their structure and support vision. These structures may be damaged by external factors or genetic reasons. The properly supported and repaired structures can be obtained by tissue engineering methods. In this study, polylactic acid/polyhydroxybutyrate/silk fibroin nanofibers were fabricated with the electrospinning method. PHB and Silk Fibroin were used to provide biocompatibility to the fiber structure. SEM was used for observing the morphological properties of the nanofibers. The biocompatibility properties of the Polylactic acid/Polyhydroxybutyrate/Silk Fibroin nanofibers were tested with mesenchymal stem cells (MSCs). Additionally, the mechanical properties of the fibers also were analyzed to determine the mechanical strength of the fibers. The degradation and swelling behaviors of the scaffolds were also examined *in vitro* conditions.

Keywords: Electrospinning; nanofibers; poly(lactic acid; polyhydroxybutyrate; retinal nerve fiber; silk fibroin.

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Ethosuximide-Loaded Alginate/Polyethylene Oxide 3D-Printed Scaffolds for Epilepsy Treatment

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ABSTRACT

A chronic medical disease known as epilepsy typically causes spontaneous, unprovoked repeated seizures that have an impact on a variety of mental and physical activities. The majority of epilepsy patients can manage their seizures with medical treatment. More than one-third of patients who do not receive adequate benefit from oral antiepileptic drug therapy continue to have seizures. It is considered as a proper option to design local drug release to the focal area of the brain where the seizure occurs in order to reduce side effects of antiepileptic drugs and to increase therapeutic efficacy by providing higher and more effective doses to the seizure focus. This study concentrates on polymer-based implants, which are polymeric devices loaded with AED and designed for implantation at the seizure focus to provide gradual, prolonged release of AED directly into the area of the brain responsible for seizures. Ethosuximide, an antiepileptic drug used in the treatment of absence seizures, was chosen as the active ingredient in this study. With 3D printing, implantable scaffolds consisting of Alginate and polyethylene oxide polymers and containing the active substance ethosuximide were produced. The properties of drug-containing polymeric scaffolds were investigated by SEM analysis, and their chemical and thermal properties were analyzed using DSC and FT-IR, respectively. The drug release of the scaffolds was tested *in vitro*. In this study, human neuroblastoma cell line, SH-SY5Y (CRL-2266™, ATCC) was used for toxicity analysis.

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Maple Functionalization of Medical Surfaces Based on Sustainable Natural Resources

Anita Ioana Visan, Socol Gabriel, Rodica Cristescu, Gianina Pelin Popescu, Luiza Izabela Jinga, Consuela Elena Matei, Marcela Popa, Mariana Carmen Chifiriuc

ABSTRACT

The authors did not agree to publish their abstract.

The Structural, Morphological and Electrochemical Stability Characterization of Two Chromium Coatings Deposited on Zy-4 Alloy for Generation IV Reactors

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ABSTRACT

The authors did not agree to publish their abstract.

Improving Corrosion Resistance of 310 H Stainless Steel Candidate for Generation IV Reactors by Deposition of Chromium Nitride Ceramic Layers

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ABSTRACT

Due to its high corrosion resistance, the 310 H stainless steel has been selected as candidate material for Generation IV reactors, especially for construction of the internal components of a supercritical water-cooled reactor (SCWR).

Although this type of steel exhibits a high corrosion resistance, it becames susceptible to sigma phase precipitation after prolonged exposure in water at supercritical temperature (550°C, 250 atm). One of the ways to improve the performances of this alloy is the application on the surface of ceramic layers by various deposition techniques.

In this paper, to improve the corrosion resistance of 310 H stainless steel, CrN_x layers with different thicknesses were deposited on the surface of this alloy by Thermionic Vacuum Arc (TVA) technique. The CrN_x coating microstructure and morphology have been investigated by scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX) and grazing incidence X-ray diffraction (GIXRD) methodes. Electrochemical tests such as linear polarization and electrochemical impedance spectroscopy (EIS) were also performed to assess the corrosion susceptibility and protective character of the CrN_x coating. According to the corrosion parameters from the potentiodynamic polarization tests, the 310 H SS sample coated with a CrN_x thicker layer had more protective character and showed a better corrosion resistance than the sample coated with a thinner layer or uncoated sample, a conclusion highlighted by the EIS method as well.

Keywords: corrosion resistance, stainless steel, CrN_x coating, TVA method, SEM, EDX, GIXRD, EIS

Hybrid Alignment of Liquid Crystal for Higher Electro-optic Applications

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ABSTRACT

A nano-sculptured thin film of lead sulphide is fabricated by glancing angle deposition method using physical vapour deposition process [1]. We have obtained an anisotropic morphology with this film which deliver an orientational effect. This motivate us to check the effect of this film on the alignment of the liquid crystal materials [2-3]. Here, a hybrid aligned liquid crystal device has been fabricated. In liquid crystal device preparation, where one side used this prepared sculptured thin film and other side used a polyamide coated thin film substrate. Later these thin film substrates assembled in antiparallel manner. It has noticed that in prepared device a very nice alignment, good extinction and high contrast realized. We have found a remarkable effect on the physical properties of the liquid crystal by prepared device with this technique. We have obtained 60% transmittance thru the prepared device. A faster switching response time 1.2ms (ON) and 19ms (OFF) receive for the device. Consequently a very lower Frederick's transition threshold i.e. 0.3V and higher contrast 25.9 dB (400:1) is achieved in the fabricated device. Thus, present work will open a new door for fast liquid crystal device with good quality alignment.

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Development of Janus Microbubbles with Varied Morphologies by the Effect of Different Solvents

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ABSTRACT

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Functionalized Ferroelectric coating of Potassium Sodium Niobate on Nickel substrate by using Electrophoretic Deposition Technique

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ABSTRACT

Electrophoretic deposition technique is well known eco-friendly process for substrate coatings with colloidal particles by using the electric field. The cost affecting processing for depositing functional ceramics $K_{0.5}Na_{0.5}NbO_3$ thick film on Ni substrate by using the EPD technique. The film thickness ranges from ~10-116µm was successively obtained by varying voltage and coating time. Thick films were densified by sintering at 1115℃ for 1 hour. X-Ray Diffraction revealed the formation of pure perovskite structure of KNN thick film.

Atomic force microscopy revealed the roughness, fineness of grains, and 3D topography of KNN thick films on Ni substrate. The scanning electron microscopy technique indicated that dense and uniform microstructure was obtained by EPD coating. The Corrosion Test revealed that KNN coatings substrate can be used in biomedical applications because of the bio-friendly nature of KNN and due to low corrosion current. The work will replace the use of lead-based thick films for applications like sensors, actuators, and especially capacitors for energy storage applications and pressure sensors and this work will also promote the use of KNN based coated materials in biomedical applications because of high chemical inertness and biocompatibility with human tissue.

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Session II. Biomaterials for Tissue Engineering and Regeneration

Vitamin E Microparticles Coated on 3D Polylactic Acid (PLA)/Polymethylsilsesquioxane (PMSQ) Scaffold For Wound Healing Applications

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ABSTRACT

Skin is an important part of integumentary system and the excretory system, which can be injured and healed by the own body cells by having complex biological processes which generally needs 4 to 6 weeks according to injury type which differ according to etiology into surgical, penetrating, blunt, burn wounds, although,the depth of wound, severity, skin integrity and the degree of contamination plays a role in duration of wound healing. On the other hand other factors effect, some of this factors are local facors like oxygenation, infection, foreign body, venous and sufficiency, some of them are systemic factors like Age, gender, sex hormones, stress, ischemia, diseases (diabetes, uremia, obesity), medications (anti-inflammatory drugs, chemotherapy), Alcoholism, smoking, and Nutrition. For faster healing processes, 3D printed scaffolds were fabricated and coated with microparticles on its surface. In this study, PLA/PMSQ 3D printed scaffolds were fabricated and coated with vitamin E microparticles. Ethyl cellulose (EC) was mixed with vitamin E and used to load the vitamin E on the scaffolds by using electrospray device. PLA was used due to its desired properties of being biocompatible and providing controlled release of functional drugs and supplements. PMSQ was mixed with it due to its high hydrophobicity and prevents agglomeration and maintains free-flowing characteristics in loose-powder products. EC was used as barrier to deliver vitamin E microparticles and assist releasing of vitamin E process on the skin due to its hydrophobicity, lipophilicity and non-toxicity properties. Vitamin E was used because of its occlusive effect that provides penetration of the vitamin on the skin, and its chemical stability. The mechanical, thermal, chemical properties and morphological analysis of the vitamin E coated PLA/PMSQ scaffolds were examined. The drug release behaviour was tested in vitro and the biocompatibility test was done using MTT assay with fibroblast cell line.

Keywords: Electrospray; PLA; PMSQ; wound healing; vitamin-E; 3D printing.

