Virtual International Scientific Conference on

"Applications of Chemistry in Nanosciences and Biomaterials Engineering"

NanoBioMat 2023 – Summer Edition

28-30 June 2023

Program

The program will be published on the official webpage of AOSR on 23.06.2023, as well as in the TEAMS Class. The link for the TEAMS Class will be provided in due time, on or before 23.06.2023.

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: 15.05.2023
2. Extended registration: 31.05.2023
3. Abstract submission: 15.06.2023
4. Acceptance Notification: 20.06.2023
5. Final Program announcement: 23.06.2023
6. Conference: 28-30.06.2023

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 15.06.2023. The abstract should be 150 – 300 words and it must contain the title, authors, and their full affiliation.

Scientific Committee

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Prof. Ze Xiang SHEN, NTU (Singapore)

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PhD Student, Eng. Cristina CHIRCOV – Conference Secretary
Dr. Eng. Angela SPOIALĂ – Technical Staff
PhD Student, Eng. Cornelia-Ioana ILIE – Technical Staff

Program

Wednesday, 28 June 2023

11:00-11:15 – **Opening Ceremony**
Chair: Ecaterina ANDRONESCU

Join here

11:15-13:00 – **Plenary Session (I)**
Chairs: Mohd Mustafa Al Bakri ABDULLAH and Anton FICAI

Join here

11:15-11:45 – *Recent Progress in Geopolymer Construction Materials Research: Processing and Performance.* **Mohd Mustafa Al Bakri Abdullah**

11:45-12:15 – *Photocatalytic Thin Films for Microbial Disinfection at the Solidair Interface*. **Sami Rtimi**

12:15-12:35 – *X-ray Photoelectron Spectroscopy (XPS) – Extracting Surface Analysis Data from Basics to Novel Applications.* **Anca Mazare**

12:35-13:00 – Q & A Session

13:00-14:00 – **Lunch Break**

14:00-15:45 – **Plenary Session (II)**
Chairs: Domenico LOMBARDO and Ovidiu OPREA

Join here

14:00-14:30 – *Fractionation of Rice Husk for Producing Value Added Materials*. **Jin Hyung Lee**

14:30-15:00 – *Ultrasonic Cavitation for Sustainable Photocatalytic Materials Synthesis*. **Ridha Djellabi**

15:00-15:30 – *Expansion Pathology: Advanced Nanoscale Investigation of Clinical Specimens Using Physical Tissue Expansion*. **Octavian Bucur**

15:30-15:45 – Q & A Session

15:45-16:00 – **Coffee Break**

16:00-18:35 – **Session I.** Biomaterials for Cancer Therapy
Chairs: Viorel NACU and Lenuța PROFIRE

Join here

16:00-18:50 – **Session II.** Materials for Advanced Applications (I)
Chairs: Sami RTIMI and Maria GAVRILESCU

Join here

Thursday, 29 June 2023

<table>
<tr><td colspan="2">09:00-12:00 – Poster Session (I)
Chairs: Pietro CALANDRA, Ridha DJELLABI, Irina FIERĂSCU, Bogdan Ştefan VASILE
Join here</td></tr>
<tr><td colspan="2">12:00-13:00 – Lunch Break</td></tr>
<tr><td>13:00-15:30 – Session III. Advanced Techniques in Material Science
Chairs: Jorg OPITZ and Ioana DEMETRESCU
Join here</td><td>13:00-15:20 – Session IV. Materials for Advanced Applications (II)
Chairs: Jin Hyung LEE and Madalina ALBU-KAYA
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<tr><td>16:00-18:20 – Session V. Biomaterials for Antimicrobial Therapies
Chairs: Serguei SAVILOV and Carmen CHIFIRIUC
Join here</td><td>16:00-18:20 – Session VI. Materials for Advanced Applications (III)
Chairs: Joan CERDA and Andreea-Teodora IACOB
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Friday, 30 June 2023

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<tr><td>9:00-11:50 – Session VII. Biomaterials for Tissue Engineering and Regeneration
Chairs: Oguzhan GUNDUZ and Alexandru-Mihai GRUMEZESCU
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Chairs: Ion NEDA and Victor FRUTH
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28 June 2023

11:00-11:15 – 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, State Secretary

11:15-13:00 – PLENARY SESSION (I)

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15:45-16:00 – BREAK

16:00 - 18:35 – SESSION I. BIOMATERIALS FOR CANCER THERAPY

Chairs – Viorel NACU and Lenuța PROFIRE

16:00-16:20 – *Optoplasmonic Biosensor for Lung Cancer Telediagnosis*. **Alemayehu Getahun**

16:20-16:35 – *Towards New Magnetite-Based Systems for Oncologic Drug Delivery*. **Paul Adrian Tărăbuță,** Ludmila Motelica, Cristina Chircov, Denisa Ficai, Anton Ficai

16:35-16:50 – *Investigation of In vitro Local Therapeutic Effects of 3D-Melt Electrowritten Theranostic Patches on Pancreatic Cancer*. **Zeynep Ruya Ege,** Gozde Enguven, Hasan Ege, Kagan Durukan, Hilal Turkoglu Sasmazel, Oguzhan Gunduz

16:50-17:05 – *Natural Products Based Nanoformulations for Breast Cancer Treatment*. **Nidhi Gupta,** Sarita Sharma

17:05-17:20 – *A New Biotechnological Treatment Method: Wound Dressing*. **Merve Nur Kaya,** Cem Bülent Üstündağ

17:20-17:35 – *The Role Of 3D Printing Techniques in the Personalized Medicine of Breast Cancer Patients*. **Eugeniu Valic,** Vladimir Valic, Ion Mereuță

17:35-17:50 – *Mesoporous Materials Loaded with Melissa Officinalis Extract*. **Gabriela Petrisor,** Ludmila Motelica, Denisa Ficai, Roxana Doina Trusca, Ovidiu Cristian Oprea, Andreea-Luiza Mirț, Gabriel Vasilievici, Justinian-Andrei Tomescu, Anca Daniela Raiciu, Cristina Manea, Anton Ficai

17:50-18:05 – *Production of Wound Dressing From GO/PVA Fibers as Drug Delivery Vehicles for Breast Cancer Surgery Wounds.* Raife Gençer, **Bilge Keleş**

18:05-18:20 – *Design and Production of Microneedle Based Drug Delivery System Loaded with Hairy Cellulose Nanocrystals as a Novel Treatment of Breast Cancer*. **Hibe Hariri,** Zeynep Ramazan, Hoda Cheikhkhamis, Cem Bülent Üstündağ

18:20-18:35 – *MgB2 Powder Modification by Ultrasonication in Different Biological Liquids and Their Bioactivity on L929 and B16 Cells.* **Any Cristina Sergentu,** Dan Batalu, Anton Ficai, Petre Badica

16:00 - 18:50 – SESSION II. MATERIALS FOR ADVANCED APPLICATIONS (I)

Chairs – Sami RTIMI and Maria GAVRILESCU

16:00-16:20 – *Cinchona Alkaloids Family: Bioactive Derivatives and Multifunctional Chiral Ligands in Asymmetric Catalysis.* **Catalin V. Maftei,** Ion Neda, M. Heiko Franz

16:20-16:35 – *Assessing the Adsorbtion Capacity of Basil and Lavender for Heavy Metals*. **Dana-Mihaela Asiminicesei**, Laura Bulgariu, Maria Gavrilescu

16:35-16:50 – *Donezepil for The Treatment of Alzheimer's Disease-Loaded with Curcumin Production of Sandwich-Like 3D PCL/PVA Tissue Scaffolds.* **Tuğçenur Ekici,** Dilek Bilğiç Alkaya, Serap Ayaz Seyhan, Sümeyye Cesur, Oğuzhan Gündüz

16:50-17:05 – *Characterizations of Ethosuximide-Loaded Bismuth Ferrite Nanoparticles for the Potential Treatment of Epilepsy*. **Yeliz Ersan,** Burcak Bulut, Songul Ulag, Banu Aydin, Oguzhan Gunduz

17:05-17:20 – *Unlocking the Marvels of Nano-Wonders: The Synergistic Symphony of Reduced Graphene Oxide and Iron Oxide Unveils Breakthroughs in Biomedical Marvels*. **Emmellie Laura Albert**, Dharshini Perumal, Che Azurahanim Che Abdullah

17:20-17:35 – *Development of Microparticles Containing Polylactic Acid/Bioactive Glass/Caffeic Acid*. **Beyda Tag,** Songul Ulag, Cem Bulent Ustundag, Oguzhan Gunduz

17:35-17:50 – *Compatibility and Stability of Retinoids Impregnated in Bioglass for Dermatological Applications.* **Ioana Lavinia Lixandru (Matei)**

17:50-18:05 – *Effects of Cobalt Doping on the Structural Properties of ZnO Thin Films Produced by the Automated SILAR Process*. **Brahim Ydir,** Amine Ajdour, Mouad Soumane, Iulia Antohe, Gabriel Socol, Luiza-Izabela Toderascu, Mohamed Boussetta, Houda Lahlou

18:05-18:20 – *Production of Vancomycin-Loaded Polylactic acid (PLA)/Polycaprolactone (PCL) Electrospun Nanofibers with Different Designs*. **Eray Altan,** Zekiye Akdag, Esra Pilavci, Sumeyye Cesur, Oguzhan Gunduz

18:20-18:35 – *Ethosuximide Loaded Polylactic Acid/Bismuth Ferrite Nanofibers for Epilepsy Treatment.* **Izel Yigit,** Oguzhan Gunduz, Banu Aydin, Songul Ulag

18:35-18:50 – *Design and Fabrication of Biofunctional PVA/PLA Bi-layer Nanofiber Wound Dressing by Electrospinning Method.* **Alpay Köse,** Cem Bülent Üstündağ

29 June 2023

9:00-12:00 – POSTER SESSION (I)

Chairs – Pietro CALANDRA, Ridha DJELLABI,

Irina FIERĂSCU, Bogdan Ştefan VASILE

1. *Development of Natural Extracts by Valorizing Agrotechnical Waste from Vineyards*. **Daniela-I. Sărdărescu,** Radu C. Fierăscu, Diana E. Vizitiu, Anda M. Baroi, Alin Din, Irina Fierăscu, Cătălina I. Guță, Elena C. Buciumeanu
2. *Surface Treatments of Microelectrodes for the Development of Electrochemical Microsensors*. **Vasilica Ţucureanu,** Octavian Ligor, Gabriel Crăciun, Alina Matei
3. *The Influence of Natural Deep Eutectic Solvents and Ionic Liquids on the Formation of the Biphasic Water Systems*. **Dajana Lazarević,** Jasmina Mušović, Jelena Jovanović, Tatjana Trtić-Petrović

4. *The Use of Hydroxyapatite and its Derivatives in the Depollution of Wastewaters*. **Roxana Ioana Matei (Brazdis),** Maria Grapin, Valentin Raditoiu, Irina Fierascu, Anda Maria Baroi, Toma Fistos, Alina Raditoiu, Florentina Monica Raduly, Radu Claudiu Fierascu
5. *Transition Metal Oxide Nanostructures and Their Potential Applications in Biotechnological Fields*. **Alina Matei,** Cosmin Romanitan, Oana Brincoveanu, Vasilica Ţucureanu
6. *Ecological Formulations Entrapping Natural Pigments with pH Sensitivity*. **Ligia Todan,** Mariana Voicescu, Daniela C. Culita, Mirabela E. Soare, Rodica M. Ion, Radu C. Fierascu
7. *Investigating the Structural Properties of Zn(BDC)(DABCO) and Zn(NH2-BDC)(DABCO) MOFs: A Step Towards Metabolic Monitoring*. **Cătălin Păun,** Ludmila Motelică, Denisa Ficai, Anton Ficai, Ecaterina Andronescu
8. *Green Synthesis of Copper Oxide/Reduced Graphene Oxide Nanocatalyst and its Application in Water Remediation*. **Zirwa Fayyaz,** Muhammad Akhyar Farrukh
9. *Biostimulatory Effect of Some Micro-Algae on the Growth and Development of Tomato Plants.* **Eugeniu Ciobanu**
10. *Detection of Ammonia Using Polymer Based Chemiresistive Sensors*. **Ana-Maria Popa,** Andrei Stochioiu, Luiza-Izabela Toderaşcu, Vlad-Andrei Antohe, Gabriel Socol, Iulia Antohe
11. *Nonstationary Behaviour of the Upconversion Processes for the Y_2O_3 Ceramic Doped with Er^{3+} Yb^{3+} Ions Pair*. **Liviu Dudas**
12. *Polymeric Membranes Containing Nanoparticles for Water and Wastewater Treatment.* **Simona Căprărescu,** Anita-Laura Chiriac
13. *Laser Pyrolysis of Iron Oxide Nanoparticles and the Influence of Laser Power*. **Iulia Ioana Lungu,** Ecaterina Andronescu, Gabriel Prodan, Florian Dumitrache, Lavinia Gavrila-Florescu, Ana Maria Banici, Iuliana Morjan
14. *Apatitic Materials Improve with Heavy Metals with Potential Antimicrobial Properties for the Treatment of Wood and Stone Cultural Heritage Objects.* **Toma Fistos**, Roxana Ioana Matei (Brazdis), Anda Maria Baroi, Irina Fierascu, Lia-Mara Ditu, Radu Claudiu Fierascu
15. *Innovative Composite Membranes Based on Alginate Biopolymers and Antibacterial Nanoparticles as Adsorbent Materials for Water Treatment.* **Angela Spoială**, Cornelia-Ioana Ilie, Georgiana Dolete, Gabriela Petrișor, Roxana-Doina Trușcă, Ludmila Motelica, Denisa Ficai, Anton Ficai, Ovidiu-Cristian Oprea, Mara-Lia Dițu