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3D-Printed Cardiac Patches Based on Fabrication and Characterization of Fucoidan-Loaded Chitosan/Silk Fibroin/PANI Scaffolds

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ABSTRACT

The incidence of cardiovascular diseases has increased dramatically in the past decay, making it the deadliest disease nationwide. The emergence of engineered cardiac tissues has broadened the spectrum of potential therapies based on biopolymer scaffolds; therefore, the ability to control and localize 3D-printed cardiac patches has provided a desirable and feasible approach for drug delivery. This study has focused on printing a novel 3D scaffold with different biopolymers, including Chitosan, Silk Fibroin, and PANI. In addition, Fucoidan, which has shown a promising therapeutic impact on all phases of cardiovascular diseases, such as an anti-inflammatory response, has been loaded into the hydrogel to boost the scaffolds' efficacy. Moreover, the biocompatibility, chemical, thermal, morphological, mechanical, swelling and degradation properties were applied to investigate the scaffold's characterization. The fabrication of chitosan 5%, silk fibroin 1%, and PANI 1 mg/3 mg with Fucoidan 10 mg demonstrated a favorable possibility for a functional 3D-printed cardiac patch.

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Fabrication and Characterization of Electrospun Polylactic-Acid/B-KerMA Nanofibers for Wound Dressing Applications

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ABSTRACT

The skin tissue, which is the largest organ of the human body, acts as a barrier by controlling the entry of water, temperature, pressure, and foreign substances into the body. However, in some cases, this integrity may be disrupted, and skin injuries may occur. In addition to the surgical methods for the healing of these wounds, it is possible to produce modern-tech wound dressings that are suitable for the wound area by imitating extracellular matrices using biomaterials to accelerate the healing process. Keratin, being the third most abundant polymer in the world, is a hard and fibrous protein. It is the main component of hair, feathers, wool, nails, and horns of mammals, reptiles, and birds. In addition, keratin wastes are an important source of renewable raw materials and it is important to evaluate the waste wool to increase its value addition. In this study, keratin methacrylate (B-KerMA) was synthesized by chemically modifying keratin, which is extracted with a high yield from white sheep wool, using 2-mercaptoethanol. B-KerMA, which shows higher biocompatibility and cell adhesion properties compared to keratin, was used for the first time as the main wound dressing material together with PLA. While 10% PLA is used as the control group in nanofiber production, different proportions of B-KerMA such as 1%B-KerMA, 5%B-KerMA and 10%B-KerMA were added to it. The morphological, thermal, chemical, and mechanical properties of the dressings were evaluated using SEM, DSC, FT-IR, and tensile testing, respectively. In vitro cell culture experiments were performed on fibroblast cells using the XTT method. As a result of characterization and in vitro experiments, it has been shown that B-KerMA increases the biocompatibility and cell adhesion of PLA electrospun fibers. However, according to the results, the B-KerMA ratio should be a maximum of 10% due to the decrease in biocompatibility and cell adhesion.

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Production and Characterization of Drug-Loaded Tissue Healing Fiber Dressing for Corneal Ulcer Treatment

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ABSTRACT

A corneal ulcer is an ocular defect caused by bacterial, fungal, and viral infections in the corneal layer of the eye. Tissue regeneration of this defect is difficult and slow. It also has a traumatizing effect on the cornea. In the medical literature, which has developed and progressed with nanotechnology, different nano-synthesis methods (electrospinning, electrospray, etc.) and drug combinations for treating of such corneal diseases can offer effective solutions in tissue repair in the long term.

In this study, drug-loaded layered nanofibers were fabricated to be used in the treatment of corneal ulcer disease by electrospinning method. These nanofibrous patches were obtained by mixing a certain ratio of PVA/gelatin (GEL) solution. After the nanofibers were produced as two separate layers loaded with fluconazole (FLU) and vancomycin (VAN) drugs in the electrospinning device, they were subjected to characterization tests.

SEM, tensile, and FT-IR tests were applied for the morphological, mechanical, and chemical evaluations of the nanofiber patches produced as PVA/GEL, PVA/GEL/FLU, PVA/GEL/VAN, PVA/GEL/FLU/VAN. SEM images showed, the effect of drug loading on the thickness of the fibers. The fiber diameter increased when the drug was added. On the contrary, according to the tensile test results, adding drugs to the fibers caused a decrease in the strength of the material against the tensile force. As a result of the FT-IR analysis, it was determined that the PVA/GEL was mixed and integrated very well with the drugs. The release of the drugs in the nanofiber patch was measured with a UV spectrophotometer. According to the release results, it was determined that the controlled drug release, which lasted up to 96 hours, was successful. An antimicrobial test was applied to evaluate the in vitro efficacy of active drug ingredients in the designed nanofiber patch against ulcer bacteria. It was observed that FLU and VAN drugs inhibited bacteria and formed a sufficient zone of inhibition around the patch. This proved that the mechanism of action of drugs could show antifungal and antibacterial effects against bacteria that cause corneal ulcers. MTT analysis was performed to measure tissue cell viability, cell proliferation, and cytotoxicity of drug-loaded nanofiber patches. Results showed no toxic effects of PVA/GEL/FLU, PVA/GEL/VAN, and PVA/GEL/FLU/VAN fibers on human cells. According to our results, drug-loaded nanofiber patches produced by the electrospinning method have the potential to pioneer many studies, especially in the treatment of corneal ulcers.

Production of Biofunctional Wound Dressing for Wound Healing Applications

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ABSTRACT

Daily life injuries occur because of minor or major accidents. The wounds can heal themselves quickly after good care and treatment and increase the patient's quality of life. In this context, wound dressings constitute an innovative and practical part of medical applications. Electrospining method provides high porosity and permeability to the wound dressing by means of nanofiber structures. With the electrospining method active ingredients can be integrated into the polymer structure. Polyvinyl alcohol (PVA) polymer used in this study is biocompatible and the formed nanofiber structure will increase the mechanical properties of the wound dressing with its high swelling capacity. In addition, the bacterial growth around the wound, which is one of the biggest problems in general wounds causing the area to have reduced healing rate, will be prevented by silver nanoparticle (AgNP) combined with graphene oxide (GO), which has been found to have an antibacterial effect by providing a synergetic effect [1]. Wounds heal as a result of a complex process. The first stage of wound healing is the stage that includes the accumulation of tissue fluids at the wound site, increased blood flow, and the inflammatory response that induces the proliferation of cells involved in the repair process. Therefore, the surface of the dressing that contacts the wound surface is very important.

It is aimed to support the epithelialization and aid in anti-inflammatory effect with these membranes. Alginate provides a moist environment and facilitates the movement of epithelial cells thanks to its high liquid absorption capacity in the healing process of the wound. The collagen cover leads to healing by providing the movement of the newly formed collagen. Collagenous biomaterials aid wound healing by recruiting macrophages and fibroblasts, promote wound maturation by forming a scaffold with mature collagen production [2]. With this membrane, the risk of infection of the wound and the possibility of leaving a scar will be prevented with herbal agents. The aloe vera and hypericum perforatum extracts are natural materials that have wound healing effects as well as keeping the wound surface moist. Hypericum perforatum plant supports epithelialization by accelerating blood flow and lowers the risk of infection with its antimicrobial effect [3]. An aloe vera is a natural structure that carries enzymes, amino acids and other active elements that increases wound healing process, with its gel consistency the migration of epithelial cells to the wound is increased and the healing is accelerated by the fluid transferred from the aloe vera to the wound area [4].

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Keratin Loaded PVA/Silk Fibroin Electrospun Nanofibers for Wound Dressing Applications

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ABSTRACT

Wound dressings play an important role in healing the infected wound. It accelerates the healing process by protecting the wound from external risk factors. There are various methods for wound healing. Along with the developments in medicine, treatment methods are also developing. One of these new methods is to provide wound healing by producing nanofibers with electrospinning method. Electrospinning, which is a technique that allows the production of nanoscale fibers using polymer solutions, is used in many applications for medicine, industry and engineering with its superior properties. Nanofibers produced by electrospinning technique have many advantages such as high porosity, controllable diameter structure, superior mechanical properties and high functionality. Various synthetic polymers and natural polymers can be used in electrospinning technique. The materials used in nanofiber production should have good biocompatibility, low toxicity and biodegradability properties.

In this study, a new approach for wound dressing applications is discussed by producing keratin-loaded polyvinyl alcohol (PVA), silk fibroin (SF) electrospun nanofibers with electrospinning method. Control group (without keratin), and containing 0.1% keratin nanofibers were produced by electrospinning method and various characterization tests were performed. By examining the SEM images of the produced nanofibers, the nanofibers were optimized at a distance of 12 cm from the collector, at a flow rate of 0.5 ml/hour and at 26 kV voltage parameters. For the characterization tests of the produced electrospun nanofibers, scanning electron microscopy (SEM) was applied for morphological analysis, tensile test to examine their mechanical properties, Fourier Transform Infrared Spectroscopy (FTIR) was used to analyse chemical bonds and functional groups of the nanofibers. In addition, in the release test to be performed with keratin-loaded nanofibers using UV spectrophotometer, the release profile of keratin, which increases structural durability and has a healing effect for wounds with its protein content, was observed.