16. *Physical and Mechanical Performance of OPC Concrete Mortar with Addition of Rice Husk.* **Muhammad Faheem Mohd Tahir,** Mohd Mustafa Al Bakri Abdullah, Shayfull Zamree Abd Rahim, Warid Wazien Ahmad Zailani, Meor Ahmad Faris Meor Ahmad Tajudin and Mohamad Firdaus Abu Hashim
17. *Comparative Study on The Biodegradation of Plastic Bags and Biodegradable Bags.* **Ionuț Cristian Mărgărit**
18. *Polyethylene/ZnO Nanoparticles Composite – A Novel Antimicrobial Packaging Film*. **Ludmila Motelica,** Ovidiu Oprea, Maria Sonmez, Maria Daniela Stelescu, Denisa Ficai, Anton Ficai, Roxana-Doina Trușcă
19. *Applications and Properties of Honey, Propolis and Royal Jelly in Skin Tissue Engineering*. **Corina Dana Dumitru,** Ionela Andreea Neacșu, Ecaterina Andronescu, Alexandru Mihai Grumezescu, Denisa Ficai
20. *Nanotechnology and Modern Methods of Prevention for Infections Associated with Mesh Repairs of Abdominal Hernias Wall*. **Bianca Câncea,** Adina Mateescu, Ecaterina Andronesci, Alina Prodan, Mihai Matei, Claudiu Turculeț, Mircea Beuran
21. *Recent Approaches Towards Silicate Biomaterials Inspired by Nature*. **Stefania Chiriac,** Laura-Madalina Cursaru, Alexandru Cristian Matei, Mihai Ghita, Roxana Mioara Piticescu
22. *Black Phosphorus-Based Scaffolds for Bone Therapy.* **Andra-Maria Sîrmon,** Ecaterina Andronescu, Ionela Andreea Neacșu, Vasile-Adrian Surdu, Alexandru Mihai Grumezescu
23. *Novel Developments in the Synthesis of Natural Hydroxyapatite-Based Materials for Bone Tissue Engineering.* **Diana-Elena Radulescu,** Ecaterina Andronescu, Otilia Ruxandra Vasile, Adrian Vasile Surdu, Alexandru-Mihai Grumezescu
24. *Green Synthesis of Metal Oxide Nanoparticles Applied in Soft Tissue Engineering.* **Denisa-Maria Radulescu,** Ecaterina Andronescu, Alexandru-Mihai Grumezescu, Vasile Adrian Surdu, Adrian-Ionut Nicoara
25. *Synthesis and Antimicrobial Properties of Cinnamaldehyde Schiff Bases.* **Neetu Singh,** Surender Singh Yadav
26. *Insights From 575 Scientific Literature Articles on SARS-CoV-2 Molecular Docking and Virtual Screening.* **Paul Andrei Negru,** Denisa Claudia Miculas, Tapan Behl, Alexa Florina Bungau, Ruxandra-Cristina Marin, Simona Gabriela Bungau

27. *Surface-Functionalized Membranes for Biomedical Applications*. **Madalina Oprea,** Stefan Ioan Voicu, Andreea Madalina Pandele
28. *Supermacroporous Cryogels as Promising Materials for Antibiotics Retention.* **Marinela-Victoria Dumitru,** Andreea Miron, Maria Ines Da Cruz Roque, Horia Iovu, Ana-Lorena Neagu (Ciurlica), Anamaria Zaharia, Ana Mihaela Gavrila, Anita-Laura Chiriac, Tanta-Verona Iordache
29. *In Vitro Evaluation of the Anti-Alzheimer's Effects of Donepezil-Loaded Poly(lactic-co-glycolic acid) Nanoparticle Embedded Sodium Alginate/Polyethylene Glycol Scaffolds Produced by 3D Printer.* **Ilke Kabaoglu**, Ece Guler, Humeyra Betul Yekeler, Muhammet Emin Cam
30. *Towards Smart SARS-CoV-2 Detection Using a Plasmonic Sensor*. **Iulia Antohe**, Bianca Solomonea, Gabriel Socol
31. *Ara H1 Peanut Allergen Detection Using an Optical Fiber Based Sensor*. **Iulia Antohe**
32. *Cerium Oxide as an Alternative for Antimicrobial Treatment*. **Cezara-Marina Bolocan,** Ecaterina Andronescu
33. *Green Synthesis of Copper Oxide Nanoparticles using Aspalathus linearis Plant Extract for Photocatalytic Environmental Remediation.* **Abubakar Dantani Meli**, Che Azurahanim Che Abdullah
34. *"Green" Polyols Based on Recycled Polymers and Renewable Feedstock for Various Industrial and Biomedical Applications.* **Sorin-Viorel Dolana**, Anamaria Zaharia, Tanţa-Verona Iordache, Andrei Sârbu, Anton Ficai

12:00-13:00 – LUNCH BREAK

13:00 - 15:30 – SESSION III. ADVANCED TECHNIQUES IN MATERIAL SCIENCE

Chairs – Jorg OPITZ and Ioana DEMETRESCU

13:00-13:30 – *Nanoscale Features: From Pure Carbon to Carbohydrates*. **Serguei V. Savilov**

13:30-13:45 – *A Combined Approach in Understanding the Potential Use of High Entropy Alloys (HEAs) in Dentistry.* **Radu Nartita,** Mihai Andrei, Anisoara Cimpean, Daniela Ionita, Andreea Cristiana Didilescu, Ioana Demetrescu

13:45-14:00 – *Predictive Energy Efficient & Secure Routing Approach in Sensor Ad-hoc Cognitive Network.* **Vijay Mishra,** Vaseem Naiyer, Bandi Nageshwar Rao

14:00-14:15 – *Gd-SiO_2 Nanoparticles as New Contrast Agents for MRI and PCCT*. **Zukhro Zoirova,** Evgeniya Suslova, Denis Shashurin, Olga Pavlova, Vladislav Rozhkov, Serguei Savilov, Georgy Chelkov

14:15-14:30 – *Salicylic Acid-Loaded Gelatin Methacryloyl Microneedles as a Potential Drug Delivery System in Plants Diseases*. **Ayse Gulcan Ipek,** Huseyin Berkay Ozarici, Ugur Sayin, Oguzhan Gunduz, Songul Ulag

14:30-14:45 – *Production of Drug-Loaded Hydrogel-Based Microneedles for the Treatment of Epilepsy and Investigation of Controlled Release of Drugs from Microneedles*. **Berrak Bulut,** Songul Ulag, Rezzan Gulhan, Oguzhan Gunduz

14:45-15:00 – *Comparison of Cellulose Nanofibers Synthesized from Three Parts of Kenaf Biomass.* **Virginia Ghita Firsty,** Soo-Jeong Shin, Jin Hyung Lee

15:00-15:15 – *Continuing Technology of Extraction Silica for Inorganic Materials from Biomass By-Products.* **Ji Yeon Park,** Yang Mo Gu, Byoung In Sang, Jin Hyung Lee

15:15-15:30 - *Effect of Se/(Sn+Zn+Sn) Ratio on the Properties of Electrodeposited Cu2ZnSnSe4 Thin Films.* **R. El Otmani,** O. El Khouja, A. El Manouni, Aurelian Catalin Galca, A. Almaggoussi

13:00 - 15:20 – SESSION IV. MATERIALS FOR ADVANCED APPLICATIONS (II)

Chairs – Jin Hyung LEE and Madalina ALBU-KAYA

13:00-13:20 – *A One-Pot Universal Approach to Fabricate Lubricant-Infused Slippery Surfaces on Solid Substrates.* **Alexander B. Tesler,** Lucia H. Prado, Marat M. Khusniyarov, Ingo Thievessen, Anca Mazare, Lena Fischer, Sannakaisa Virtanen, Wolfgang H. Goldmann, Patrik Schmuki

13:20-13:35 – *Mechanical Effect of Molarity of Sodium Hydroxide on Fly Ash Based Geopolymer Filler in Recycled High-Density Polyethylene (rHDPE) for 3D Printed Filament.* **Mohammad Firdaus Abu Hashim,** Meor Ahmad Faris Meor Ahmad Tajudin, Mohd Mustafa Al Bakri Abdullah, Tan Soo Jin, Yusrina Mat Daud, Mohamad Syahmie Mohd Rasidi, Muhammad Faheem Mohd Tahir

13:35-13:50 – *Characterization of Oxides Grown on Uncoated and CrNx Coated 310 H Stainless Steel After Exposure to Supercritical Water Environment.* **Aurelia Elena Tudose,** Ioana Demetrescu, Florentina Golgovici, Manuela Fulger, Cristina Surdu-Bob4, Alexandru Anghel, Oana Brîncoveanu, Cosmin Romaniţan

13:50-14:05 – *The Synthesis of Nanocomposite with a Core-Shell Morphology Made of Graphene Nanoflakes and Lanthanum Nanoparticles.* **Aleksei P. Kozlov,** Evgeniya V. Suslova, Denis A. Shashurin, Georgy A. Chelkov, Serguei V. Savilov

14:05-14:20 – *Applications of Nanotechnology in Phytoremediation of Heavy Metal-Contaminated Soils: A Review of Current Developments and Future Prospects*. **Hamza Badamasi**

14:20-14:35 – *Dielectric and Electrical Properties of Melt-Extruded Polypropylene Carbon Nanofiber Composites*. **Z. Samir,** A. J. Paleo, N. Aribou, Y. Nioua, M. S. Martins, M. F. Cerqueira, J. Agostinho Moreira, M. E. Achour

14:35-14:50 – *Electrical Conductivity Modeling of Carbon Reinforced Polymer Composites Using an Interphase Approach*. **Najoia Aribou,** Yassine Nioua, Zineb Samir, Mohammed E. Achour

14:50-15:05 – *Colloidal Tweezers Using Magnetic Colloidal Polymers.* **Joan J. Cerdà**

15:05-15:20 – *Injectable Hydrogel Consisting of Resveratrol-Loaded Nanoparticles and Travoprost for Neuroprotective Glaucoma Treatment.* **Amira Khalil,** Emira Kalifa, Ola Ramazan

15:30-16:00 – BREAK

16:00 - 18:20 – SESSION V. BIOMATERIALS FOR ANTIMICROBIAL THERAPIES

Chairs – Serguei SAVILOV and Carmen CHIFIRIUC

16:00-16:20 – *Synthesis of Metal Nanoparticles with Plant Extract Loaded with Niosomes for Potential Anti Skin Bacterial Psoriasis.* **Che Azurahanim Che Abdullah,** Yuki Shirosaki, Rathi Devi Nair, Ashreen Norman

16:20-16:35 – *Design and Development of Hybrid Hemodialysis Membrane Containing Graphene Oxide and Polysulfone.* **Elif Yildiz Küçüktepe**, Cem Bülent Ustundag

16:35-16:50 – *Enrichment of Antioxidant Properties of Chitosan-Fish Gelatin Edible Films by Incorporating Procyanidin*. **Udana Eranda**

16:50-17:05 – *Antibiotic-Loaded PLA Nanofibers for Treatment of Skin Infections*. **Nasma Anjrini,** Songul Ulag, Oguzhan Gunduz

17:05-17:20 – *Green Synthesis of Copper Based Particles Using Ocimum Sanctum Leaf Extract and its Synergistic Antibacterial Activity*. **Surendra Prakash Gupta,** Shweta Agarwal, Ankur Bhardwaj, Mohit Kumar, Riya Soni

17:20-17:35 – *Effect of Silver on Novel Biodegradable Zinc-Copper Alloys for Ureteral Stent*. **Sercan Basit,** Rinat Islamgaliev, Yasemin Yilmazer, Elif Damla Arisan, Burak Dikici, Hakan Yılmazer

17:35-17:50 – *Silver-Coated Magnetite Microspheres for Targeted Antimicrobial Properties*. **Adrian Moraru,** Cristina Chircov, Alexandra Cătălina Bîrcă, Cornelia-Ioana Ilie, Vladimir Lucian Ene

17:50-18:05 – *Ciprofloxacin Loaded GelMA Scaffold as a Therapeutic for Joint Infections*. **Hilal Yilmaz,** Tuba Bedir, Sevda Gursoy, Elif Kaya, Gulgun Bosgelmez Tinaz, Oguzhan Gunduz, Cem Bulent Ustundag

18:05-18:20 – *Development of Electrospun Nanofibers Containing Gentamicin and Cinnamaldehyde for Treating Corneal Infections*. **Tufan Arslan Tut,** Sumeyye Cesur, Elif Ilhan, Ewa Kijeńska-Gawrońska, Oguzhan Gunduz

16:00 - 18:20 – SESSION VI. MATERIALS FOR ADVANCED APPLICATIONS (III)

Chairs – Joan CERDA and Andreea-Teodora IACOB

16:00-16:20 – *Functional and Novel Perovskite Materials for Biomedical and Energy Harvesting Applications*. **Muhammad Salman Habib**

16:20-16:35 – *Heavy Metal Removal from Contaminated Soils by Phytoremediation*. **Raluca-Maria Ţâbuleac**, Camelia Smaranda Bețianu, Maria Gavrilescu

16:35-16:50 – *Influence of Silica Nanoparticles on Thermal Properties of Wood.* **Diana Floriana Talau,** Ovidiu Oprea, Anton Ficai

16:50-17:05 – *Identification of the Origin of Essential Oils Using Principal Component Analysis*. **Bogdan Purcăreanu,** Veronica Drumea, Dan Eduard Mihaiescu, Alina Moroşan, Laura Olariu, Anton Ficai

17:05-17:20 – *Tolerance of White Mustard (Sinapis Alba L.) to the Toxicity of Co(II), Cu(II), Ni(II) and Zn(II) As Soil Pollutants*. **Petronela Cozma,** Mariana Minuț, Mihaela Roșca, Raluca-Maria Hlihor, Maria Paiu, Ionela-Cătălina Vasilachi, Diana-Elena Ungureanu-Comăniță, Maria Gavrilescu

17:20-17:35 – In*ula helenium Extract-Loaded Nanofibrous Patches for the Treatment of Cancer*. **Rabia Betul Sulutas,** Sumeyye Cesur, Serap Ayaz-Seyhan, Dilek Bilgic-Alkaya, Oğuzhan Gündüz

17:35-17:50 – *Production of PVA/HA Dental Membrane in Nanofiber Structure Containing Ag+ Nanoparticles*. **Seymanur Berat Yeni,** Hande Yaren Kahraman, Ceren Keskin, Iremnaz Bandırma

17:50-18:05 – *3D Printing of Scaffolds for Bone Tissue Engineering Based on Bacterial Hydroxyapatite.* **Sabere Nouri,** Songul Ulag, Giti Emtiazi, Ayse Ceren, Oguzhan Gunduz

18:05-18:20 – *Drug-Loaded Tumor Dressing Design With 3D Printer for Controlled Release Systems.* **Ayşe Betül Bingöl**

30 June 2023

9:00 - 11:50 – SESSION VII. BIOMATERIALS FOR TISSUE ENGINEERING AND REGENERATION

Chairs – Oguzhan GUNDUZ and Alexandru-Mihai GRUMEZESCU

9:00-9:20 – *Silver and Gold Nanoparticles in Biomedical Applications*. **Fernanda Pilaquinga,** Jeroni Morey, María de las Nieves Piña

9:20-9:35 – *GELMA-Sodium Alginate Based Artificial Cornea*. **Buket Hazal Ağyüz,** Doğa İrem Aktaş, Tuba Bedir, Cem Bulent Ustundag

9:35-9:50 – *Production of Essential Oil Coated Polycaprolactone Scaffold with Antibacterial Properties.* **İrem Tuba Arslan,** Faik Nuzhet Oktar, Oguzhan Gunduz, Songul Ulag

9:50-10:05 – *From Theory to Practice: Synthesizing Bioglass for Bone Tissue Engineering*. **Andreea-Luiza Mîrț,** Anton Ficai, Gabriel Vasilievici