Keywords: Electrospinning, Wound Dressing, Biomaterials, Silk Fibroin, Keratin

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Promoting Effect of Nano Hydroxyapatites and Vitamin D3 on the Osteogenic Differentiation of Osteoblasts and Bone Regeneration

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ABSTRACT

One of the most promising strategies in bone regeneration therapy is the development of composites with drug release capabilities, based on nano-hydroxyapatites, pure: HAP or multi-functionalized HAP: mf-HAP, that can transport active agents, like drugs and/or vitamin D3, to the bone more efficiently, increasing accumulation within the affected area and thus promoting the bone regeneration. In the present study, nano-hydroxyapatites/vitamin D3 composites were successfully synthesized by the adsorption method of vitamin on HAP or on mf-HAP particles, in the absence and the presence of lecithin. The proliferation and differentiation of osteoblasts were determined using MTT method, ALP activity, and Alizarin red staining. The simultaneous presence of nano biomimetic HAP and vitamin D3 led to the increased activity of ALP in the early stages (at about 2 weeks) and increased mineralization in the late stages (at about the 21st day). The results indicated that nano HAPs and vitamin D3 have a synergistic effect on the osteogenic differentiation of osteoblasts and bone regeneration.

Hydroxyapatite Functionalized with Essential Oils

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ABSTRACT

The authors did not agree to publish their abstract.

Session III. Biomaterials for Tissue Engineering and Regeneration

Synthesis of PVA/Chitosan/Fucoidan Nanofibers for Skin Cancer Melanoma Treatment through Electrospinning Mechanisms

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ABSTRACT

Fucoidan is an edible algae that has been recently discovered for its pharmacological activities such as anti-viral, antimicrobial, anti-thrombotic, anti-inflammatory and even anti-cancer properties. The aim of the study was to develop a Polyvinyl Alcohol (PVA) film which contained Fucoidan where we focused on its anti-cancer abilities for treating skin cancer melanoma. Up to now, melanoma has been treated by chemotherapy, surgery and radiotherapy but a new way to treat it should be found. We have tried five different solutions on electrospinning, the first one was the control solution with only PVA 13%, the second one was PVA 13% with Chitosan low molecular weight and finally the last one was with PVA 13%, Chitosan and Fucoidan (0.5g/0.1g/0.02g). Before using Chitosan, it was optimized so we got the best results (0.1 g). Once prepared the electrospinning films of each solution, their morphology was watched and were crosslinked at 60ºC for a posterior SEM analysis and effectivity testing. The best results were shown with Fucoidan solution (0.1g FUC + 13% PVA + 0.1g CS) as was proved a constant drug release that was not harmful for the body and reduced the melanoma action until treating it at least at all. By concluding the study we could say that there is more to investigate in this field even the results showed good results as the next in-vivo tests should be tested.

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Fabrication of Chitosan/Collagen Membranes Coated with Polyvinyl Alcohol/Amoxicillin Nanofibers for Dental Applications

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ABSTRACT

Periodontal diseases are responsible for the majority of tooth loss in adults. These diseases can be treated easily and successfully when diagnosed at an early stage. However, if left untreated, the gingival tissue surrounding the teeth recedes, exposing the tooth or tooth root. As a result of periodontitis, gaps form between the teeth and the gum line. Bacteria that will cause infection accumulate in these cavities and periodontitis may progress and cause irreversible damage to the gingiva and alveolar bone that supports the teeth.

Soft tissue regeneration is applied to prevent this situation. Autologous free gingival grafts and connective tissue grafts are used for soft tissue regeneration, usually by resorting to surgical procedures. However, removing these grafts from the palate is painful and time-consuming for the patient. At the same time, bleeding, pain, swelling and infection are usually seen after this procedure. However, while tissue scaffolds used for soft tissue regeneration support cell proliferation, they provide healing of damaged tissue. It increases patient and doctor comfort with the advantage of not having additional surgical procedures.

In this study, it is aimed to develop a dental membrane to support soft tissue regeneration by matching two different methods. Nanotechnology that enables the development of new systems and devices by contributing to the improvement of the properties of matter in physical, chemical and biological fields, was benefitted in one of these methods. Electrospinning method was used to obtain nano-sized fibers because it is simple, low cost, easy to apply, fast and suitable for commercial production. The another method is solvent casting, which is a quick and easy technique to obtain film.

The morphological properties of the surfaces was evaluated by scanning electron microscopy; thermal analysis was carried out with a differential scanning calorimeter device; intermolecular interactions were examined with fourier transform infrared spectroscopy; its antibacterial activity on *staphylococcus aureus*, *streptococcus mutans*, and *lactobacillus bacteria* were tested. The biological properties were carried out with fibroblast cell line.

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Investigation of Antimicrobial and Biofilm Properties of 3D Alginate/Polyethyleneglycol/ Phenethyl Alcohol Scaffolds

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ABSTRACT

Chronic wounds are an important health problem that affects a significant part of the population in developed countries, reduces their quality of life, and imposes a serious financial burden on health systems. More than 90% of chronic wounds are caused by biofilms. Biofilms are matrices made up of extracellular polymeric substance (EPS), which is formed by microorganisms, allows them to adhere to any surface or each other, and in which the forming microorganism is embedded. In biofilm formation, firstly, planktonic bacteria adhere to a surface within minutes and become more resistant to antibiotics, antiseptics, and disinfectants within 6-12 hours, and a mature biofilm colony is formed within 2-4 days, depending on the type of microorganism and growth conditions. The biofilm protects the microorganisms in it from the host's immune system and the effects of topical and systemic antimicrobial agents. Bacteria in the biofilm can be up to 1000 times more resistant to antibiotics than planktonic bacteria. The main reason for this high resistance is the inability of effective concentrations of antibiotics to pass through the EPS matrix and reach the bacteria in the biofilm. In addition, the metabolic rate of bacteria at the base of the biofilm is very low, the low metabolic rate significantly reduces the effects of antibiotics and increases antibiotic resistance. Recent studies show that biofilm development is the most important factor in the chronicity of wounds. It is reported that at least half of all chronic wounds contain biofilm. Several animal experiments have confirmed that biofilm formation in wounds delays wound healing. Therefore, new approaches for wound healing and prevention of biofilm formation are important in the treatment of biofilm infections. Therefore, this study, it was aimed to produce sodium-based 3D tissue scaffolds containing non-toxic and natural, plant molecules that prevent biofilm formation. Using 3D printers, PEG/sodium alginate scaffolds containing plant-derived molecules such as phenyl ethyl alcohol at different concentrations were produced. First of all, these scaffolds were characterized by Fourier Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscope (SEM), and mechanical analysis. Then, the antibacterial and anti-biofilm effects of the characterized scaffolds were tested on *P. aeruginosa* and *S. aureus* strains.

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Fabrication of 3D Scaffolds with Antibacterial and Antibiofilm Properties for the Treatment of Chronic Wounds

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ABSTRACT

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Chicoric Acid of *Taraxacum Officinale* Leaves as a Potential Agent Against Glioblastoma

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ABSTRACT

The *Taraxacum officinale F. H. Wigg* or *Dandelion* plays an important role in traditional medicine due to its anti-inflammatory, antioxidant and antitumor activities (1–4). Among different compounds like minerals, fibers, vitamins, essential fatty acids, polyphenols and flavonoids make it as a favorite food source which is used for treatment of different illnesses. Chicoric acid is an organic compound of phenylpropanoid class which protects the cells against free radicals damaging actions. Its effectiveness in case of tumors remains unclear. Glioblastoma represents one of the most dangerous malignant tumours; due to its specific localization and the existence of natural barriers we still have limited possibilities of treatment.

Keywords: *Taraxacum officinale* leaves, MTT test, glioblastoma, U-138, chicoric acid.

Aim of the study: to evaluate the influence of *Taraxacum officinale* F. H. Wigg (TOL) leaves extracts on glioblastoma cell line U-138 viability by MTT test, related to chicoric acid content.

Materials and methods: Dried leaves of TO were harvested in May 2017 from a natural habitat of Republic of Moldova. The raw material was desiccated in the laboratory at room temperature for 2 weeks and pulverized. The TOL powder was extracted by DMSO and ethanol of (20%, 50% and 80%).

The chicoric acid content (mg/ml) was determined by HPLC method (*Agilent 1260* Infinity *Diode Array Detector* (*DAD*)). The viability of human glioblastoma cell line U-138 MG (Cell Lines Service) was evaluated by colorimetric MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) test. The experiment was performed according to Mosmann's method (5). The action of TOL extracts were compared to Doxorubicin solutions of different concentrations (1.28 – 10^5 µg/L). The results were reported as percent of viable cells which survived after incubation with tested compounds. All assays were done in triplicate. The GraphPad Prism 8 Software (USA) was used to calculate the IC_{50} (the half maximal inhibitory concentration), as well the mean and standard deviation (M±SD). The correlation between tested compounds concentration and cells viability was evaluated by Spearman (r_s) assessment. The *p*-values equal or less than *0.05* were considered *statistically significant.*

This study was approved by the Research Ethics Committee of the *Nicolae Testemitanu* State University of Medicine and Pharmacy from Republic of Moldova.