10:05-10:20 – *3D Printed Scaffolds Based on Biopolymers-Calcium Phosphates and Magnetic Nanoparticles for Bone Tissue Engineering.* Iustina Botezatu, Isabella Nacu, **Florina Daniela Cojocaru**, Vera Balan, Liliana Verestiuc

10:20-10:35 – *Development and Characterization of 3D-Printed Bioactive Glass-Doped Scaffolds*. **Yigit Turan,** Aleyna Keramet Savur, Songul Ulag, Alireza Valanezhad, Oguzhan Gunduz

10:35-10:50 – *Design and Development of a Nanofiber-Based Scaffold with Antimicrobial Properties for the Repair of Damaged Tissue*. **Mohammad Moghaddasi,** Muhammed Mustafa Mert Özdemir, Hüseyin Murat Özadenç, Ali Torabkhani, Cem Bülent Üstündağ

10:50-11:05 – *Eco-Friendly Scaffold Design Made from Eggshell PCL/Nano-Sized Strontium-Substituted Hydroxyapatite Composite for the Treatment of Bone Fractures.* Ayse Naz Koc, **İpek Oktay**, Cem Bulent Ustundag

11:05-11:20 – *Fabrication and Characterization of Polylactic Acid/Hyaluronic Acid/Collagen Nanofibers for Tendon Tissue Engineering*. **Elif Nur Yildiz,** Zekiye Akdag, Ali Sahin, Oguzhan Gunduz, Songul Ulag

11:20-11:35 – *Fabrication of Interpenetrating Network Hydrogel Scaffold Conjugated with Nanoparticles by Extrusion Type Three-Dimensional Printing*. **Nidanur Kaçar,** Hasan Sadıkoğlu, Hale Berber, Hakan Yılmazer

11:35-11:50 – *Cartilage Tissue Repair with Bacterial Cellulose*. **Beyza Topçu,** Elif İlhan, Orhun Pınar, Dilek Kazan, Oğuzhan Gündüz

9:00 - 11:50 – SESSION VIII. NATURAL BIOACTIVE COMPOUNDS

Chairs – Ion NEDA and Victor FRUTH

9:00-9:20 – *Mycotoxin Patulin: A Natural Compound of Comprehensive Review of Interest.* **Rupak Kumar**

9:20-9:35 – *New Methods of Cultivating Cyanobacteria with Nostoc Halophilum Hansg. With Antibacterial Effect.* **Alina Trofim,** Roman Rusnac, Andrei Ciursin

9:35-9:50 – *Production of Nanofiber for Combination with Anticancer Tragopon Porrifolius L. Naringenin*. **Ezginur Yeşil,** Serap Ayaz Seyhan, Dilek Bilgiç Alkaya, Sümeyye Cesur, Oğuzhan Gündüz

9:50-10:05 – *Phytochemistry, Pharmacology, Ethnobotanical and Chemotype of Bioactivity of Abelmoschus: A Review.* **Jemkur Maurice,** Amos Mamman, Joy Yohana Ishaya

10:05-10:20 – *Glucose Level in Alloxan Diabetes on the Background of the Administration of Extracts from Cyanobacteria Nostoc Halophilum Hansg. – As a Natural Nutritional Supplement*. **Alina Trofim,** Iurie Bacalov, Oleg Țurcanu

10:20-10:35 – *Development and In-Vivo Evaluation of Niosomal Gel Containing Loxapine Succinate*. **Rama Shukla**, Gaurav Tiwari, Neeraj Sharma

10:35-10:50 – *Evaluation of Gallic Acid and Quercetin-Loaded Mesoporous Silica Nanoparticles for the Treatment of Colorectal Cancer: A Novel Approach*. **Rucsandra-Cristina Dumitrescu**, Iuliana Samoilă, Ludmila Motelica, Cristina Chircov, Roxana Doina Trusca, Vasile Adrian Surdu, Denisa Ficai, Ovidiu Oprea Cristian, Anton Ficai, Sorina Dinescu

10:50-11:05 – *QbD Based Curcumin Loaded Nanostructured Lipid Carrier for the Management of Ocular Disorder Diabetic Retinopathy*. **Kamini Sharma,** Manish Kumar, Abhishek Mangla

11:05-11:20 – *Production and Characterization of a Dual Drug Delivery System of Memantine and Naringenin by Electrospinning Method.* **Ayşem Birinci,** Dilek Bilğiç Alkaya, Serap Ayaz Seyhan, Sümeyye Cesur, Oğuzhan Gündüz

11:20-11:35 – *Ibuprofen and Centaury Oil Loaded Foam Wound Dressing Production for Burn Injuries.* **İrem İlayda Kılıç**

11:35-11:50 – *Magnetite-Enhanced Polysulfone Membranes Loaded with Resveratrol for the Treatment of Peripheral Nerve Injury*. **Gabriela Daniliuc,** Alexandra-Elena Dobranici, Ludmila Motelica, Roxana Doina Trușcă, Denisa Ficai, Ovidiu Cristian Oprea, Anton Ficai, Sorina Dinescu

11:50-13:00 – LUNCH BREAK

13:00-14:00 – POSTER SESSION (II)

Chairs – Cem Bulent USTUNDAG and Radu Claudiu FIERĂSCU

1. *Potential Application and Upcycling Process of Thermoset Polyurethane Based Automotive Wastes Combined with TPU via Electrospinning Method in Automotive Industry*. **Ethem Gokhan Ozcelik,** Furkan Kasap, Cem Yigit
2. *In Situ Monitoring of the Materials Degradation in Concrete-Based Structures by Means of Portable Raman Spectroscopy*. **Maria Teresa Caccamo,** Roberto Caruso, Guerino Sarullo, Giuseppe Lupò, Giuseppe Spinella, Alessandro Boncaldo, Salvatore Magazù, Domenico Lombardo
3. *Surfactant Assisted Dispersion of Carbon Nanotubes into Cement Mortars for Structural Monitoring Applications*. Roberto Caruso, Guerino Sarullo, Giuseppe Lupò, Giuseppe Spinella, Maria Teresa Caccamo, **Alessandro Boncaldo**, Salvatore Magazù, Domenico Lombardo
4. *Carbon Quantum Dots-Modified Electrodes For D-Fructose Detection*. **Ștefania-Diana Boldeanu,** Andreea-Maria Dinu, Alexandra Constantinescu, Cristian Pîrvu
5. *Motion Capacities of Exosomes*. **Israfil Kucuk, Esra Mutlu**
6. *Enhanced Osteogenic Differentiation of Human Adult Mesenchymal Stem Cells Cultured on Plate-Like Hydroxyapatite Coatings*. **Vasile Pruna,** Daniela-Madalina Ghetu, Diana Vranceanu, Cosmin Cotrut, Alina Vladescu (Dragomir) , Irina Titorencu

7. *ZnO Asisted Photocatalytic Removal of a Pharmaceutical Pollutant: Preliminary Evaluation of the Toxicity of Treated Solutions.* **Maria Paiu,** Lidia Favier, Doina Lutic, Raluca-Maria Hlihor, Maria Gavrilescu
8. *Studies on the Behavior and Phytoremediation Potential of Rapeseed (Brassica Napus L.) Growing on Soil Polluted with Cadmium Ions.* **Mariana Minuţ,** Mihaela Roşca, Petronela Cozma, Mariana Diaconu, Vasile Stoleru, Maria Gavrilescu
9. *Potential Role of Green Iron Oxide Nanoparticles in Diagnosing and Treating Neurodegenerative Diseases.* **Mohamed Abdelmonem,** Emmellie Laura Albert, Norazalina Saad, Che Azurahanim Che Abdullah
10. *Coronary Stents – From Past to Future.* **Teodor Băjeu,** Ecaterina Andronescu
11. *Phytoniosome Antidiabetic Nanoformulations as Promising Paradigm for Effective Therapy.* **Devi-Nair Gunasegavan Rathi,** Norhaizan Mohd Esa, Che Azurahanim Che Abdullah
12. *Force Field Comparison for In Silico Analysis of Gene Carrier*. **Razvan Puf,** Tudor Vasiliu, Dragos Peptanariu, Razvan Ghiarasim, Mariana Pinteala, Aatto Laaksonen
13. *Decellularized Amniotic Membrane: An Innovative Solution for Tissue Regeneration and Ulcer Therapy.* **Viorica Mihaluța,** Alina Stoian, Olga Ignatova, Grigore Verega, Viorel Nacu
14. *Synthesis and characterization of magnetic bioglass nanostructure*. **Marian Rașcov,** Ecaterina Andronescu, Anton Ficai, Ovidiu Cristian Oprea, Otilia-Ruxandra Vasile
15. *In-Vitro Antioxidant and Antibacterial Activity of Pistacia Lentiscus L Aqueous Extract Mediated Bioactive Silver Nanoparticles.* **Yasmina Khane,** Sofiane Khane, Djaber Aouf, Fares Fenniche
16. *Preparation and Characterization of Composite Bone Substitutes*. **Alina Florentina Vladu,** Ludmila Motelica, Roxana Trusca, Florin Iordache Anton Ficai
17. *3D-Printed Wound Dressings.* **Daniela Alina Ionita,** Ecaterina Andronescu, Ionela Andreea Neacsu, Vasile Adrian Surdu, Alexandru Mihai Grumezescu
18. *Kombucha – Tradition Turned into Science.* **Ionuț-Marian Catangiu,** Cristina-Alexandra Diaconu, Mihai Pîrlogea, Călin-Victor Ungureanu, Marina Ionela Ilie, Andreea-Letiția Arsene

14:00-14:30 – CLOSING CEREMONY

Chair: Ecaterina ANDRONESCU

Book of Abstracts

Plenary Sessions

Recent Progress in Geopolymer Construction Materials Research: Processing and Performance

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[3]Malaysian Research & Innovation Society (MyRIS)

ABSTRACT

The development of geopolymer research is to step ahead towards searching for green materials with the purpose to minimize or replace the use of ordinary Portland cement (OPC) and emissions of carbon dioxide (CO_2). The production method applied is significant and user and eco-friendly with lower consumption of energy. The potential of source materials in a wide range of slag, natural clay, waste and natural Al–Si minerals possibly will provide as potential source materials for the production of geopolymer. current research on geopolymer demonstrates how geopolymer products display superior properties good for many applications including as a new building materials (lightweight concrete, insulating concrete, lightweight brick, lightweight aggregate, a new steel fiber reinforced concrete), a new materials for road base application, as a repair materials, a new materials for corrosion application, a new filler in piping application, as underwater concrete materials, a low sintering temperature ceramic, as reinforced material in solder alloy, lightweight ceramic application and also high strength paste application. The advancement made in the various research of science and technology has helped us to have equivalence or a better quality of existing product. The characteristic and performance of geopolymer products has proved for better thermal insulation properties, higher fire resistance, lower processing temperature, low permeability, good chemical resistance, excellent in acid and salt environment.

Photocatalytic Thin Films for Microbial Disinfection at the Solid-Air Interface

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ABSTRACT

In recent decades, there has been a rise in infections caused by toxic pathogens and biofilms, resulting in hospital-acquired infections (HAI). Polymers are used for biomedical gadgets, serum bags, textiles, and many other applications in hospital settings. Photo-responsive coatings attracted much attention during the last decade as a novel self-disinfection method to inactivate pathogens (bacteria, viruses, fungi…) without ions release. This has prompted scientists to develop more advanced antibacterial nanostructured thin films with a uniform particle distribution, strong adhesion to the substrates, mechanical resistance, and faster bacterial/biofilm inactivation under light and in the dark. While TiO_2 films have been used for many years as bactericide films under light < 387 nm, their limited absorption of solar/visible light and slow bacterial inactivation kinetics have led researchers to explore bimetal coated surfaces (such as Cu, Ag or Fe) to shift the absorption of the films to the visible region [1-2]. Coupling TiO_2 with copper oxides showed bacterial inactivation in the minute range. provide a brief overview of the bactericidal activity of the Ag-Cu bimetal/oxides system [3].

Magnetron sputtering was recently reported to allow the preparation of advanced antibacterial uniform coatings. PES-Cu samples sputtered for 160s with a Cu-loading of 0.11 Cu wt %/wt PES and induced a 6log10 CFU loss of viability on *E. coli* within 15 min under dark/light conditions [4]. In the case of *C. glabrata*, a reduction of 4log10 CFU was observed in the dark, and a 5og10 CFU under light irradiation. The faster viability loss of the fungi *C. glabrata* under light compared to dark runs is attributed to the CuO/CuO on PES charge separation under light irradiation [4]. In a separate study, Ag/Cu-coated catheters were investigated for their efficacy in preventing methicillin-resistant *Staphylococcus aureus* (MRSA) infection in vitro and in vivo. In vitro, Ag/Cu-coated catheters pre-incubated in PBS and exposed to 10^4-10^7 CFU, prevented the adherence of MRSA (0-12% colonization) compared to uncoated catheters (50-100% colonization; P< 0.005). MRSA inactivation occurred instantaneously at the interface of the sputtered catheters under indoor light [5]. The sputtered surfaces were characterized using up-to-date surface science techniques and the mechanisms behind the photo-activities are illustrated in this presentation.

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X-ray Photoelectron Spectroscopy (XPS) – Extracting Surface Analysis Data from Basics to Novel Applications

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ABSTRACT

X-ray photoelectron spectroscopy (XPS) is a well-known and well-established characterization technique, with a high surface sensitivity, that is used to obtain information on the chemical and compositional properties of surfaces, and more so for tailored nanosurfaced, functional surfaces, or in the field of catalysts and co-catalysts [1,2]. When dealing with functional materials, a critical questions is related to how was the functional material obtained, what is its chemical composition, or what modifications have occurred on the material. This means that when a material, such as TiO_2, is decorated with a protein or drug,[3] or otherwise modified (e.g., hydrothermal treatments in amine [4]), can the modification be confimed quantitavely and qualitatively. XPS can give answers to all these questions, however the accuracy of the data interpretation is directly linked to the knowledge of the person evaluating the data.

Moreover in the context of the recent development in single atom catalysts, XPS can provide crucial information with respect to the the chemical state of the metal co-catalysts, using a quite simple and efficient experimental setup compared to other techniques such as absorption spectroscopy. Namely, in the high-resolution XPS peaks of the corresponding metal, the single-atom state shows a chemical shift of δ+ as a result of the oxygen coordination, e.g., Pt SAs on TiO_2 (Pt is bound to oxygen instead of Pt [5]). Compared to classical metallic nanoparticles, the single atoms on similar support material show a shift to higher binding energies, which is related to its surface coordination (e.g., Pt, Pd, Rh, Au or Ir on TiO_2 [5,6] and the surface coordination is also substrate dependant, which further increases the difficulty of the data interpretation.

The above, combined with the typical data misinterpretation arising from peak calibration (recently it was shown that calibration to adventitous C at 284.8eV is actually substrate dependant) and from peak fitting leads to eroneous conclusions or data assignation.