Results: All TO extracts could suppress tumor's cells viability. The best activity was determined at the highest concentration of TO in extracts as follow: DMSO extracts of 110000 µg/L (18.57±4.54%, equal to 8.16 mg/ml of chicoric acid), TOL extracts on 20% of ethanol at 140000 µg/L (38.37± 2.05%, 23.8 mg/ml), on alcohol of 50% at 150000 µg/L (13.65± 3.2%, 35 mg/ml) and on ethanol of 80% at 40000 µg/L (16.12± 9.03%, 2.26 mg/ml). The correlation test between alcohol concentration and tumor cells viability did not reach a statistical significant level (r_s=-0.50, p=0.07). The Spearman test between chicoric acid concentration and cells viability resulted with strong, negative, statistically significant correlations: DMSO

– r_s=-0.96, p=0.0002, ethanol of 20% – r_s=-0.95, p=0.0001, 50% – r_s=- 0.76, p=0.01, 80% – r_s=-0.90, p=0.001,

The greatest inhibitory activity of Doxorubicin was determined in samples with highest concentration of 100000 µg/L (15.32±0.86%).

Conclusions: *Taraxacum officinale* leaves suppress glioblastoma cells viability. This action depends of type of extractant, plants' part and chicoric acid content. The most promising antitumor activity exhibited leaves extracts made in DMSO and ethanol of highest concentration. Further studies are needed to elucidate the mechanisms of TOL influence on the viability of tumors.

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Fabrication and Characterization of Antibiotic-Loaded GelMA Microneedles for Transdermal Drug Delivery

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ABSTRACT

Microneedle (MN) platforms are an important technology that increases the effectiveness of transdermal drug delivery by creating microchannels on the skin thanks to micron arrays. The traditional techniques used in the fabrication of MNs are quite complicated and only limited geometries can be fabricated with these techniques. In this study, we present the fabrication of antibiotic (amoxicillin-AMX)-loaded gelatin methacryloyl (GelMA) MNs via digital light processing (DLP)-based 3D printing technique as a transdermal drug delivery system. Thanks to the DLP approach, high-resolution MNs were prepared in a very short time and without geometric limitations. We investigated the morphological, mechanical, and swelling abilities of 3D-printed AMX-loaded GelMA MNs. Moreover, the drug release profile of MNs was studied *in vitro*. Morphological analyzes indicated that the obtained 3D-printed MNs were fabricated in a regular structure and in the desired geometries with sharp tips. Moreover, mechanical test results showed that AMX-loaded GelMA MNs have excellent mechanical properties consistent with 0.1 N/needle without breaking. According to the swelling test results, the swelling rate of blank GelMA MNs (~475%) was higher than that of AMX-loaded GelMA MNs (~394%). As well as AMX-loaded GelMA MNs exhibited an 80% burst release of AMX in the first 6 hours of incubation at the drug release test. These results supported that 3D-printed drug-loaded GelMA MNs are a beneficial platform for the transdermal delivery of therapeutics.

Fabrication and Characterization of Naringenin-loaded Poly (Lactic Acid) (PLA) Nanofibrous Scaffolds

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ABSTRACT

Cancer is a major threat to people's health and life worldwide. According to the data from the World Health Organization, cancer caused about 10 million deaths each day, and is one of the leading causes of death worldwide. Studies have shown that cancer cells proliferate faster in response to high levels of glucose. Agents that inhibit glucose uptake should decrease the proliferation of cancer cells. Flavonoids, polyphenolic compounds distributed widely in plant-based foods, exert diverse biological effects in cultured cells and in vivo. Flavonoids exhibit anti-inflammatory, antioxidant, anti-mutagenic, anti-cancerous, anti-proliferative, proapoptotic activities, enzyme modulating activities with minimal toxicity issues. The flavanone naringenin, abundant in grapefruit, inhibits glucose uptake in U937 monocytic cells and in 3T3-L1 adipocytes. Naringenin (4′,5,7-trihydroxyflavanone) (NAR) is flavonoid belonging to the class flavanone, predominantly found in grape fruit, bitter orange and other citrus fruits. It has very prominent pharmacological actions like antitumor, vasoprotective, antihypertension, antiviral, and antishockactions. Due to its anti-inflammatory, antioxidant, anticancer, antiallergic, photoprotective actions, naringenin is pertinent flavonoid for cancer treatment.

The use of natural compounds without undesired side effects, in tissue engineering applications, is highly preferred compared to chemical drugs. In recent years, many studies have been carried out to produce nanofibrous materials by electrospinning method. Electrospun nanofibers have very large surface area, controllable pore size and tunable drug release profiles. Several biocompatible polymers with excellent biocompatibility and biodegradability including poly ethylenglycol (PEG) and poly lactic acid (PLA) have been widely used for the synthesis of nanofibers using the electrospun technique.

In this study, nanofibers were obtained by adding of NAR at different concentration into PLA by electrospinning technique. Morphological (SEM), molecular interaction (FT-IR), thermal analysis (DSC), antioxidant activity, drug release and physical analysis were carried out after production process. The resulting structures of nanofibers are suitable for biomedical applications.

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Miconazole and Neomycin Non-Pressurized Topical Spray

Neelam Pawar

ABSTRACT

The authors did not agree to publish their abstract.

Magnetic Nanoparticles in Oncotherapy

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ABSTRACT

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Encapsulation of Anti-Cancer Drug (Tamoxifen Citrate) Conjugated with Magnetite Nanoparticle for Targeted Drug Delivery

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ABSTRACT

There is no specificity between chemotherapy drugs and the metabolic pathways of cancer cells. Therefore, it is necessary to apply targeted drug delivery utilising composite nanoparticles to overcome these disadvantages. Likewise, tamoxifen citrate (TAM) shares these disadvantages. TAM is a drug used to treat breast cancer. Current research suggests the use of magnetite nanoparticles (MNP) as anti-cancer drug carriers due to their biocompatibility, ultrafine size, and superparamagnetic characteristics. In this study, poly (d,l-lactice-co-glycolide acid) (PLGA) was used to encapsulate both MNP and TAM to create a nanoparticle with both the superparamagnetic properties of MNP and the therapeutic ability of TAM. MNP were produced using the co-precipitation technique. It was then coated with oleic acid (OA) to prevent aggregation, and its abbreviation was OAMNP. Using an oil in water emulsion evaporation technique, TAM-PLGA-OAMNPs (TAM-PLGA-OAMNPs) were formed with TAM using PLGA. The XRD pattern revealed that the MNP's crystalline phase is inverse spinel cubic of Fe_3O_4. After modification, FTIR spectra demonstrated that TAM had been successfully encapsulated in PLGA matrices. Using TEM, the particle size of TAM-PLGA-OAMNP is determined to be 131 ± 28 nm. The VSM analysis of TAM-PLGA-OAMNP revealed no hysteresis loop, indicating the absence of a superparamagnetic property. This project also includes a discussion of the optimal conditions for TAM-PLGA-OAMNPs colloid stability based on aggregation and sedimentation. Finally, the TAM released behaviour is investigated.TAM-PLGA-OAMNPs were released via biphasic phase released [1-2].

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Session IV. Applications of Smart Materials

Emerging Biological Application of Smart Materials

Rupak Kumar

ABSTRACT

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Functionalized Mesoporous Silica Materials Loaded with Ferulic Acid

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ABSTRACT

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The Coating of Iron Oxide Nanoparticles Using Polyethylene Glycol for Biomedical Application

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ABSTRACT

In the recent decades, researchers have been focusing on iron oxide nanoparticles (IO) due to their superparamagnetic properties, biocompatibility, and chemical stability. Studies has proven that IO can pose as good candidates for biomedical application including contrast agent for magnetic resonance imaging, targeted drug delivery, and magnetic hyperthermia. However, the biggest limitation for IO is the aggregation that causes the size to appear bigger making them challenging for biomedical application. The stratergies to overcome this problem includes coating IO with polyethylene glycol (PEG), organic polymer that are approved by Food and Drug Administration of the United States for clinical application. In this study, green synthesised IO was used to be coated with PEG using co-precipitation method. The green synthesised IO was obtained from synthesis using cocoa extract and roselle extract, which then were used for coating of PEG. The cocoa IO (CIO) and roselle IO (RIO) were added into PEG solution consisted of different concentrations, 100, 150 and 200 mg/ml, at various temperature of 40℃, 60℃, and 80℃. The mixture was stirred at different speed of 400, 600 and 800 rpm for varying period of 0.5, 1 and 1.5 hours. Taguchi design is used to assess and optimize the parameters used in the experiment to minimize the variation in order to obtail the best level of control factors. The PEG coated CIO (PEG-CIO) and PEG coated RIO (PEG-RIO) were charcterised using ultraviolet-visible spectroscopy and the results display that both CIO and RIO has been coated with PEG successfully.

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Biogenic Synthesis and Optimisation of Gold Nanoparticles Using Roselle Extract for Biomedical Application

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ABSTRACT

The authors did not agree to publish their abstract.