Therefore, the goal of this work is to bring to your attention the key points ensuring accurate XPS data measurement and interpretation, further enhancing the participants surface analysis skills and their applicability to their own research area. Furthermore, we will discuss critical examples of recent novel applications in extracting the maximum information with the highest accuracy using TiO_2 as an model with i) graphite / protein and evaluating the changes occuring in the C1s / C1s&N1s, and with b) noble metal single atom decoration on bare TiO_2 or on a composite CdS decorated TiO_2 photocatalyst.

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Fractionation Of Rice Husk and Synthesizing Value Added Materials

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ABSTRACT

Rice husk, a residue from the rice milling process, is one of the most produced biomass materials in the world. Rice husk consists of mainly cellulose, hemicelluose and lignin like other lignocellulosic biomass. However, one of unique properties of rice husk is its high ash content, about 13~20 wt%. It can be a renewble resource for the production of value-added silica as well as bio-based organic materials. This study will present the fractionation of rice husk and synthesize value added materials using each component. A continuous silica extraction process was developed using attrition ball milling and alkaline hydrothermal methods. The silicate obtained from rice husk was used to synthesize engineered silica particles using an environmentally friendly method. The residual carbohydrates were used to produce methane by the anaerobic digestion process. The residual carbohydrates showed 1.8 times higher biogas production than that of the untreated rice husk. The residual carbohydrates were used to synthesize cellulose based materials as well, such as cellulose nanofiber and nanocellulose. The fractionation technique used in this study can extract high value-added silica material from rice husk as well as provide a resource of cellulose based material, eventually contributing to the improvement of the economy of the rice husk-based bioenergy industry.

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Ultrasonic Cavitation for Sustainable Photocatalytic Materials Synthesis

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ABSTRACT

In any given catalytic application, material design is the core key to control the effectiveness, selectivity and stability of the process. Ultrasonic cavitation provides extraordinary condition combining shock wave physical effect, high pressure and extreme local heat, high speed micro-jets and produced reactive oxygen species (ROS). This tool has been applied over decades in many fields including environmental, food industry, synthesis, cleaning and disinfection, energy production and medical/biomedical related applications. The focus of this talk will be on the application of ultrasonic cavitation tool for synthesis of photocatalytic materials, by emphasizing the fundamental concept and related research studies. Ultrasonic cavitation can control the size of nanoparticles, materials porosity, and it is used to desig of composites with special interfacial bonding. A case research study on the fabrication of TiO_2 coated biomass with specific Ti-O-C interfacial bridge will be discussed in depth. The role of ultrasonic cavitation to build this interfacial bridge and its importance for enhanced visible light harvesting and charges separation will be explained. On top to the unique effects of ultrasonic synthesis, this tool is relatively low cost and it could be alternative to organic solvents or/and convocational heat, fitting the sustainable development aspects.

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Expansion Pathology: Advanced Nanoscale Investigation of Clinical Specimens using Physical Tissue Expansion

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ABSTRACT

Optical microscopes are conventional tools required in most biomedical research fields and are indispensable in clinical disciplines, such as diagnostic pathology. These conventional microscopes, however, can't reach a resolution less than 250 nm, making the use of more expensive microscopes, such as electron/super-resolution microscopes, required in certain diagnostic pathology areas, such as those related to diagnosis and/or confirmation of kidney nephrotic syndromes. In a Harvard-MIT collaborative team effort, we developed and patented a pathology-optimized physical tissue expansion technology called Expansion Pathology (ExPath) and a rapid ExPath variant (rExPath), which enable a symmetrical physical tissue expansion (fixed tissues) of about 100 times in volume (~ 4-5 times in one dimention), in this way being able to extend the resolution limit of an optical microscope to about 70-80 nm (from ~250 nm).

Through increasing the resolution of optical microscopy, ExPath and rExPath enable a high-resolution investigation of fixed cellular and tissue samples required in many research biomedical areas. Specifically, we demonstrated a high precision classification of the early breast neoplastic lesions that are hard to classify and, for the first time, the investigation of the tertiary foot processes of the podocyte and diagnoses of specific kidney nephrotic lesions with an optical microscope, previously diagnosed and/or confirmed only with an electron microscope.

We hope that Expansion Pathology will enable routine advanced investigation of clinical specimens and improved diagnosis of a wide range of pathologies, such as cancer.

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Nanoscale Features: From Pure Carbon to Carbohydrates

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ABSTRACT

Present lecture is focused on the nanoscale effect. In spite it is well described during last decades, almost any new research opens new horizons. Carbon - one of the most important in our life and at the same time - most abundant element at the Earth - can serve as an ideal example for demonstrating nanoscale effect. The chemistry of carbon is extremely interesting due to the multitude of its allotropic modifications (graphite, graphene, diamond, lonsdaleite, fullerene, carbon nanotubes, etc.), which demonstrate various, sometimes opposite, characteristics. Starting from thermodynamics, it is important to note, that almost half century ago it was fixed that the triple point at the state diagram is shifted for graphite in the bulk state and for its cluster for thousands of atoms. That is why so important to understand structural features of the compounds at the levels, higher than atomic, but lower than micron. Sometimes the existence of the particles with so small size is impossible without stabilization by, e.g. functional groups, that can be also demonstrated on carbon nanotubes or few-layer graphene fragments which are characterized by a continuous, extended structure, consisting of 1–10 carbon layers. Depending on the number of layers and particle size their planarity, associated with the number of carbon atoms with uncompensated valences and functional groups, can vary. These changes can be traced using their heats of formation, calculated from DCS data or bomb calorimetry. The morphology of the objects can be investigated by HRTEM, whale the surface composition at the depth of 1 nm - by XPS. Some unusual effects - like a trap of Fe single atoms between functionalized carbon layers - can be studied by synchrotron radiation-based X-ray absorption spectroscopy (XAS) method actual for ppb concentration level.

The transition to nanoscale derivatives for much more complicated objects, such as cellulose, deal with decrease of "fundamentality" of the research but sufficient rise of its practice significance. The structure of cellulose is formed from repeating units. Each next unit is inverted from the previous one, giving the molecule a flat ribbon conformation. Due to the linearity and stereoregularity cellulose molecules forms extended spatial macrocomplexes. Due to a network of hydrogen bonds amorphous and crystalline regions in microfibrils exists together. Modern synthetic approaches allow researchers to remove these anistropic fragments -microcrystalline and nanocrystalline celloloses, demonstrating many effects, which are important for the practical use.

Session I. Biomaterials for Cancer Therapy

Towards New Magnetite-Based Systems for Oncologic Drug Delivery

Paul Adrian Tărăbuță[1-3, *], Ludmila Motelica[2-4], Cristina Chircov[1-3], Denisa Ficai[2-4], Anton Ficai[1-3, 5]

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ABSTRACT

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Natural Products Based Nanoformulations for Breast Cancer Treatment

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ABSTRACT

Cancer is a leading cause of death worldwide. WHO estimates that breast cancer accounts for 2.3 million cases every year that makes it most common cancer among adults. Also, WHO has released a new Global Breast Cancer Initiative Framework that has the target to save 2.5 million lives from breast cancer by 2040 [1]. Natural products possess wide potential for breast cancer treatment. However, problems associated with these natural products such as low aqueous solubility, low bioavailability, short half life and rapid clearence limits their clinical usefulness. Therefore, nanotherapeutics has overcome the limitations associated with conventional drug delivery system. Natural product based nanofoemulations were found to possess reduced side effects [2]. In this article, we will discuss about various nanoformulations of natural products for breast cancer treatment.

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A New Biotechnological Treatment Method: Wound Dressing

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ABSTRACT

Wound dressing plays a crucial role in the management of various types of wounds. This presentation provides an overview of wound dressing as a new biotechnological treatment method. Wounds can be classified as acute or chronic, each requiring different healing conditions. Factors influencing wound healing include local factors such as infection, inadequate blood circulation, and tissue necrosis, as well as systemic factors like nutritional deficiencies and chronic diseases. To address the diverse needs of wound care, modern wound dressings are manufactured using a wide range of materials, including synthetic polymers, hydrogels, foams, films, and composites.

These dressings offer properties such as moisture management, breathability, and antimicrobial activity. According to their effectiveness, wound dressings can be categorized as passive dressings, interactive dressings, and bioactive dressings. Passive dressings simply protect the wound, while interactive dressings maintain a moist wound environment and allow interaction with the surrounding environment. Bioactive dressings actively contribute to the wound healing process by releasing bioactive substances. Furthermore, modern wound dressings can be classified based on their material composition, physical forms, and active ingredient content. Examples of modern wound dressings include hydrocolloids, alginate dressings, hydrogels, foams, transparent films, and dressings with antimicrobial agents, growth factors, or vitamins and minerals. These dressings offer benefits such as preventing exudate leakage, promoting wound healing, and providing antimicrobial activity.

In summary, this compilation focuses on wound dressings and their expanding applications in wound management. Wound dressings have evolved over time and become specialized for various types of wounds. Additionally, tissue-engineered dressings have emerged as a promising option for refractory wounds requiring increased growth stimulation. It is expected that modern wound dressings developed using tissue engineering approaches will provide versatile solutions for effective wound management in the present and future.

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The Role Of 3D Printing Techniques in the Personalized Medicine of Breast Cancer Patients

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ABSTRACT

Breast cancer represents a current worldwide threat due to high morbidity, mortality and disability. According to the IARC, in 2020, there were about 2.3 million new cases of breast cancer globally and about 685 000 deaths related to breast cancer, with large geographical variations observed between countries and world regions.[1] Only 1.3% of positive breast cancer patients are detected in the early stages, while 24% in the late stages. As the development of 3D printing technologies is rising, creating new methods and using new materials in the proceeding, they have a promising future in the improvement of understanding, diagnosing and managing breast cancer patients by creating anatomical models of tumors for explanatory and surgical purposes, as well as of compatible and safe breast implants.

Aim of the study: 1. Determining of the recent improvements in the 3D printing technologies field;

2. Underlying the role of the 3D printed technologies in breast cancer management; 3. Promoting and implementing new ways of personalized medicine through 3D-printing technologies in oncology field.

Materials and methods: a literature review was performed using scientific articles from IARC, NCBI, PubMed, Frontiers, Science Direct, 3D Printing in Medicine databases.

Results: This review underlines the main domains and purposes of using the 3D printing technologies in the management of breast cancer patients. A personalized approach in surgical treatment of breast cancer and preoperative planning are essential in a successful and high-efficient medical care. Using images of mammary gland from CT or MRI scanning, processing them via computer software and subsequently 3D printing of the gland and tumour models, allows the detailed explanation of patients' condition and enhance the safe concerns and quality of medical decision in choosing an appropriate and personalized therapeutic tactic, including pre-operative training of tumour excision and post-surgical rehabilitation.[2] The interactive 3D models of tumours can be used during lectures and practical lessons for medical students, enhancing their knowledge about the tumour process and treatment options. Bioprinting allows the modeling and creation of breast gland implants using hypoallergenic, safe and compatible materials with the formation of patient-specific bio-absorbable matrices (scaffolds). On these scaffolds, different types of stem cells in combination with specific growth factors can be seeded and grown, ensuring the processes of adipose tissue formation and angiogenesis. After the resorption of scaffolds, the injected adipose tissue is kept as the extracellular matrix and minimize the significant volume loss of breast adipose tissue, often seen in the lipofilling technique.[3]

Conclusion. The 3D printing technologies have a promising role in the development of personalized medicine of breast cancer patients through educational, research, pre- and post-surgical purposes.

Key words: Breast cancer, bioprinting, 3D printing, 3D implants, personalized medicine

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Mesoporous Materials Loaded with *Melissa Officinalis* Extract

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Production of Wound Dressing from GO/PVA Fibers as Drug Delivery Vehicles for Breast Cancer Surgery Wounds

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ABSTRACT

Breast cancer surgery is a fairly common treatment option in cancer treatment. With this surgical procedure, some or all of the breast tissue can be removed. Cancer cells are removed during surgery. However, even a small group of cells after surgery can cause the disease to recur, multiply and lead to a serious condition. Therefore, postoperative treatment can be repeated in patients. In addition, it has been proven in some studies that damage to the tissue during wound healing of surgical tissue also triggers the development of metastasis. It is a promising approach to prepare a wound patch to the region by designing fiber after surgical treatment to prevent regional recurrence and infection, and to treat cancer by continuing drug delivery. This patch is expected to show good properties in terms of physiological stability and biosafety, antitumor and antibacterial activities.

By designing the dressing with polymers, a biosafe, biocompatible, non-toxic release that makes drug delivery systems target drug release can be achieved. Graphene oxide(GO) is a biocompatible material that helps to increase efficiency by targeting the cancer area. Combining graphene oxide with different polymers is an important use in drug delivery systems. Polyvinyl alcohol (PVA) is another alternative polymer used in cancer treatment. It is a biocompatible and water-soluble polymer. Targeting cancer cells by loading PVA particles with drugs increases the bioavailability and effect of the drug, reducing toxicity on healthy cells. In this project, we aimed to create DOX-loaded GO-PVA fibers for metastasis after breast cancer surgery with the advantages of material and electrospinning technology.

Design and Production of Microneedle Based Drug Delivery System Loaded with Hairy Cellulose Nanocrystals as a Novel Treatment of Breast Cancer

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ABSTRACT

Breast cancer is a prevalent and life-threatening disease, necessitating the development of innovative treatment approaches. This study presents a novel approach utilizing microneedles (MNs) for the targeted delivery of chemotherapy drugs in breast cancer treatment. The aim is to enhance treatment efficacy while minimizing side effects and improving patient quality of life. The project involves the design and fabrication of MNs loaded with Electrostatic Hairy Cellulose Nanocrystals (ENCC) as a carrier for Doxorubicin (DOX), a commonly used chemotherapy drug.

The research begins with a comprehensive literature review of existing breast cancer treatment methods, identifying the need for more effective and economically viable alternatives. The proposed combined treatment method using MNs seeks to overcome the limitations of conventional approaches by enabling localized and sustained release of the drug, minimizing systemic side effects. Additionally, the use of ENCC facilitates high drug-carrying capacity and controlled release, enhancing the therapeutic potential of the MNs.

Various characterization techniques, including scanning electron microscopy (SEM), X-ray diffractometry (XRD), Fourier transform infrared spectroscopy (FT-IR), in-vitro drug release tests, swelling tests, and degradation tests, are employed to evaluate the physical, chemical, and functional properties of the MNs. These characterizations confirm the successful fabrication and suitability of the MNs for efficient drug delivery in breast cancer treatment.

The project's innovative approach holds great promise for revolutionizing breast cancer treatment, with potential for significant impact on patient outcomes and healthcare costs. Collaboration opportunities with different countries are explored to support the research project and leverage global competitiveness. In comparison to current treatment methods, this innovation is expected to offer improved effectiveness, cost-efficiency, ease of application, and enhanced patient experience. Further studies and in vivo evaluations are warranted to validate the efficacy and safety of the MNs in clinical settings, ultimately offering a new era in breast cancer treatment.