Plant Derived Triterpenoids as Potential Anticancer Agents

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ABSTRACT

Cancer is one of the leading cause of death worldwide. Natural products possess broad chemical diversity, have played and are continuing to play a highly significant role in treatment of different types of cancer and other infectious diseases. Triterpenoids are structurally diverse organic compounds obtained from squalene, C30 precursors through a series of intramolecular condensation reactions. They are mainly found in two main classes, tetracyclic and pentacyclic triterpenoids. Among the pentacyclic triterpenoids, ursane, oleanane, dammarane, euphane and lupane are the extensively studied triterpenoid classes that possess multiple biological activities. Some of the triterpenoids such as oleanolic acid, betulinic acid, betulin, lupeol, boswellic acids, maslinic acid and ursolic acids have been explored in recent past due to their anticancer properties. Anticancer mode of action studies of triterpenoids included inhibiting the NF-κB activation, angiogenesis, apoptosis, mitochondrial dysfunction and modulating MDR genes and proteins. Many of these pentacyclic natural products are in phaseI/II clinical trials for treatment of cancer. However, these isolated triterpenoids possess several problem associated with them such as low water solubility, less bioavailability and fast metabolism. To solve all these issues and to further improve the anticancer activity, several structural derivatives of triterpenoids have been developed by modifying the key functional positions available on these molecules. Two well known examples of synthetic derivatives of oleanolic acid, a pentacyclic triterpenoid are CDDO and CDDO-Me that possess potent anticancer effects compared to the parent molecule and have been entered into clinical trials against cancer. Also, a variety of dosage forms of these triterpenoids have been developed including cyclodextrin complexes, nanoparticles, phospholipid complexes, self-emulsifying drug delivery systems for further improving the water solubility and bioavailability thereby improving the patient compliance by reducing the dosage regimen. Therefore, triterpenoids possess remarkable potential for the development of anticancer agents having better efficacy and less side effects.

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Development of QCM-Based Biosensors by Determining Antibacterial Properties of Silver Nanoparticle Graphene Oxide Quantum Dots

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ABSTRACT

One of the most important problems growing in parallel with technological developments is the pollution of water resources by fungi and other bacteria. In recent years, materials with antibacterial capabilities have become more and more important to overcome this problem. Graphene oxide (GO) and other graphene derivatives with silver nanoparticles (AgNP), which is an effective biocide, can increase the antibacterial activity of silver in composite materials. Quantum dots are used for simultaneous and multiple detections of biomolecules between nanomaterials which have versatile features such as signal amplification properties, adjustable size, and electrocatalytic performance.

In this study, Graphene oxide quantum dots (GOQD) were synthesized and GOQD/AgNP combination was prepared. The structural properties of GO and GOQD were investigated using analytical techniques such as FTIR, Zeta sizer, and TEM. It was aimed to determine their antibacterial activities against bacteria such as Escherichia coli and Salmonella typhi. GOQD/Ag based biosensor results using the Quartz Crystal Microbalance (QCM) technique showed that good detection sensitivity for the bacterial contaminant in waters. Another important goal of the project is the development of biosensors for on-site and immediate detection of bacterial pollutants, especially in drinking water sources, beaches and swimming pools, etc., used by the majority of people. According to the results, QCM-based biosensors developed with GOQD/AgNP showed high antimicrobial activity against Escherichia coli (E. coli) and Salmonella typhi. QCM-based biosensors developed with GOQD/AgNP have led the way for on-site and instant detection of water with bacterial contaminants, leading to further studies.

Management of Non-Melanoma Skin Cancer by Binding of Tretinoin Loaded Miceller Gel With α-β-γ Retinoic Acid Receptor

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ABSTRACT

Micelles are colloidal carriers which contain hydrophilic shell and hydrophobic core in which core acts as reservoir for hydrophobic drugs and shell gives hydrophilic properties to the system. In drug loaded micelles tri-block copolymer i.e. Pluronic-F 127 was used and analyzed the ability to achieve target concentration. The study was aimed to investigate drug loaded polymeric micelles by Thin Film hydration method for topical delivery system and to enhance the permeation Tretinoin. The polymeric micelles were characterized by some parameters like, entrapment efficiency, particle size, *In-vitro* permeation, *Ex-vivo* skin permeation, *In-vivo* skin irritation, histology etc.

From all (F1-F12) formulations the formulation F with the lowest particle size of 83.12 nm, least polydispersity value of 0.230, highest entrapment efficiency of 98.44% and cumulative drug permeation of 96.33% in 10 h, was selected to develop pH-sensitive micelles loaded miceller gel for topical delivery. Five formulations (G1-G5) of miceller gel is prepared, a comparative *Ex-vivo* skin permeation study was done in between G1, F7, pure drug, and market preparation by using porcine skin. The optimized miceller gel proved to be superior in its *Ex-vivo* skin permeation with porcine skin and cell line study. TEM shown spherical polymeric micelles which is trapped in the gel matrix.

The experiments spectrum presented the hydration capability, non-irritancy, and histologically safe gel formulation that had appropriate handling characteristics. Finally, the sustain release topical formulation are capable to carrying drug into the skin via topical delivery was successfully developed for the treatment of non-melanoma skin cancer.

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Eggshell Membrane as an Efficient Bioadsorbent for Removing Heavy Metal Ions from Wastewater

Hamza Badamasi

ABSTRACT

The authors did not agree to publish their abstract.

Antimicrobial Effect of Silver Nanoparticles Applied on Stone Substrates

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ABSTRACT

Silver nanoparticles are well known for their improved antibacterial effect being used in medicine, biology, biochemistry, textiles, water treatment, electronic equipment, agriculture, construction fields. The sizes and shapes of silver nanoparticles lead to a specific efficiency and depending on these characteristics develop a high efficiency against the formation of biofilms. Based on their high antimicrobial effect silver nanoparticles can be proposed to be used in the stone treatment and thus can avoid the classic biocides application with high toxicity against human and environment. The potential applications of silver nanoparticles as the protective film or the impregnation of stone substrates shown an efficiency against the microorganism formation acting both in depth of their structure and onto their surface. This work studies and compare the antibacterial effect of various type of silver nanoparticles obtained by chemical routes and applied on different stone substrates, usually used in the construction buildings mainly for aesthetic aspect.

The present work aims to study the antibacterial effect of the synthesized silver nanoparticles on the travertine (T) and limestone (L) stones, usually used in the construction as décor elements. Stones are impregnated with a silanes coupling agent, 3 mercaptopropyl methoxysilane (3MPTMS) and treated with synthesized silver nanoparticles synthetized at room temperature (RT) and high temperature (HT) , to protect stone surface against aggressive climatic factors microorganisms and biofilms formation[1-3].The impregnated stones were investigated by FTIR, SEM EDAX and microbiological tests.

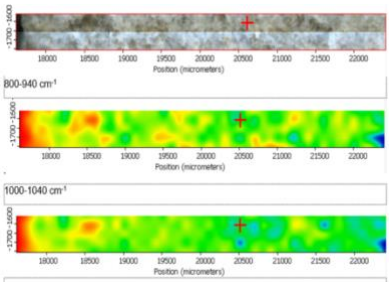


Figure 1 FTIR image of impregnated travertine with 3MPTMS

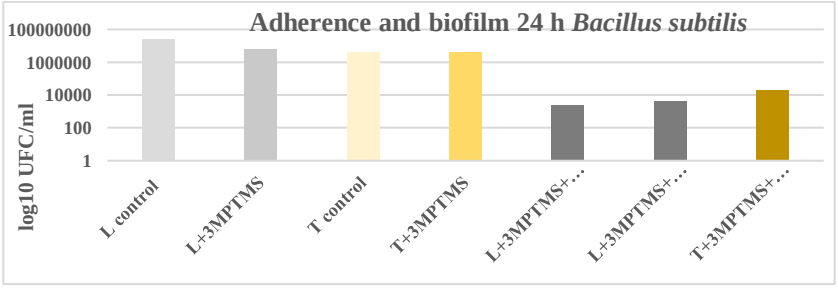


Figure 2 Adherence and biofilm for treated stones with 3MPTMS and AgNps

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Session V. Materials for Advanced Applications

In Vitro Testing of Influence of Some Copper Coordination Compounds, Thiosemicarbaside Derivates on the Level of Malondialdehyde

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ABSTRACT

New data were obtained on the molecular mechanisms of antiproliferative, antiinvasive, antiangiogenic, vasoprotective, antiatherogenic, antioxidant and anti-inflammatory action exerted by bioactive compounds. An increased interest is actually offered in the evaluation of the impact of the new copper coordination compounds (CCC) - thiosemicarbaside derivates. CCC showed important antitumoral properties, however their influence on the malondialdehyde level in the supernatant of human periferic blood by *in vitro* testing has not been studied.

The aim was to study the influence of the new copper coordination compounds, thiosemicarbaside derivatives, on the level of malondialdehyde (MDA) of the human periferic blood by the *in vitro* testing.