Key words: Breast cancer, microneedles, chemotherapy, drug delivery, Electrostatic Hairy Cellulose Nanocrystals (ENCC), Doxorubicin (DOX)

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MgB_2 Powder Modification by Ultrasonication in Different Biological Liquids and Their Bioactivity on L929 and B16 Cells

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ABSTRACT

MgB_2 is interesting for the biomedical field considering its properties, such as biocompatibility, biodegradability, antimicrobial and antitumor properties [1]. This material has the potential to be used in cancer therapy, bone tissue engineering, epithelial tissue engineering, and surgical applications [2]. Nevertheless, the reaction between MgB_2 powder and biological media is a new topic, as there are only a few studies in this regard. Thus, systematic, complex research is needed to determine how MgB_2 is modified or decomposed by biological media and explain the interaction with different cell lines.

The present research investigates the interaction of MgB_2 commercial powder with distilled water, ethanol, and simulated media such as phosphate-buffered saline (PBS), Dulbecco's Modified Eagle Medium (DMEM). Ultrasonication is applied on the colloidal solutions of MgB_2 in the indicated liquid environments.

Through our experiments, we aim to obtain the modification of the MgB_2 powder in selected liquids and to study the influence of the modified powders on cell lines of interest for biomedical applications.

The biocompatibility of the modified (ultrasonicated) powders has been assessed on L929 (subcutaneous adipose tissue fibroblasts) and B16 (melanoma cells) by MTS (proliferation assay) and LDH (cytotoxicity assay). The powders have different cytotoxic behavior depending on the ultrasonication amplitude and the liquid medium. This can be explained by the large range of morphological, structural, and vibrational characteristics of the as-processed powders.

The experiments confirm that there are favorable concentrations for which the powders have the potential to be antitumor agents. Higher working concentrations (24.9 µg/ml or 58.1 µg/ml) for the indicated purpose are obtained for powders processed in DMEM. Results prove that by using the ultrasonication process in distinct media, the bioactivity of the MgB_2 powder can be controlled according to the targeted application.

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Session II. Materials for Advanced Applications (I)

Cinchona Alkaloids Family: Bioactive Derivatives and Multifunctional Chiral Ligands in Asymmetric Catalysis

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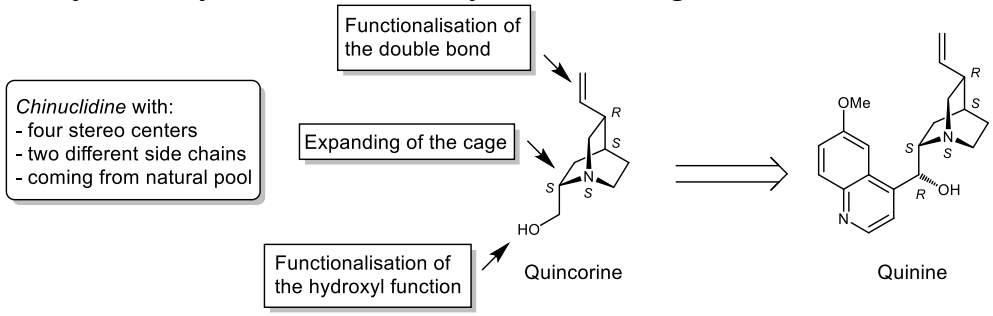
ABSTRACT

Quinine is the well-known representative of the *Cinchona* alkaloids which are used especially in catalysis, medicine and food industry. This important class of substances has inspired the chemical community for generations. Hoffmann *et al.* discovered a new way of cleavage. The two enantiopure quinuclidines, Quincorine (QCI) and Quincoridine (QCD) established a new branch in this field of demanding chemistry [1]. They are used in the last years as building blocks.



Initially, simple derivatives were synthesized in one or two steps [2-4]. These were then used more and more as chiral building blocks for complex molecules which were part of natural product based libraries and used as catalyst or as chiral moieties in bio-active substances [5-7].

Nowadays new types of chiral symmetrically and unsymmetrically N-heterocyclic carbenes (NHC) are synthesised with these quinuclidines and derivatives thereof. The novelty of this NHC´s is their chirality and their three-dimensional structure. The biological activity of these substances is very high [8]. Unpresented structures of these bitter carbenes will presented.

Furthermore, Cinchona alkaloids and their derivatives are widely used as chiral ligands, catalysts or racemic resolution agents in various industrial applications. This unique class of multifunctional chiral ligands, catalysts and resolving agents offer a genuine alternative to current systems and a broad range of new easily accessible derivatives for Asymmetric Synthesis.

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Assessing The Adsorbtion Capacity of Basil and Lavender for Heavy Metals

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ABSTRACT

Medicinal plants have long been utilized for their therapeutic properties and continue to hold significance in modern medicine. Despite the availability of synthetic drugs, medicinal plants serve as a valuable source of new medicines and offer complementary therapies for various health conditions. These plants contain diverse bioactive compounds that can positively impact human health. Preparation of teas or extracts from the dry biomass of medicinal plants is a common approach for their utilization.

However, the increasing contamination of the environment with heavy metals like lead, cadmium, and mercury raises concerns regarding the safety and quality of medicinal plants (Intawongse and Dean, 2006; Kohzadi et al., 2018). Heavy metal contamination can occur through atmospheric deposition, industrial activities, and the use of polluted water and soil for plant cultivation. Organic matter and pollutants can facilitate the absorption of heavy metals by medicinal plants, leading to potential risks for human health. To better understand heavy metal retention in medicinal plant biomass, an experimental program was conducted. It aimed to assess the capacity of dry medicinal plant biomass to retain heavy metal ions through biosorption during inappropriate storage.

Our study examined the adsorption of heavy metal ions, specifically Pb^{2+} and Cd^{2+}, from aqueous solutions using the dry biomass of basil (*Ocimum basilicum*) and lavender (*Lavandula angustifolia* L.). The optimal pH for Pb^{2+} adsorption was found to be 5, while for Cd^{2+} adsorption it was 6.5, for both plant biomasses. The adsorption capacity of medicinal plant biomass for heavy metal ions was influenced by factors such as pH, sorbent dose, and the type of heavy metal ions present. Basil exhibited a higher adsorption capacity for Pb^{2+} (82 mg/g) compared to Cd^{2+} (8.2 mg/g), while lavender showed a higher adsorption capacity for Pb^{2+} (61 mg/g) than for Cd^{2+} (17 mg/g).

Overall, the study demonstrated that the adsorption capacity of medicinal plant biomass for heavy metal ions is influenced by multiple factors, including pH, sorbent dose, and the specific heavy metal ion. These findings highlight the importance of understanding and mitigating heavy metal contamination in medicinal plants to ensure their safety and efficacy for medicinal purposes.

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Donezepil for the Treatment of Alzheimer's Disease-Loaded with Curcumin Production of Sandwich-Like 3D PCL/PVA Tissue Scaffolds

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Characterizations of Ethosuximide-Loaded Bismuth Ferrite Nanoparticles for the Potential Treatment of Epilepsy

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ABSTRACT

Epilepsy is the most common neurological disease that affected people of all ages, races, social classes, and geographical locations. According to the 2019 World Health Organization (WHO) data, about 0.7 % of the population is struggling with epilepsy. In addition, nearly 5 million people are diagnosed every year. The basic characteristic of epilepsy is aberrant electrical activity in several brain regions. About %70 patients with epilepsy can be treated successfully with antiepileptic drugs to control the patient's seizures. 20–30% of patients exhibit pharmacoresistance, and only a small portion of these patients will benefit from surgical intervention. Therefore, developing a successful treatment for the disease is still quite difficult. To accomplish this objective, antiepileptic drug-loaded carrier nanoparticles can be an alternative treatment for epilepsy.Recent developments to improve the release of drugs from smart materials include Near Infrared Light (NIR) radiation (NIR), ultraviolet (UV) and visible wavelength light, magnetic fields, ultrasound, and electrical stimulation. Compared to drug delivery systems based on stable passive delivery, these strategies offer more effective control over the delivery of drugs. Nanoparticle drug carriers are being studied further for controlled drug delivery due to their benefits including good structure and tunable characteristics. Multiferroic materials due to their controllable possession, have drawn interest in recent years to develop new materials or structures. Bismuth ferrite ($BiFeO_3$, BFO) is a single-phase multiferroic material with a polar R3c space group and rhombohedral distorted cell, has the ability to be both ferroelectric and anti-ferromagnetic.In this study, bare and drug loaded bismuth ferrite nanoparticles were synthesized by co-precipitation method. Bare and drug loaded nanoparticles were characterized by fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), X-ray diffraction analysis (XRD), and scanning electron microscopy (SEM). Ethosuximide is an FDA-approved, made available as an efficient and generally well-tolerated medication to treat absence seizures. It prevents clonic seizures generated on by bicuculline or pentylenetetrazole when administered subcutaneously. Also, biological test was done by using microglia cells.

Keywords: Epilepsy; bismuth ferrite nanoparticles; ethosuximide; joint infections; tissue engineering.

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The Synergistic effect of Biogenic Reduced Graphene Oxide and Iron Oxide Unveils Breakthroughs in Biomedical Application

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Development of Microparticles Containing Polylactic Acid/Bioactive Glass/Caffeic Acid

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ABSTRACT

Bone diseases or defects cause significant problems for people around the world, both in terms of the economy and their health. The deficiencies in traditional methods have led researchers to focus on bone tissue engineering (BTE) and explore new and improved methods. In this study, the production and characterization of microparticles (MPs) for BTE are emphasized. By using the polylactic acid (PLA), bioactive glass (BG), and caffeic acid (CA) electrospray (ES) method with optimum parameters, four different types of MPs (3% PLA, 3% PLA/0.1% BGs, 3% PLA/0.1% CA, and 3% PLA/0.1% BGs/0.1% CA) were produced. Scanning electron microscopy (SEM) analysis revealed an increase in the mean diameter with the addition of substances. Fourier transform infrared spectroscopy (FTIR) analysis confirmed the presence of the main material, PLA. Differential scanning calorimetry (DSC) analysis demonstrated that the added substances affected the thermal properties of PLA. X-ray diffraction (XRD) analysis showed that the substances had minimal impact on the PLA pattern. In addition, in the in vitro drug release test, the release characteristics of CA from MPs were examined, and as a result, different compositions at different rates (180 min and 720 min) were determined. Moreover, the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay results showed that the MPs did not show toxicity against human fetal osteoblastic (hFOB) 1.19 cell lines. In conclusion, this study provides comprehensive information about the production and characterization of MPs and will be a promising study for use in BTE studies thanks to the results obtained.

Compatibility and Stability of Retinoids Impregnated in Bioglass for Dermatological Applications

Ioana Lavinia Lixandru (Matei)

ABSTRACT

Retinoids are effective against acne, psoriasis, skin aging, discoloration and other skin conditions. However, apart from their side effects, their susceptibility to degradation is a limiting factor for their widespread use. Thus, using retinoids in cosmetic formulations may be limited by their susceptibility to heat, oxygen, light, and acids. In a cosmetic product, the composition, as well as the storage conditions and the type of packaging, may influence the degradation of retinoids into less active forms. Thus, in this paper I am going to discuss the protocol I used for choosing the package and performing stability tests and compatibility test with the container for the molecule I developed starting from retinoids impregnated in bioglass: BGS 0.3 Molecule. An appropriate analytical methodology, stability tests assess the formulation whereas compatibility tests assess the product in its final packaging. Both tests are highly important to ensure a qualitative formulation. Moreover, these two types of tests complement each other.

In addition, retinoids are highly photolabile or photo-unstable and exhibit rapid photodegradation. As a result, whenever exposed to light and air, they oxidize. In conclusion, they may lose some of their efficiency until they stop working altogether. Moreover, in a study published in 2021, performed on commercial cosmetics, focusing on different factors affecting retinoids stability was mentioned that light degradation was more pronounced than temperature-induced degradation, for the samples analyzed. Thus, for the molecule BGS 0.3 Molecule, I chose a special kind of packaging that does not expose the product to light and air. As a result, my choice was biophotonic glass, the glass jar that protects, prolongs and enhances natural products. In addition, comparative tests (biophotonic glass versus transparent glass) show that biophotonic glass as a glass container for retinoids protects, prolongs and enhances the stability of the product.

In conclusion, the obtained results after the compatibility and stability tests show that the cosmetic product: The 0.3% BGS Molecule showed good sensory and physical-chemical characteristics after stability and compatibility testing protocol. Thus, the product is a stable and quality formula that can be safely used for topical application.

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Effects of Cobalt Doping on the Structural Properties of ZnO Thin Films Produced by an Automated SILAR Process

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ABSTRACT

In recent years, numerous experiments have been carried out to tailor the properties of zinc oxide (ZnO) for various purposes [1]. In this context, ZnO doped with a transition metal (MT - Ni, Mn, Cu, Fe, Co, etc.) combines both, magnetic and semiconducting properties, and became an essential material for improving the performance of a variety of modern technological devices, including optoelectronic sensors, photovoltaic cells, and electronic components.

Cobalt (Co) is of particular interest among the above-mentioned MTs because of its abundant electronic state, its high solubility in the ZnO matrix, its ionic radius close to that of Zn [2], and because of its capability to form the Co+3 cation by Co+2 cation ionization under light excitation. This ionization releases an electron which will be found in the conduction band. This mechanism leads thus to an improvement in the electrical conductivity of films under light excitation [3]. As a result, Co ions are easily incorporated into the ZnO host lattice without undergoing significant distortion.

The present work reports the synthesis, characterization, and properties evaluation of high-quality Co-doped and undoped ZnO films (Co: ZnO) exhibiting ferromagnetic behavior at room temperature (RT) grown using a low-cost homemade successive ionic layer adsorption and reaction (SILAR) automated technique [4]. Although the Co concentrations varied, all films were synthesized using the same deposition conditions. Moreover, the effect of Co doping on the structural, morphological, and optical characteristics of deposited films was investigated.

Keywords: ZnO, thin film, Cobalt, Doped ZnO, SILAR, transition metal, nanomaterials

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Production of Vancomycin-Loaded Polylactic acid (PLA)/Polycaprolactone (PCL) Electrospun Nanofibers with Different Designs

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ABSTRACT

Wound dressings serve an important role in the management of all types of wounds, including acute and chronic wounds, by facilitating healing and providing a favorable environment for tissue regeneration (Kumar et al., 2018). Electrospinning has emerged as a potential approach for producing nanofibrous materials with diverse applications such as tissue engineering, drug delivery, and filtration (Huang et al., 2003). Because of their biocompatibility and tunable mechanical properties, poly(lactic acid) (PLA) and poly(-caprolactone) (PCL) are two of the most extensively researched polymers utilized in electrospinning (Li et al., 2009). However, there is still a lot of study being done on how electrospinning factors affect the morphology, structure, and characteristics of PLA and PCL nanofibers. Electrospraying is a versatile and promising approach in particle engineering and drug delivery, providing fine control over particle size, shape, and composition(Thakur et al., 2020). Due to their numerous features and prospective uses in enhancing therapeutic results, polyvinylpyrrolidone (PVP) nanoparticles have drawn a lot of attention in drug delivery research (Zhang et al., 2020). Vancomycin, a glycopeptide antibiotic, has been widely used for the treatment of severe gram-positive bacterial infections, particularly those caused by methicillin-resistant Staphylococcus aureus (MRSA) (Hidayat et al., 2006). It has shown activity against biofilms, making it a promising option for the treatment of device-related infections. In this study, the effects of various designs on the properties of PLA/PCL nanofibers and PVP nanoparticles were compared. PLA/PCL nanofibers were produced and the surface was electrosprayed with PVP, including both control and drug-containing groups. In other groups, PVP nanoparticles were between the nanofibers. Therefore it was expected that a change among the drug releases of both groups would be observed depending on the design. SEM imaging will be applied in order to observe the patches morphology. FTIR analysis will be performed to obtain the functional groups in the structure. DSC analysis will done for the thermal properties of the designed patches. Drug release will be performed in order to compare the release speed. Also, antimicrobial tests will be done. This work can inspire new researches that will be using electrospinning and electrospraying methods in order to produce nanofibers with different designs.

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Ethosuximide Loaded Polylactic Acid/Bismuth Ferrite Nanofibers for Epilepsy Treatment

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Design and Fabrication of Biofunctional PVA/PLA Bi-layer Nanofiber Wound Dressing by Electrospinning Method

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ABSTRACT

Injured tissues are conditions that occur with internal or external factors and limit the social activities of the patients. A nanofiber dressing was aimed to ensure rapid healing and to create a suitable wound environment.

In this study, it was produced to form double-layered polymeric and functional composite nanofiber structures by electrospinning method. In the first layer of the dressing, PLA (Polylactic acid) polymer, which degrades faster, and propolis compound with antibacterial activity, which is desired to reach the wound immediately, were used. In the second layer, PVA (Polyvinyl alcohol) polymer and aloe vera gel, which supports cell migration and has wound healing properties, were used. These two different solutions were printed on each other by electrospinning method under appropriate parameters and double-layered nanofiber materials were formed. The samples obtained were first examined under an optical microscope, then the solubility of the compounds in the structure was analyzed by FTIR characterization and the visibility of the nanofibers was analyzed by SEM.

Finally, by sharing the results of the study, it was ensured that the preferred polymers, additional components and formation methods contributed to the wound dressing area.

Session III. Advanced Techniques in Material Science

A Combined Approach in Understanding the Potential Use of High Entropy Alloys (HEAs) in Dentistry

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ABSTRACT

To address various anatomical deteriorations and effectively overcome dental health problems, the use of metallic alloys in both restorative works and implants has progressively increased over time. These alloys are commonly employed in prosthodontics, serving as fixed restorations and removable partial dentures.

Despite significant advancements in the study of metallic materials, including titanium, zirconium, and noble alloys [1], the discovery of a material that can be used without associated risks or the need for revision after a considerable period remains elusive. Conventional implants face two main issues: a mismatch in mechanical properties that can lead to stress shielding and degradation of biocompatibility caused by ion release triggered by chemical corrosion or wear [2].

Restrictions have been imposed on the usage of metallic alloys in dentistry due to the toxicity of cobalt and allergic reactions induced by nickel. As a result, research has focused on exploring alternative materials and eliminating cobalt- and nickel-chromium (CoCr, NiCr) alloys from dental applications [3].

The European Union Medical Devices Regulation (MDR) (2017/745), originally intended to take effect in May 2021, has been updated to incorporate the toxicological risks associated with cobalt-chromium alloys used in dentistry [4]. However, the complete implementation of the medical device regulation (MDR) has been postponed until December 2022 due to global events, including the ongoing pandemic. This delay involves changes such as the reclassification of current goods and a greater need for conducting clinical trials.

Current research endeavors primarily focus on high entropy alloys (HEAs) in the pursuit of achieving an optimal balance between biocompatibility, strength, corrosion resistance, and wear resistance [5]. Biocompatible multicomponent alloys containing elements such as titanium, zirconium, tantalum, niobium, and molybdenum have demonstrated excellent cytocompatibility, high strength, and enhanced corrosion resistance, and constitute the majority of the BioHEAs under investigation [6–8].

However, although the existing data including cell-based tests suggest that BioHEAs are promising materials to be used in dental restorations and to reduce implant failure, it is to notice that more *in vivo* studies are also needed to evaluate the overall performance of BioHEAs with regard to resistance to corrosion and wear, as well as mechanical compatibility. Additionally, HEAs implant materials come with certain disadvantages, including financial constraints such as high manufacturing costs, and technical challenges such as elemental segregation. Efforts are being made to address these issues, such as exploring HEA coatings on less expensive substrates and various fabrication methods that allow for more precise tailoring of the properties of such alloys.

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Gd-SiO_2 Nanoparticles as New Contrast Agents for MRI and PCCT

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ABSTRACT

Recent advances in biomedical imaging techniques, such as ongoing implementation of photon-counting computed tomography (PCCT), triggered the need for development of novel classes of the contrasting agents (CA). Special attention is devoted to CA that could be used in multiple types of imaging studies dramatically enhancing their experimental and diagnostic capabilities. Among such CA, Gd-based nanoparticles with core-shell structure are considered the most promising due to their usability for both magnetic resonance imaging (MRI) and CT/PCCT combined with variability in size, morphology, and functionalization capabilities allowing to tailor their physico-chemical and pharmacological properties [1].

In this study, CA with a SiO_2@Gd_2O_3@SiO_2 structure was obtained. SiO_2 nanoparticles were synthesized by precipitation of silicon oxide from rice husk ash. The nanoparticles had narrow size distribution and highly developed surface, which allowed using them as a template for Gd-containing CA. SiO_2 shells were obtained by catalytic deposition from TEOS, according to [2].

MRI evaluation of the proposed CA was done by determination of their relaxivities. The phantoms were prepared in 5% gelatin with Gd concentrations of 0, 0.0625, 0.125, 0.25, 0.5, and 1 mM. The study was performed on 7T MRI scanner Bruker BioSpec 70/30 USR. T1 and T2 maps were obtained using RARE-VTR and MSME pulse sequences, respectively. The dependences of the two relaxation rates (1/T1 and 1/T2) on Gd concentration were measured, and relaxivities denoted as r1 and r2 were determined.

For PCCT, the samples with Gd concentrations 0, 2.5, 5, 10, and 20 mg/ml were studied using MARS Bioimaging PCCT scanner equipped with Medipix 3RX detectors. Energy thresholds of of 7, 40, 48, 56 and 64 keV were used, with Gd presence determined by attenuation ratios between energy windows of 40-48 and 48-56 keV. The obtained data were compared with phantoms with $Gd(NO_3)_3 \cdot 6H_2O$ and Gd_2O_3.

The r1 and r2 values for SiO_2@Gd_2O_3@SiO_2 and $Gd(NO_3)_3 \cdot 6H_2O$ in 5% gelatin were 2.62±0.05 $mM^{-1}s^{-1}$ and 1.72±0.08 $mM^{-1}s^{-1}$, respectively , while the r2 values for SiO_2@Gd_2O_3@SiO_2 and $Gd(NO_3)_3 \cdot 6H_2O$ were 11.8±0.9 mM^{-1}s-1 and 8.2±0.6 $mM^{-1}s^{-1}$, respectively. PCCT studies confirmed the possibility to visualize and quantify SiO_2@Gd_2O_3@SiO_2 CA in concentrations down to 2.5 mg.

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Salicylic Acid-Loaded Gelatin Methacryloyl Microneedles as a Potential Drug Delivery System in Plants Diseases

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ABSTRACT

The authors did not agree with the publishing of the abstract. (Inca n-a trimis)

Comparison of Cellulose Nanofibers Synthesized from Three Parts of Kenaf Biomass

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Continuing Technology of Extraction Silica for Inorganic Materials from Biomass By-Products

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Session II. Materials for Advanced Applications (II)

A One-Pot Universal Approach to Fabricate Lubricant-Infused Slippery Surfaces on Solid Substrates

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ABSTRACT

Wetting is a surface phenomenon that is common in nature having an enormous impact on human life. Slippery, liquid-infused, porous surfaces have recently been developed to meet the growing demand for anti-fouling coatings.[1, 2] While short-chain fluorinated compounds, commonly used to reduce the surface energy of substrates, have been banned due to environmental toxicity, silane-based compounds are expensive and poorly scalable. In this sense, silicone-based chemistry could fill the gap as a real alternative since silicone compounds are biocompatible (also FDA approved), abundant, extremely low-cost and widely used in medicine. However, the grafting approaches demonstrated to date either suffered from slow binding kinetics or were applied under harsh destructive conditions.

Here, we show that polydimethylsiloxanes can be grafted onto virtually any substrate when exposed to UV light, acting simultaneously as a reducing surface energy agents and lubricants.[3] This process has been applied to metals, metal oxides and ceramics with different surface morphologies from smooth to highly rough. The proposed approach is simple, fast, scalable, environmentally friendly, and low cost, yet forms stable lubricant infused slippery surfaces in a one-pot process. Due to the biocompatibility of silicone-based compounds, the process has been studied on medically applicable substrates such as scalpel blades and glass lenses, which show improved corrosion resistance, reduced incisional friction, and repulsion of blood stains and bacterial adhesion, without degrading their mechanical and optical properties.

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Characterization of Oxides Grown on Uncoated and CrN_x Coated 310 H Stainless Steel After Exposure to Supercritical Water Environment

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ABSTRACT

In the context of GENIV nuclear concepts [1, 2] development, supercritical water reactor was selected as an option because it promises a higher thermal efficiency using a more compact system. Because the supercritical water is an aggressive environment, the selection of the best materials candidates for internal components represent a true challenge. In this sense there are many concerns in improve the performances and corrosion resistance of existing commercial alloys. One of the ways to improve corrosion resistance of the existing materials is the coating of the alloys surface with thin metallic or ceramic layers by various deposition techniques.

The paper's aim is the oxidation behavior assessment of uncoated and CrN_x coated 310 H stainless steel (SS) in water at supercritical temperature of 550°C and pressure of 25 MPa for up to 2160 hours. The chromium nitride layers were obtained by the thermionic vacuum arc (TVA) method [3]. After oxidation, all samples were characterized using gravimetric analysis, scanning electron microscopy (SEM) with an energy dispersive spectra detector (EDS), and grazing incidence X-ray diffraction (GIXRD). Corrosion susceptibility was assessed by two electrochemical methods: electrochemical impedance spectroscopy (EIS) and linear potentiodynamic polarization. Gravimetric analysis revealed that all tested samples gained weight and the oxidation of the uncoated and CrN_x coated 310 H samples followed a parabolic law indicating that it is driven by a diffusion process. From EIS spectra was observed an increase of impedance values for all coated samples compared to uncoated samples. Also, the low corrosion rate obtained for the CrN_x coated 310 H samples oxidized for a different time period indicated better corrosion resistance than the uncoated samples oxidized the same time period.

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The synthesis of a Core-Shell Nanocomposite Consisting of Lanthanum Nanoparticles Encapsulated in Carbon Matrices

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ABSTRACT

Carbon-containing nanocomposite materials are a notable area of chemistry and are actively investigated for applications in such fields as catalysts, energy storage, drug delivery, and aerospace technologies [1].

One of the methods of synthesis of composites based on carbon nanomaterials and metals is impregnation of dispersion of carbon nanoparticles with solution of metal nitrates followed by annealing in order to partially or completely decompose the nitrate to oxide or further metal reduction [2].

Despite the productivity of the method, the resulting metal-containing nanoparticles reside on the surface of the carbon material, which may lead to the problem of nanocomposite integrity. The solution to this problem can be the formation of additional carbon layers thus effectively covering the metal-containing particles and forming a core-shell structures.

In this work, a method is proposed for the synthesis of nanocomposite based on nanoscale, few-layered graphite fragments and Lanthanum, and its post-treatment by hydrothermal method in sucrose solution in order to form additional carbon layers covering the metal.

The resulting modified nanocomposite's morphology was studied by transmission electron microscopy and the surface properties were evaluated by X-ray photoelectron spectroscopy. The obtained data were compared with the nanocomposite prior to the modification.

The nanocomposite sythesized using the described methods is planned to be studied as a model for further covalent functionalization with low molecular weight species in order to synthesize a drug of selective action and study it with the help of spectral computed or magnetic resonance tomography.

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Applications of Nanotechnology in Phytoremediation of Heavy Metal-Contaminated Soils: A Review of Current Developments and Future Prospects

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ABSTRACT

Heavy metal contamination in soil is a worldwide issue that poses one of the most serious risks to the environment and public health. Several conventional approaches like adsorption, excavation, chemical precipitation, in situ fixation, and so on are employed in the cleanup of heavy metals in the contaminated soils. However, these approaches have disadvantages such as higher cost, secondary pollutant production, partial removal of heavy metal ions, and time consumption, among others. Therefore, there is a need for a rapid, cost-effective, efficient, and environmentally friendly method of removing heavy metals from soil.

Phytoremediation is a potential tool for addressing these challenges since it is an environmentally friendly, inexpensive, long-lasting, and innovative method. Nonetheless, the application of phytoremediation alone as a technique for heavy metal remediation in soil has several limitations. Nanoparticle-assisted phytoremediation is therefore advocated as a more reliable approach to removing contaminants from the environment. Because of their enormous surface areas, large number of active surface sites, and high adsorption capabilities, nanoparticles have a strong affinity for heavy metal ions, making them a suitable alternative for polluted soil remediation. Therefore, the integration of nanotechnology into phytoremediation has the potential to dramatically increase the efficiency and efficacy of heavy metal removal, providing a viable option for future sustainable soil remediation.

This paper discusses the recent applications and principles employed by plants in phytoremediation of HMs as well as plant-nanoparticle interactions. The paper also examined how nanoparticles affect plant growth and physiological and biochemical changes, as well as their roles in the removal of heavy metals from contaminated soils. Moreover, the drawbacks, mitigation strategies, and future prospects of nanotechnology applications in phytoremediation of heavy metal-contaminated soils were discussed.