The influence of the new CCC, thiosemicarbaside derivatives, coded as CMA-18, CMC-34, CMD-8, CMG-41, CMJ-33 and doxorubicin (DOXO**)** in the doses of 10,0 μM/L and 1,0 μM/L was tested *in vitro*, according to the method developed by Atasayar S., et al. (2011), in our modification (2012) [1, 2]. The tested compounds CMA-18, CMC-34, CMD-8, CMG-41, CMJ-33 have been developed at the State University of Moldova in the Laboratory "Advanced materials in biopharmaceutics and technics" [3]. The influence of CCC and doxorubicin on the MDA level, was determined in the supernatant of human periferic blood by *in vitro* testing collected from 8 conventionally healthy individuals.

As results the research showed different changes exerted by the new CCC on the level of MDA in conventionally healthy individuals. The study revealed that the MDA level increased statistically significant by 29%-63% by the tested compounds CMG-41, CMJ-33 and DOXO, all in the dose of 10 μM/L compared with the control group, which denotes their prooxidant effect, MDA being the final product of the peroxide oxidation of lipids. The amount of MDA level decreased conclusively by 15%-41% under the influence of compounds CMA-18 (both doses), CMC-34-10 μM/L, CMD-8 (both doses) and CMG-41-10 μM/L, compared with doxorubicin, a drug widely used in the treatment of cancer. These results denote the antioxidant effect of the tested compounds, being much more effective than doxorubicin. Conclusions: the influence of studied CCC on MDA level was selective and differentiate. Larger studies are needed in the future to find out the main mechanisms of the CCC influence.

Keywords: copper coordinative compounds, supernatant of peripheral blood, malondialdehyde.

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Can High Entropy Alloys Be Used as Structural Nuclear Materials for Future Nuclear Applications?

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ABSTRACT

The fundamental shortcomings of present nuclear reactors will be addressed by future generations of nuclear reactors, such as Generation IV fission reactors and fusion reactors, which should be able to sustainably increase efficiency, decrease radioactive waste, and lower prices. Finding appropriate materials that can endure the severe environment to which they would be exposed in these types of reactors is the challenge at hand [1,2]. These reactors are anticipated to operate in substantially harsher conditions than present ones. The six, generation IV, systems are capable of operating at temperatures of at least 500 °C and up to 1000 °C. Besides this, exposure to radiation and coolants such as liquid metals, liquid salts or gas produces a particularly harsh environment in which the exposed material might degenerate through corrosion, stress, vibration, irradiation etc. Fusion reactors, on the other hand, encounter even tougher conditions, having neutrons with ten times more energy, compared with fission reactors, while some components have to face plasma temperatures and resist He embrittlement [2,3]. Atomic displacements, radiation-induced hardening, radiation-induced creep, material swelling, and stress corrosion cracking are the principal consequences of irradiation. [4]. However, amorphization is favored by HEA's compositional complexity and elevated atomic stress. Additionally, recombination is stimulated through the extended temperature spikes caused by the reduced electron-free pathways under particle irradiation. These processes are thought of as self-healing processes [5]. Heat dissipation and mechanical characteristics are enhanced by fostering the recombination and annihilation of defect mobility processes and defect formation. Particularly RHEAs are promising as they maintain their mechanical stability even at extremely high temperatures [3]. Fortunately, the discovery of HEAs opened up new avenues for material science research, which is rapidly expanding and has already developed auspicious materials.

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Microparticle-Coated Microneedle Scaffolds for Transdermal Drug Delivery

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ABSTRACT

Transdermal drug delivery system (TIDS), is a method in which drug release was provided through the skin. Microneedle is one of the tools of TIDS, which is placing micron-sized needles on the skin. Some 3D printers, such as Digital Light Processing (DLP) 3D printers, are useful tools to produce microneedles. TIDS can be strengthened by using materials sensitive to stimuli in order to provide drug release in a controlled manner.

In this study, microneedle production was made using a DLP 3D printer. The microneedles were coated with electrically active silver nanoparticles and drug-loaded polylactic acid (PLA) microparticles using the electrospraying machine. Characterization tests were performed on the microneedles. A scanning electron microscope (SEM) to view the morphology of microneedles, a fourier transform infrared (FTIR) spectrometer to learn about its molecular structure, a tensile device was used to determine the tensile strength, a differential scanning calorimetry (DSC) device to detect its thermal properties, X-ray diffraction to determine the crystal structure, swelling and degradation tests were carried out. An electrically stimulated drug release test was performed on microneedles. Microneedles were tested on bacteria to determine their antimicrobial property. As a result, microneedles were successfully coated with PLA microparticles and permitted drug release. The study proves the usability of microneedles coated with microparticles in stimulated drug release.

Keywords: Microneedle, Polylactic acid, microparticles, drug delivery

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Piezoelectric Polymer-Based Electrospun Fiber Design for Advanced Arthritis Treatment

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ABSTRACT

Arthritis is a prevalent disease that separated lots of types such as osteoarthritis, gout, psoriatic arthritis, rheumatoid arthritis, and ankylosing spondylitis. Autoimmune diseases are by a large effect on the whole body and are functional like this scale illness while skeleton systems. Joints are the center point of these conditions while literature is all over the world. While joint pain is seen in most of the movable joint types in this disease, it is mostly seen in the hand and foot joints and knee joints. With the increase of the inflammation between the joints over time, the severity of the pain increases, and the joint becomes useable. In this study, drug-loaded fiber was designed to prevent the destruction and damage of articular cartilage and bones. Considering that the Curmumin drug used in arthritis disease is an effective and naturally sourced Tumeric drug, nanofibers were loaded at different rates. PHB and PLA polymers, which are thought to be suitable for the proliferation of bone cells, were shot at three different rates of drug-loaded fiber by using the electrospinning technique at certain rates. While performing characterization tests of fiber design; Morphology, molecular structures, thermal properties, crystal structures, and tensile strength behaviors were checked using analysis and imaging techniques such as SEM, FT-IR, DSC, X-RAY, and mechanical tests. Briefly, a nanofiber design was made with the aim of preventing joint loss by repairing the destruction of the joints.

Keywords: Electrospinning, Polylactic acid, Polyhydroxybutyrate, Curcumin, Arthritis

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Retinoids: New Approach to Deacrease Their Side Effects While Increasing Their Effectivenes

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ABSTRACT

Topical retinoids have been a pillar of various therapies for various skin problems. However, on certain skin types, the potential side effects of retinoids (the "worse than better" effect, dryness, peeling, redness, etc.) can lead to the need to discontinue the therapy. Thus, taking into account the fact that retinoids are extremely beneficial in curing various skin illnesses, but they are not so easy to integrate in a therapy due to their side effects, the molecule that incorporates retinol impregnated in BioGlass is a novel delivery system that can help in decreasing side effects of retinoids while increasing their effectiveness. In association with retinoids, BioGlass has the capacity to reduce their side effects, ensures a long term application of retinoids without tissue damage, prevents irritations and ensures the usage of higher doses of retinoids.

Thus, in this study, I shall present the steps of the impregnation of microspheres for the BGR 0.3 molecule. To demonstrate the compliance of the cosmetic product, I made sure that it has been subject to a safety assessment based on the relevant information and that specific reports on the safety of the cosmetic product is drawn up.

Microbiological testing is therefore a vital aspect of the safety and quality of cosmetic products. In order to meet the regulatory requirements, such as those specified by the Cosmetics Regulation (EC) 1223/2009, the microbiological quality of cosmetics formulas must be tested before released. For the formula BGR 0.3, I selected an independent laboratory in Europe, which carried out tests to determine the purity of the formula. The purpose of the analysis is to search for and identify microorganisms:

- Specified and non-specified microorganisms;
- Candida albicans;
- Staphylococcus aureus;
- Escherichia coli;
- Pseudomonas aeruginosa;
- Specific organism microbiological analysis.

Moreover, the patch test is the first evaluation with humans of the final formula according to European regulation. For the patch test of the BGR molecule, I opted for the same independent European laboratory. The patch test required a unique application for 48 hours. Negative controls were used for evaluation purposes. Treatment sites were evaluated prior to the first application of the test material (baseline), after treatment at 30 minutes, after removal of the patch, and 24 and 48 hours after removal of the patch. The patch is applied to the skin for 48 hours. Skin reactions are noted throughout the test by the same experienced evaluator, a dermatologist, who performed the basic evaluation under the same light source, on a predefined rating scale. Skin irritation is quantified on a numeric scale (erythema, edema, dryness/desquamation, vesicles). The average irritant score of the tested product is calculated from the average of the reactions obtained from each volunteer. Thus, the product can be ranked from "non irritant to very irritant".

In conclusion, to ensure a high quality product and safety during use, clinical trials are required. Since the BGR 0.3 formula gets in touch with the skin, I followed a predetermined protocol in order to make sure that the formula will not cause clinical signs, discomfort sensations, etc. Thus, passing the formula through microbiological and dermatological tests, I was able to demonstrate its properties and compliance with the market in force, thus making it a viable dermato-cosmetic product for the current market.

Keywords: retinoids, vitamin A, retinol, side effects of retinol, skin.

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Eco-Friendly Magnetic Nanomaterials for Dye-Contaminated Aqueous Solutions

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ABSTRACT

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Morphologic Changes of Human Erythrocyte During the Interaction with Deferoxamine. An AFM Investigation

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ABSTRACT

The present research is focused on the AFM characterization of biological samples such as, human erythrocytes, in order to obtain information about changes that occurs when they interact with deferoxamine (DFO). This technique is non-invasive and allows a good visualisation of erythrocytes on glass substrates. AFM images are used to investigate the membrane surface topography of healthy erythrocytes and the changes that occurred during their contact with deferoxamine at different concentrations. The morphologic changes were investigated at scanning areas of 10 µm x 10 µm and 1 µm x 1 µm. The size of the cell and the depth of the concavity were evaluated. The formation of the nanostructure domain and the roughness are estimated depending on the concentration of DFO from 10^{-6} M and 10^{-5} M, to 10^{-3} M and 10^{-2} M. The more specific changes occur at a higher concentration of deferoxamine, 10^{-2} M, when pores and filaments were illustrated. Such research is necessary to reveal information regarding the mechanisms of drug action on the human cells.

Low-Cost Adsorbent for the Removal Xenobiotic Pollutant Morpholine: A Proof of Concept

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ABSTRACT

By products of industry, agriculture, house hold and nature now a days are recognized as resources for the removal of pollutants. The inside nature of these by-products are that it behaves as adsorbents having capacity or tendency to adsorb or cause to accumulate on a surface. This sustainable practice for the removal of dyes, heavy metals and organic pollutants has been well established with different adsorbents. Despite numerous low cost adsorbents, still it is necessary to explore the other cost effective on site sorbents for the removal of chemicals which has be used by the process industry. Morpholine and its derivatives is one such chemical which is broadly used in textile industry (lyocell process) and consequently significant amount of this chemical is also released via industrial effluents into environment. On the other hand fly ash, which is produced as waste from the textile plant, too has been used as an adsorbent for the removal of morpholine so that on site solution of both of the waste have been addressed through this approach. In this study, an attempt was made to make use of fly ash as a material to reduce the pollutant concentration mainly morpholine in the textile industries effluents. Proof of concept has been adopted by adsorbing 1 gm of dried fly ash with 20 ml of 0.5% morpholine followed by centrifugation at room temperature. The supernatant is later lyophilized and undergone successive washing with MeOH. Gas Chromatography (GC) was run against positive control with this adsorbent supernatant (1:10 dilution) to estimate the morpholine to be adsorbed or left out. GC analysis revealed that morpholine is adsorbed on adsorbent with 99% retention in first wash. It clearly shows that almost complete adsorption of morpholine i.e., 1gm adsorbent completely adsorbed 0.5% morpholine at overnight incubation. This prospective solution for environmental sustainability is achieved through the waste route is considered as one of the cleaner, greener and safer, way of waste management practices for decontaminating wide range of pollutants and its mitigation.

Keywords: Morpholine and its derivatives, Fly ash, Gas Chromatography, Environmental sustainability, Waste management

Development and Evaluation of Prednisolone Acetate Containing Polymeric Micelles Loaded *In Situ* Gel for the Treatment of Ocular Inflammation

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ABSTRACT

Development of polymeric micelles have been done for the treatment of allergic Uveitis. It also lessens the disadvantages of topical insertion, which involves poor patient adherence, poor absorbance in stroma and many more adverse effects. The investigation was focused at creating a polymeric micellar system of Prednisolone Acetate for Ocular Drug Delivery. Thin Film Hydration method was used for preparing polymeric micelles. The evaluation of polymeric micelles formulations was done for checking various parameters like entrapment efficiency, micelle size, *in vitro* permeation, *ex vivo* transcorneal permeation, *in vivo* ocular irritation and histology. Optimized micelles formulation (PA3), with the lowest micelle size of 90.31 nm, least polydispersity value of 0.158, highest entrapment efficiency of 96.0 ± 0.17%, and a cumulative drug permeation of 85.12 ± 1.26% in 8h, was selected to develop pH-sensitive micelles loaded Carbopol in situ gel. The Optimized in situ gel (A4) proved to be superior in its *ex vivo* transcorneal permeation when compared with Market Preparation and pure drug suspension, exhibiting 42.32 ± 0.87% Permeation with zero-order kinetics (r^2 = 0.9944) across goat cornea. Transmission Electron microscopy revealed spherical polymeric micelles trapped in the gel matrix. A series of experiments showed hydration capability, non-irritancy, and histologically safe gel formulation that had appropriate handling characteristics. For the treatment of uveitis, a controlled release, pH-sensitive ocular formulation that can administer the medicament via topical application to the eye's anterior segment has been created.

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Electrochemical Anodization as a Nanostructuring Tool for Biomedical Applications

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ABSTRACT

Nanoscale surface modification of titanium and its alloys are a well-developped research field due to its influence on governing cell fate, with improved biocompatibility and corrosion resistance [1]. Electrochemical anodization results in different TiO_2 nanostructures, depending on the anodization conditions used (electrolyte composition, anodization potential, temperature, etc.), such as compact surface oxide layers, nanopores, nanotubes, mesosponge layers [1]. TiO_2 nanotubes (NTs) have a well controlled surface (nanoscale) morphology, high aspect ratio and high surface area, harvesting functionality, etc. [1–3], and were shown to elicit specific cellular response, as a function of the tube diameter size [1].

NTs based biomedical applications include osseointegration, mitigation of the inflammatory response, antibacterial activity, or applications such biosensors or drug delivery [1,2,4–6]. Typically, nanotubular layers have a closed-packed configuration [5], however nanotubes with a distinct spacing from top to bottom can be grown in specific anodization conditions (generally in organic electrolytes using dietylene glycol, dimethyl sulfoxide, etc. [7]). We have recently shown that the lateral spacing of NTs induces differences in the pre-osteoblast behavior with higher capacity of larger spacing nanostructures to enhance the osteogenic differentiation [8], as well that the nanotube's intertube spacing can influence, to a different degree, the macrophage in vitro response (cell proliferation, actin cytoskeleton organization, cell fusion, and inflammatory cytokine/chemokine secretion) [9].

Here we show the key aspects for tailoring anodization conditions and NT morphology for targeted biomedical applications, for example for their interaction with osteoblast cells or stem cells in vitro tests or for drug delivery applications

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Poster Session (II)

Ferrostatin-Loaded Polylactic Acid/Tricalcium Phosphate Microparticles for Bone Tissue Engineering

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ABSTRACT

The authors did not agree to publish their abstract.

Fabrication of Vitamin E Loaded 3D-printed Sodium Alginate/Xanthan Gum Scaffolds for Wound Healing Applications

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ABSTRACT

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Evaluating the Photo-Oxidation Effciency of an Organic Water Contaminant through a Cost-Effective Ecotoxicity Method

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ABSTRACT

The presence of emerging pharmaceutical pollutants in environmental compartments is today of a major global concern. Indeed, several of these molecules are disposed in unchanged form or as active metabolites in high percentages and are continuously discharged into the aquatic environment. The study of the contamination of aqueous environments with emerging organic pollutants, such as residual molecules of pharmaceuticals, is of great relevance because of the negative impact on both the development of living organisms and ecosystems and on human health. Most active pharmaceutical compounds are highly stable, have very high mobility in the environment, because of their low hydrolysis and poor biodegradability under different environmental conditions. Since many wastewater treatment plants are not able to remove them with good efficiency, these pollutants remain in the treated effluents and are released into the aquatic environment where they can bioaccumulate in plant and animal tissues. Thus, the present study aims to investigate the efficiency of applying a photocatalytic process based on the use of TiO_2_La/UV-A system for the degradation and removal of toxicity generated by the oxidation of an emerging pharmaceutical contaminant from aqueous solutions. The targeted compound considered in this research is cetirizine (CTZ), a drug used in the treatment of allergies and urticaria, identified in the literature as persistent. For the photocatalytic investigation, lanthanum-doped titanium dioxide was used as catalyst. Special emphasis was placed on investigating the toxicity of the photo-treated CTZ solutions, in order to analyze a possible environmental impact generated by the photocatalytic process. Therefore, a series of preliminary phytotoxicity tests were performed using seeds of a higher plant species, named *Lepidium sativum*, to investigate the likelihood of a possible environmental impact of the photocatalytic treated solutions. Such an approach is necessary to be considered because of the presence of reaction intermediates in the treated solutions, which in some cases may be more toxic than the parent compound. The data obtained showed that the untreated solution (containing 10 and 30 mg/L of pollutant) causes an inhibition of both seed germination and radicle and leaf length, which is possibly due to the recalcitrance of pollutant and its toxicity. Also, the ecotoxicological results obtained after the application of the photocatalytic process, after an irradiation time of 5h and 8h respectively, showed a significant ecotoxicological improvement for the CTZ-treated solution, confirming that the photocatalytic treatment considerably reduces the toxicity of the reaction intermediates.