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Dielectric And Electrical Properties of Melt-Extruded Polypropylene Carbon Nanofiber Composites

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Electrical Conductivity Modeling of Carbon Reinforced Polymer Composites Using an Interphase Approach

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ABSTRACT

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Colloidal Tweezers Using Magnetic Colloidal Polymers

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ABSTRACT

The pair-depletion interactions between two non-magnetic soft colloidal particles surrounded by a suspension of magnetic colloidal polymers is studied via numerical simulations in a quasi-two dimensional geometry (representative of interfaces). The depletion force profiles obtained are observed to present magnetic field modulable regions of attraction and repulsion leading in some cases to the existence of stable points, i.e. local potential wells. It is observed that the use of an external magnetic field allows to shift the location of those regions and enhance the attractive and repulsive regimes observed in the depletion profiles, as well as the number of stable points present in the force profiles. Our results show that these interfaces have the potential for allowing to control the distance between the two non-magnetic colloidal particles, which is a step forward to the creation of magnetic colloidal tweezers.

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Session V. Biomaterials for Antimicrobial Therapies

Synthesis of Metal Nanoparticles with Plant Extract Loaded with Niosomes for Potential Anti Skin Bacterial Psoriasis

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ABSTRACT

Skin infections pose a significant clinical challenge on a global scale. These infections in humans are brought on by bacterial agents. Our preliminary research indicates that a standardised extract of local extract, has the potential to inhibit skin bacterial infections, especially those caused by *Staphylococcus aureus*. However, there are obstacles to the therapeutic application of synthesised zinc oxide nanoparticles (ZnONPs) combined with local extract. Low extract stability, solubility, and bioavailability are the primary obstacles to its efficacy. To unlock the therapeutic potential of the plant extract, it is crucial to address these limitations promptly. Nanoencapsulation using niosome nanotechnology formulations represents a promising alternative to conventional delivery systems. Niosomes permit the sustained release of bioactive compounds at a specific site. As a result, the purpose of this research is to examine the efficacy of nanoencapsulation via niosome formulations in overcoming the therapeutic limitations of synthesised ZnONPs derived from local extract as an anti-psoriasis agent. The ZnONPs synthesised with the extract will be synergized via nanoencapsulation with niosomes. Using scanning electron microscopy (SEM), transmission electron microscopy (TEM), zetasizer, and Fourier transform infrared spectroscopy (FTIR), the formulation's physicochemical properties, including particle size, stability, and morphology, will be evaluated. The formulation of niosomal nanoencapsulation aims to improve the bioavailability of the synthesised ZnONPs from local extract and enable sustained release of bioactive compounds, making it an ideal vehicle for delivering existing anti-psoriasis and skin treatment therapies.

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Design and Development of Hybrid Hemodialysis Membrane Containing Graphene Oxide and Polysulfone

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ABSTRACT

One of the most common procedures that is being used at kidney failure treatment is hemodialysis and membrane properties that are used in hemodialysis devices are very important. Complications that are arisen from the membrane properties and the related risks for the patients are still being seen. Due to these reasons, there is a need for the production of better quality and biocompatible membranes.

It is preferred that the membranes to be used for hemodialysis have high pore ratio and filtration performance and are biocompatible. When a literature search was conducted in line with this goal, it was seen that the materials commonly used in membrane synthesis are synthetic polymers due to these advantages. In this context, Polysulfone (PS) was chosen as the polymer to be used in membrane production in the project, and Graphene Oxide (GO) was chosen as the layer material. It is aimed to increase the filtering capacity of the membrane with the active, porous and hydrophilic structure of GO, and to improve the membrane performance thanks to its high durability and easily stretchable material. PS was preferred because it provides chemical and thermal stability to the membrane. In this project, It is aimed to produce multi-layered and nanofiber structured membranes by using PS and GO.

Electrospinning has become a preferable method for the production of nanofiber materials with rapidly developing technology. With this method, it is possible to produce materials having high porosity, high surface area and nano scale structure. For this reason, this technique was chosen for the production of membranesIt is foreseen that the membranes to be produced in this way will have high porosity, surface area and hydraulic permeability, better toxic substance clearance and filtration capacity, and that, by increasing the hemodialysis performance and efficiency, membrane-related complications that might occur in patients will be reduced.

The method to be used in this project has two main steps. Firstly, by the use of electrospinning method, polysulfone nanofiber membrane materials will be obtained. Then Graphene Oxide will be synthesized and added to polysulfone fibers by vacuum filtration method. Membranes will be obtained in three different structures (PS - PS/GO - PS/GO/PS) and their performance will be evaluated after characterization procedures.

It is foreseen that membranes to be produced will provide higher retention performance with the addition of GO layer to the nanofiber structure compared to pre-manufactured membranes. Thus, with the use of these membranes, it will be possible to perform more efficient hemodialysis procedures.

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Enrichment of Antioxidant Properties of Chitosan-Fish Gelatin Edible Films by Incorporating Procyanidin

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ABSTRACT

Chitosan and fish gelatin are naturally occurring biopolymers recovered from fishery industrial waste that, when coupled with plant extracts rich in antioxidant properties, can be used to produce edible films that can be utilized to extend the shelf life of food products. In this study, chitosan-fish gelatin edible films prepared with incorporation of procyanidin (PC). Investigations are conducted on the impact of PC on the antioxidant, microstructure, physical characteristics, and antibacterial activities of films and solutions.

The results revealed that the incorporation of PC make the chitosan-gelatin film produced the highest 2,2-azinobios-(3-ethylbenzothiazoline-6-sulfonic acid) radical scavenging activity up to 95.63% at 1.00 mg/mL. Mechanical properties showed a decrease in tensile strength (27.17+ 62.35%) and an increase in elongation at break (33.42+62.48%) for film with 1.00 mg/mL PC. The results indicated that the addition of PC to the fish gelatin–chitosan film increased its ABTS radical scavenging activity to up to 95.63% at a concentration of 1.00 mg/mL, whereas other techniques yielded values of 89.13%, 69.85%, and 68.85 % for the DPPH, HRSA, and RP assays, respectively.

The study of the antibacterial activity of solutions revealed that the increasing amount of PC had no effect on the activity. Given the twin antioxidant and antibacterial capabilities demonstrated for these films based on gelatin and chitosan blends complimented with PC, they may offer an alternative as an active packaging material for food applications such as fish, meat, and cheese.

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Antibiotic-Loaded Polylactic Acid Fibers for the Treatment of Skin Infections

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ABSTRACT

Skin infections are medical conditions caused by parasites, bacteria, viruses and fungi when these microorganisms enters skin by having damaged skin or simply with insect bite, mostly skin infections can be recognized with edema, erythema, lesions and other inflammation signs [1]

Globally according to systemic study covered skin diseases analysis between 1990 and 2019 the number of bacterial skin diseases patients is increasing with rate of change of age standarized (7.38%) [2], this study raised the awarness about finding ways to prevent the formulation of skin infections and treating it in effective way.

Traditional methods in treating skin infections includes the herbal treatments that were used form ancient centuries (e.g. Achyranthes aspera , Aloe vera,...), these herbs have proved its effectivness with more than 80% cured people in India which depends on traditional treatments for skin diseases [3].

Conventional treatment of skin infections includes the usage of antibiotics in its different forms, and different mechanism of action according to the cause of the infection (gram positive or gram negative bacteria). On the other hand, the dosage differ according to the form of antibiotics, and the antibiotic type[4]

Modern medicine of treating skin infections includes the usage of new drug delivery systems which applies the usage of biomaterials (polymers, ceramics, metals, composites) at different size scales (macro, micro, nano) that help in reducing the side effects of drugs, extend the half-life, and having optimal pharmacokinetics processes for the targeted drug [5].

In the last two decades, the interset in developing new methods to deliver drugs has become more and more; espically the deliver of antibiotics because of the increase in resistance on global scales. These methods includes using different techniques such as electrospinning technique which produces fibers mainly composed of polymers loaded with drugs, this technique is classified as promising method for personlized medicine and the improvement of drug release profiles. [6]

In this work, we tried to focus on taking advantages of electrospinning technique to deliver minimum amount of antibiotics (Gentamicin, Caffeic Acid) to skin for the treatment of skin infections away from antibiotic resistance. Fibers were fabricated by loading antibiotics with Poly Lactic Acid polymeric solution and produce fibers that can be used directly on skin with lower side effects and lower dosage when compared to conventional methods of delivering drugs. Morphological, mechanical, thermal, chemical analysis were ivestigated for the fabricated fibers; in addition to swelling antimicrobial, drug release profiles.

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Green Synthesis of Copper Based Particles Using Ocimum Sanctum Leaf Extract and its Synergistic Antibacterial Activity

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ABSTRACT

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Effect of Silver on Novel Biodegradable Zinc-Copper Alloys for Ureteral Stent

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ABSTRACT

Clinical problems, such as urinary tract obstruction and injury, are economic and social burdens that require solutions worldwide. A urinary tract obstruction can occur anywhere in the urinary system, such as the ureter, which connects the kidneys to the bladder, or the urethra, the external urinary canal. Urethral stents, just like vascular stents, are developed for the treatment of the narrowed or blocked area. With improving ease of application, these medical devices are widely used for therapeutic purposes in urology practice[123]. However, there have been reports of complications such as crusting, patient discomfort and infection with currently used stent materials[45] . So new approaches are needed in this regard.

In the present study, it was aimed to produce a biodegradable Zn-based alloy to develop a biodegradable ureteral stent with high radial strength. High purity Zn, Cu and Ag elements(99,99% from alfa easer) were prepared for the newly developed alloy and produced by casting method.. The melting was carried out in a boron nitride-coated graphite crucible at 550°C. After alloying, it was poured into a steel mold preheated to 250°C. After casting, homogenization heat treatment was applied at 350°C for 16 hours and quenched in 0±2℃ ice water. The desired composition was checked by applying elemental analysis(XRF) to the produced samples.

The microstructures of the samples were investigated by optical microscopy and X-ray diffraction analysis. The mechanical properties of the samples were investigated by hardness test and tensile test. According to the hardness tests, the hardness of pure Zn was measured to be 38HV, while when alloyed with Cu, this value was found to be 54HV. With increasing addition of silver, the hardness reached about twice that of pure zinc hardness. An increase in tensile strength was observed with increasing alloying element in the alloy system. The degradation behavior of the novel alloys was investigated by in vitro immersion tests in two different liquids.

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Silver-coated Magnetite Microspheres for Targeted Antimicrobial Applications

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ABSTRACT

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Ciprofloxacin Loaded GelMA Scaffold as a Therapeutic for Joint Infections

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ABSTRACT

Bacterial infection can occur after tissue scaffolding or a prosthesis is placed in a joint. To prevent this, it is very important that the tissue scaffold produced is antimicrobial. To this end, the aim was to produce antimicrobial scaffolds with ciprofloxacin loaded gelatin methacrylate (GelMA).

Ciprofloxacin is an FDA-approved, broad-spectrum antibiotic in the fluoroquinolone class. It is used to treat many infections, including skin, bone and joint infections. In addition, the combined use of a biomaterial and ciprofloxacin may prevent drug resistance problems and allow for targeted and patient-specific applications at lower doses than traditional drug delivery methods. GelMA is a biodegradable and biocompatible hydrogel that promotes localized delivery of cells and biomolecules. GelMA is formed by the modification of gelatin with photocrosslinkable methacrylamide groups.

In this study, GelMA was synthesized from type B gelatin and then ciprofloxacin was added to GELMA at specific concentrations. According to FTIR, swelling, antimicrobial and drug release analyses, ciproflaxacin loaded GelMA is promising for future use in various tissue engineering applications.

Keywords: GelMA, Ciprofloxacin, Joint Infections, Tissue Engineering

Development of Electrospun Nanofibers Containing Gentamicin and Cinnamaldehyde for Treating Corneal Infections

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ABSTRACT

Corneal infections are serious health problems that occur when the cornea, the clear outer layer of the eye, becomes infected. These infections may be of bacterial, viral or fungal origin and may present with a variety of symptoms. Treatment of corneal infections can be possible with early diagnosis. Biomaterials can be used to control infection, reduce inflammation and support the healing process of the cornea. Electrospinning method is preferred in tissue engineering due to the ability of the produced nanofibers to be biocompatible and slow release of drugs. This ensures that the antimicrobial agents are released in a controlled manner and are effective for a long time at the site of infection. Thanks to these properties, it provides a better tolerance when used in the treatment of corneal infections.

In this study, drug-loaded electrospun nanofibers were developed to treat corneal infections. An alternative method for the treatment of corneal infections is considered which involves the utilization of polyvinyl alcohol (PVA), gelatin (GEL), cinnamaldehyde (CA) and gentamicin (GEN). Pure (PVA/GEL), CA-loaded (PVA/GEL/CA), GEN-loaded (PVA/GEL/GEN), and combined drug-loaded (PVA/GEL/CA/GEN) electrospun nanofibers have been successfully produced and characterization tests were carried out. Electrospun nanofibers were optimized at a distance of 12 cm from the collector, at a flow rate of 0.5 ml/hour and at 25 kV voltage parameters. The characterization of the nanofibers was carried out with Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM) and Differential Scanning Calorimetry (DSC). Also mechanical properties, swelling and degradation behavior, and drug release kinetics were investigated. Drug release results showed that CA release continued until 96th hour, while GEN release continued until the 264th hour. MTT analysis was conducted to assess the biocompatibility, cellular growth of nanofiber patches loaded with drugs. The results indicated nanofibers did not exhibit any toxic effects.

Keywords: Electrospinning, Corneal Infections, Biomaterials, Gentamicin, Cinnamaldehyde

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Session VI. Materials for Advanced Applications (III)

Functional and Novel Perovskite Materials for Biomedical and Energy Harvesting Applications

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ABSTRACT

From years scientest finding ways to develop alternatives for the energy sector. This prespective has emerged due to the climatic changings that costs the healty enviornments and the populations that are eating the non-renewable energy sources. The current demands of energy, medical and enviornment are tackled by novel materials. The ongoing revolution of energy sector with increasing efficencies of harvesting the energy by several routes to fulfill the need of renewable energy. An impressive class of materials having its property when mechanically strain produce electrical voltage utilze in the solar cells, sensors, actuators, high temperature materials and sprintonics. The developments shows that when these materials attach with the muscles, limbs, inserted in the shoes, and movement of intenal organs produces a large amount of energy. The biomedical feature of these materials is an added advantage.The biomechanical importance colectively targeted by piezolectric properties helped scientest to fabricate peizoelectric energy bio harvestors (PEBH). Many of them are relacing previously placed cardic pacemakers, blood pressure sensors, and direct simulation of bone and tissue movements[1-4].

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Heavy Metal Removal from Contaminated Soils by Phytoremediation

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ABSTRACT

Soil pollution with heavy metals is one of the most significant and visible environmental problems facing Romania. Heavy metals in soil originate from various sources, including natural geological processes, as well as anthropogenic activities like industrial operations (mining, smelting, manufacturing), agricultural practices (fertilizers, pesticides, manure), urbanization and traffic-related pollution, improper waste disposal, atmospheric deposition, and historical factors such as previous land use and mining activities. Large areas of land are affected and therefore need to be remediated and protected. Reducing concentration levels or eliminating heavy metals will also significantly reduce environmental and human health risks. This study aimed to analyse the suitability of phytoremediation for environmental decontamination, following a decision based on the results of the environmental and human health risk assessment of a site polluted with heavy metals (i.e. Copșa Mică).