Keywords: persistent pollutants, photocatalysis, phytotoxicity, *Lepidium sativum*

Assessment of the In Vitro Toxicity Induced by Rare Earth-Doped Phosphor Nanoparticles on Human Lung Fibroblast Cells

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ABSTRACT

The fluorescence of rare earth-doped nanoparticles can be used as a powerful tool in the field of bioimaging grace to their specific properties, such as high tissue penetration depth, quantum yield and signal-to-noise ratio. In the last years, there was an increased interest of researchers to test these nanoparticles for tumor therapy, but few studies concerning their biocompatibility were developed. In this context, we aimed to evaluate the toxicity exerted by $BaSO_4$:Eu phosphor nanoparticles, which can be purchased from Sigma-Aldrich. Non-tumoral fibroblasts from human lung (MRC-5 cell line) were selected for the present study, being incubated with these barite ($BaSO_4$) nanophosphors up to 72 hours. None of the concentrations tested (up to 200 µg/mL nanoparticles) reduce the number of viable cells compared to control, as it was measured by MTT assay. The same result was also established by the double staining of viable and dead cells with calcein AM and ethidium homodimer, respectively. A slight increase of nitric oxide level released by cells into the media after the incubation with nanoparticles was observed compared to control, showing that no significant inflammation was induced during the 72-h incubation. However, the increased fluorescence intensity of lysosomes staining by LysoTracker Green DND-26 in a time- and dose-dependent manner suggested a possible sequestration of the Eu-doped barite particles in these organelles in order to be degraded by cells. In conclusion, our in vitro study showed only a slight toxicity of the BaSO4:Eu phosphor nanoparticles on human lung fibroblasts, proving their good potential for applying in various biological applications. Acknowledgements: This research was funded by UEFISCDI, grant number PN-III-P1-1_1-TE-2021-1375 (no. 81TE/2022).

The Potential of Bee Products in Dermal Tissue Engineering

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ABSTRACT

The authors did not agree to publish their abstract.

Skin Regeneration: Highly Porous Materials and Their Properties

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ABSTRACT

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Black Phosphorus-Based Materials for Bone Regeneration

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ABSTRACT

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Latest Research in Green Synthesis of Metal Oxide Nanoparticles Applied in Tissue Engineering

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ABSTRACT

Over the years, the application of nanotechnology in the materials science domain has widely increased due to their facile application in the pharmaceutical (cancer therapy, tissue repair, drug delivery, etc) and environment fields (photodegradation, detection of pollutants and toxins, remediation and water treatment). Thus, nanoparticles (NPs) are one of the most researched materials as they exhibit unique features due to their nanometric morphology. Related to their application in the biomedical field, metal oxide NPs can be easily incorporated into scaffold fabrication, due to their capacity to enhance the antioxidant, antibacterial, anticarcinogenic or antifungal effects of the developed material. The most well-known metal oxide NPs that have a wide range of applicability in soft tissue engineering and wound healing are platinum (Pt), silver (Ag), gold (Au), nickel (Ni), palladium (Pd), copper (Cu) and zinc (Zn) nanoparticles. These NPs can be developed through many routes of synthesis such as conventional (chemical or physical methods) or green synthesis methods.

Nevertheless, the main concern about the synthesis route of metal oxide nanoparticles is represented by the environmental impact. Physical and chemical synthesis are the most highly used routes. Their main disadvantage is the use of toxic precursors that could exert carcinogenicity and environmental toxicity. Green synthesis method comes as a solution to counter these limitations, by using reagents and non-toxic precursors such as bacteria, yeasts, fungi, plants, and algae. The extracted biomolecules and phytochemicals from plants are the key active compound that acts as stabilizing and reducing agents for nanoparticle formation. Furthermore, these active molecules could reduce toxicity, prevent nanoparticle agglomeration, and improve the antimicrobial activity of the developed scaffold, leading to a potential synergistic effect.

The aim of this study is represented by the successful synthesis of copper and zinc oxide nanoparticles by using green synthesis routes. In this direction, orange peel has been used as a capping and reducing agent for both types of nanoparticles.

Latest Developments of Calcium Phosphate Synthesis from Natural Sources Applied in Bone Tissue Engineering

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ABSTRACT

Bone tissue engineering has progressed extraordinarily considering materials synthesis, application techniques, and cell engineering due to the increased demand in the medical field. The main goal in this domain was to improve the treatment of bone defects without applying autologous bone grafts. Until this moment, the perfect material to simulate natural bone regeneration has not been yet obtained. In this regard, multifunctional nanomaterials with improved biological properties gained great interest in the biomedical field. An example is represented by calcium phosphates due to their similarity with the natural osseous tissue, biodegradability, biocompatibility, chemical stability, and osteoconductivity. Even though there are many advantages of these materials, there are still some drawbacks associated with these materials, such as poor mechanical properties needed for remineralization, particle size, and morphology issues on drug delivery and brittleness for bone transplantation.

Recently, a unique and effective strategy for developing functionalized biomaterials with complex structures from natural origins has been proven. Hence, bovine/fish bones, seashells, and eggshells have shown an ideal potential in obtaining hydroxyapatite with increased availability to enhance orthopedic applications. The obtained materials were proved to retain various properties from the precursor materials, such as chemical composition, and pore structure. As for the functionalization method, material doping has been the perfect solution to improve the surface properties of the material. The synthesis of doped nanostructured materials with multifunctional properties and improved biocompatibility has huge potential for biomedical applications. One of the main characteristics of hydroxyapatite is its structural capacity to accept many ionic substitutions, which grants it new features. Numerous studies have investigated the extrinsic dopant substitution in hydroxyapatite to improve its chemical and physical features, functional properties, and biological performance *in vivo* or *in vitro*. For example, Mg prevents hydroxyapatite crystallization, necessary for bone formation, and decreases bone fragility. This dopant can replace ~1% Ca^{+2} ions, presenting similar properties to bone tissue. Further, Zn disturbs the stability of the solution, inhibiting bacterial colonization, but also regulates inflammatory mediators. Another dopant, Sr inhibits bone resorption, promotes osteogenesis, activates signaling pathways, and regulates cell behavior. This study intends to present the optimum synthesis method of calcium phosphates using natural sources, which can be further applied in medical applications without affecting the human body. Moreover, the possibility to enhance the obtained materials with different dopants has been also investigated to improve the antimicrobial potential of medical applications.

Antimicrobial Platforms Based on Natural Polymers for Drug Delivery Applications

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ABSTRACT

For the past few decades, antimicrobial platforms based on natural polymers have been extensively designed for multipurpose applications, especially in the biomedical sector [1]. Alginate is a natural water-soluble polysaccharide extracted from brown seaweeds, including *Laminaria digitata*, *Laminaria japonica*, *Ascophyllum nodosum*, and *Macrocystis pyrifera*. Alginate has significant biological functionalities, such as biocompatibility, biodegradability, nontoxicity, and mucoadhesivity, which offer great potential as an adequate candidate for therapeutic approaches [2, 3]. Literature showed great interest in developing alginate-based nanoparticles. The gel form of alginate has been used due to its capability to adsorb and incorporate various bioactive compounds while providing an optimal environment for drug delivery processes [4]. Due to their antibacterial, antifungal, antiviral and anti-inflammatory effects, silver nanoparticles were intensively studied in biomedical applications such as diagnosis, treatment, medical devices, drug delivery systems, and wound dressings [5].

This study aimed to develop natural polymeric platforms as drug delivery systems for bioactive compounds through casting technology. The synthesized platforms were characterized by Fourier Transform Infrared (FTIR) spectroscopy, scanning electron microscopy (SEM), complex thermal analysis and water absorption capacity.

Keywords: natural polymeric platforms, antimicrobial nanoparticles, drug delivery systems, casting technology

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Investigation of Universal Stress Protein from Mycobacterium Tuberculosis

Onyewuchi Njoku

ABSTRACT

The authors did not agree to publish their abstract.

Natural Polymer Based Hydrogels: An Accelerator in Wound Healing

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ABSTRACT

The authors did not agree to publish their abstract.

Incorporation of Iron Compounds in MCM-41 Structure

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ABSTRACT

Mesoporous materials are a class of porous materials which date from relative short time, with more precisely said from the last decade of the twenty century. The development of this materials has a big rise due to their interesting properties of absorbtion and release capacity, controllable porosity, versatile availability of surface modification [1].

MCM-41 was synthesized via a wet method using ethanol-water as media, ammonium hydroxide as pH regulator, cetyltriammonium bromide (CTAB) as template and various silica sources [2]. To incorporate iron compunds two different ways were used: First through injection of a solution containing iron salts as precursors in the structure of MCM-41 and, the second one, to put magnetic nanoparticles functionalized with palmitic acid (MNP-AP) and functionalized with citric acid (MNP-AC) before the adding the silica source, tetraethyl orthosilicate (TEOS). The samples with iron incorporated through first method, was put at calcination to form iron oxide(s) [3] and for samples obtained in the second way, to remove the template [4].

The characterization of the composit was done by Scanning Electron Microscopy, X-ray Diffraction, Complex Thermal Analysis–DTA-TG and Fourier Transform Infrared Spectroscopy. These nanostructures can have numerous applications in different areas such us drug delivery [5], catalyst [6], materials for environmental protection, etc. [7].

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Relative Interdistance Distributions Between Er^{3+} And Yb^{3+} Dopant Ions in Some Crystal Matrix Hosts Used for Upconversion Luminescence

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ABSTRACT

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