In order to make a decision on the application of this depollution alternative, we considered it necessary to develop a support, based on scientific, technical and economic arguments justifying the selection and application of this alternative. The ecological and human health risk assessment is an important tool in making decisions to reduce the risk by removing heavy metals from the site. There is sufficient evidence in the literature to demonstrate the crucial role of environmental and human health risk assessment in subsequent risk management decisions. Criteria for risk-based remediation decisions are supported by deterministic methods, which follow steps such as hazard characterisation, exposure assessment, risk characterisation by considering the exposure-risk ratio. In the paper this was further investigated by obtaining data and information from the analysis of the risks to human health and the environment from the presence of heavy metals in certain concentrations on the site considered. Two methods were applied to confirm the veracity of the existing situation in order to make a scientifically sound decision: (i) calculation of the hazard quotient (HQ) for each heavy metal under analysis (cadmium, zinc, arsenic) for the environment and human health (according to USEPA recommendations) (HQ≤1: unlikely adverse health effects, HQ>1: probability of adverse health effects, HQ>10>high chronic risk); (ii) risk assessment according to MAPPM Order 184/1997.

For phytoremediation, the literature in recent years shows that the plants most commonly applied in phytoremediation belong to the *Brassicaceae* family due to their high potential for bioaccumulation of heavy metals and the opportunities for subsequent management of biomass after phytoremediation for metal recovery by chemical digestion of plant biomass or incineration. Results obtained in the laboratory using *Brassica napus L*. (rapeseed) as a cadmium phytoaccumulator confirmed that it is tolerant to heavy metals at cadmium concentrations in solution below 100 mgCd/L (seed germination index above 0.7; stem elongation rate above 0.6; growth inhibition rate below 0.5). The results also confirmed that rapeseed is tolerant to cadmium at cadmium concentrations in solution below 100 mgCd/L (< 1.78 milliequivalent gram

per litre). The polluted soil at the Copsa Mica site contains about 46 mgCd/kgDM (0.82 milliequivalent gram/kg). Based on these data, we propose the decision to remediate the polluted site by phytoremediation using *Brassica napus L.* (rapeseed) which is tolerant to cadmium at concentrations for which ecological and human health risks have been analysed. Further laboratory experiments will highlight the extent of metal recovery through phytoremediation/fitomining, going through the technology chain from soil selection, plant cultivation and processing to biomass valorization and characterizing impacts and costs through Life-cycle assessment and Life Cycle Cost Analysis.

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Influence of Silica Nanoparticles on Thermal Properties of Wood

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ABSTRACT

In the pursuit of developing innovative materials and enhancing the performance of traditional ones, the study of nanotechnology has emerged as a groundbreaking field. In this regard, silica nanoparticles influence on wood's thermal properties has been explored over the years. This work presents an overview of recent research conducted in the laboratory, where wood samples treated with silica nanoparticles synthesized via the sol-gel method were analyzed using DSC-TGA (Differential Scanning Calorimetry and Thermogravimetric Analysis). The obtained results exhibit great promise and offer exciting possibilities for various applications in the future.

The incorporation of silica nanoparticles led to a notable enhancement in the thermal stability of wood, as evidenced by an increase in the samples' residual mass. The observed enhancement implies that the silica nanoparticles create a protective layer encompassing the wood fibers, thereby reducing the probability of thermal degradation and improving the ability to withstand elevated temperatures. This indicates that the incorporation of silica nanoparticles aids in preserving the structural integrity of the wood by minimizing the release of volatile compounds during thermal decomposition.

The research conducted in the laboratory, investigating the influence of silica nanoparticles on the thermal properties of wood, has yielded highly promising results. The incorporation of silica nanoparticles through the sol-gel method has demonstrated significant improvements in the thermal stability, heat flow behavior, and weight loss characteristics of wood samples. Further research and development in this area are essential to fully explore the range of possibilities and refine the synthesis and application methods of silica nanoparticles in wood treatment, together with the incorporation of other fire-retardants compounds along with the nano-silica in wood.

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Identification of the Origin of Essential Oils Using Principal Component Analysis

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ABSTRACT

Antioxidant, antibacterial and/or antimicrobial, insecticidal, herbicidal, antifungal, anti-inflammatory properties, etc., makes yarrow (*Achillea millefolium*) a very important medicinal plant. It has been used since ancient times for ailments or diseases such as rheumatism, skin disorders, neuralgia, abdominal pain, inflammation, colds, coughs, ulcers, epilepsy, colic, heartburn, stomach aches, etc. *Achillea*, which belongs to the Asteraceae family, is widespread throughout the world, being found in North America, Europe, the Middle East, Eastern and Western Asia, Australia and New Zealand. Depending on the geographical area, soil or climatic conditions, yarrow has adapted, resulting in a very varied chemotype (over 100 species). Depending on the soil, topography or geographical area of the harvested plant, the composition of the volatile oil obtained by hydrodistillation using a neo-clevenger system differs from one sample to another by composition and compounds concentration. As *Achillea Millefolium* is very important in the chemical and pharmaceutical industry and in traditional medicine, it is very important to be able to identify the origin of the volatile oil or extract obtained from certain parts of the plant. Mid-IR or Far-IR spectra provide a lot of information about the composition of a sample, but can be difficult to interpret. If the reference is known, the IR spectra can serve as a "fingerprint" analysis to confirm the identify of the sample, but for detecting differences between volatile oils obtained from different sources, even if they are insignificant, principal component analysis (PCA) is a very powerful chemometric alternative.

This study proposes a rapid analysis/investigation to identify the origin of essential oils from Achillea millefolium using infrared spectrometry in conjunction with principal component analysis software without needing chromatographic separation or qualitative and quantitative analysis of the mixture.

Acknowledgments: This research was funded by project: „Compozit multifunctional pe baza de matrice silica-organica transpozabila pentru inovatii de produse si formulari particularizate in industria alimentara si farmaceutica/ Multifunctional composite based on transposable silica-organic matrix for product innovations and customized formulations in the food and pharmaceutical industry", INNOVATIVE TECHNOLOGICAL PROJECT FOR MORE DEVELOPED REGIONS (Bucharest- Ilfov), Cod SMIS 122027, Contract no. 257/09.06.2020.

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Tolerance of White Mustard (*Sinapis Alba* L.) to the Toxicity of Co(II), Cu(II), Ni(II) and Zn(II) As Soil Pollutants

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ABSTRACT

Soil pollution with toxic pollutants, including heavy metals (HMs) had become a serious global problem. One of the most economically and environmentally feasible alternatives applied for remediation of HMs polluted sites is phytoremediation technique. The toxicity effects of HMs on plants vary along with plant species, soil types and pollutants categories, although there is a strong evidence that (hyper)accumulative plants naturally tolerate HMs toxicity with a higher degree comparative to sensitive plants. Conversely, metal-tolerant plants exhibited different strategies of tolerance mechanisms. For example, metal-tolerant plants can sequester a high proportion of metals in their roots allowing limited transfer to the aerial part of the plant (stems and leaves). The intensive use of *Brassica* species in phytoremediation results from their intrinsic tolerance to HMs and significant biomass production. Several species of the *Brassicaceae* family are known to accumulate metals and have been evaluated as potential plants for phytoextraction. White mustard (*Sinapis Alba* L.) belongs to the *Brasicaceae* family being widely applied in laboratory experiments to assess the toxicity and bioaccumulation of organic and inorganic pollutants.

In this regard, the main purpose of this work was to investigate the tolerance and accumulation capacity of *Sinapis Alba* L. to different heavy metals Co(II), Cu(II), Ni(II) and Zn(II) from polluted soils. The experiments were performed in greenhouse conditions for 41 days. The plants were grown in polyethylene pots containing 1000 grams of urban soil (collected from Iasi vicinity). After 41 days of growth, the plants were sectioned in two parts (roots and stems with leaves), washed and dried at 105°C and then subjected to wet mineralization. The samples were analyzed by flame atomic absorption spectrometry (AAS) in order to determine the quantity of metals accumulated in various parts of the plant. To assess the degree of accumulation of metals in plants, bioconcentration factor (BCF), bioaccumulation coefficient (BAC) and translocation factor (TF) were considered. It is known that plants with BCF> and TF>1 have the potential to be used in phytoextraction. Plants with BCF>1 and TF<1 are suitable for phytostabilisation (immobilisation), while values of TF<1 indicate that the plant has accumulated metals in the root and rhizomes more than in leaves and stems. The bioaccumulation factor (BAC) provides information about the ability of the plant to accumulate metals in the aerial parts of the plant. Our results revealed that *Sinapis alba* L. is not a heavy metal hyperaccumulator and is not suitable for phytoextraction at high metal ion concentrations, at least under the conditions tested and for the soil type considered. However, *Sinapis alba* L. have the potential for Zn, Ni and Co immobilization in roots, since BCF >1 and TF <1 for the majority of treatments tested (levels around 10 to 300 mg/kg of pollutant in soil).

Acknowledgments: This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS/CCCDI – UEFISCDI: project number PN-III-P2-2.1- PED-2019-5239, Contract no. 269PED/2020.

Inula helenium Extract-Loaded Nanofibrous Patches for the Treatment of Cancer

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ABSTRACT

Cancer is one of the leading causes of death worldwide. Biomaterials produced with nanotechnological methods for cancer treatment are more effective and complementary than existing treatment strategies. Nanofiber scaffolds are biomaterials that can be used in cancer treatment and can be produced in composites with biocompatible polymers and anti-cancer drugs, plant extracts. The electrospin device used for the production of these materials creates nanofiber networks by providing the electric field between the needle tip and the metal collector, which transmits the polymer solution.

PLA is a biodegradable synthetic material preferred in tissue engineering studies and is a biocompatible, high mechanical strength, low cost polymer suitable for use in drug delivery systems. PVP is a polymer with good adhesion, high physiological compatibility, low toxicity and easily soluble in most organic solvents, especially used in the pharmaceutical industry. The extract of the plant *Inula helenium*, whose main component consists of sesquiterpene lactones, is also used in treatments for cancer. This component, which has various biological activities, has a significant anti-cancer effect.

In this study, the polymer ratio used in the production of nanofiber scaffold obtained by adding *Inula helenium* extract is 75% PLA-chloroform / 25% PVP-ethanol and 1% Tween 80. The surface morphology of the produced fiber material was determined according to the results in the SEM images. The diameters of the fibers were measured and given in the histogram graph. FT-IR for chemical structure between bonds and DSC tests for thermal behavior analysis were applied. Tensile test was performed for mechanical analysis. Swelling-degradation test was performed and drug release kinetic data were calculated by UV spectrophotometer. In addition, its effectiveness on cancerous cells was examined by MTT analysis.

In conclusion, *Inula helenium* extract-loaded nanofibers can reduce the risk of local recurrence of cancer after surgery and can be directly implanted into solid tumor cells for treatment

Keywords: *I. helenium*, Electrospin, Biomaterials, Cancer treatment

Production of PVA/HA Dental Membrane in Nanofiber Structure Containing Ag+ Nanoparticles

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ABSTRACT

Bone tissue loss, which occurs in situations such as traumatic accidents, is a health problem seen in middle and advanced age groups. Grafting and membrane therapy are applied to restore the lost bone tissue. The most common problem encountered with this treatment method is the risk of infection. For this reason, the use of silver nanoparticles in the membrane structure promises to eliminate this risk by providing antibacterial properties to the membrane structure. Membranes are among the biomedical materials used in bone tissue engineering applications. In this study, it is suggested to produce antimicrobial dental membrane in nanofiber structure by using electro-spinning technique on the graft applied in the treatment of jaw bone tissue loss.

The difference between the proposed membrane design and the currently used membrane designs can be explained in two ways. One of the differences is that with this project, it is aimed to prevent infections that may occur by giving antibacterial properties to the membrane coated on the graft treatment applied in bone tissue damage/loss. Another difference is that the resorption time, which is one of the most important points in dental membranes, is at an optimum value. However, the lack of bone formation as a result of premature degradation in currently used dental membranes or the need for surgical intervention due to non-degradation are common problems.

Appropriate combinations of the biomaterials used will enable the determination of the resorption time, thanks to their physical and chemical properties. Care has been taken to ensure that the biomaterials planned to be used in the production of dental membranes are biocompatible and biodegradable. At the same time, resorption should not be rapid so that bone tissue does not degrade before its formation is completed. In this context, hydroxyapatite was used as bioceramic in the structure of the membrane to be produced and Polyvinyl-Alcohol was used for the polymer matrix.

Keywords: Bone tissue engineering, dental membranes, PVA, HA, silver nanoparticles, nanofiber membranes, electro-spinning technique

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Sağlık İdaresi Dergisi , 23 (4) , 537-546 . Retrieved from https://dergipark.org.tr/tr/pub/hacettepesid/issue/58128/837778

3D Printing of Scaffolds for Bone Tissue Engineering Based on Bacterial Hydroxyapatite

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Drug-Loaded Tumor Dressing Design With 3D Printer for Controlled Release Systems

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ABSTRACT

Doxorubicin (DOX), an anthracycline antitoxin, is one of the effective chemotherapeutic anticancer drugs commonly used to treat various solid and hematopoietic tumors such as breast, ovary, cervix, prostate and leukemia. It is known that the rates of drugs used after intravenous administration of chemotherapeutic drugs are high and accordingly, their toxic effects are at substantial levels. It is aimed to decrease the rate of drug used within the scope of the study and to implant the decreased drug rate specifically to the tumor region. Polylactic acid (PLA), which has good biocompatibility and biodegradability and has been approved for use as a biomedical material by the US Food and Drug Administration (FDA), was chosen for this implantation process.

In this study, DOX drug molecule, which is a chemotherapeutic anticancer drug; A tumor dressing was designed with a three-dimensional (3D) printer by combining it with PLA, which is easily converted into lactic acid and has no toxic effect when it implants in the body. PLA-DOX tumor dressing was designed as a controlled drug delivery system to suppress tumor growth and was produced with 3D printing technology. Fourier Transform Infrared Spectrometer (FT-IR) was used to determine the chemical bonds and bond interaction in the structure of the DOX-loaded PLA tumor dressing produced by 3D printing technology, and an optical microscope was used to verify the dissolution rate and pore structure of the DOX molecule. In vitro release test was performed for the tumor dressing produced. Finally, Scanning Electron Microscopy (SEM) was used to observe the morphological features of the 3D-printed PLA-DOX tumor dressing that were completed. These results demonstrated that 3D-printed PLA-DOX tumor dressing can be used as potential controlled drug delivery systems for cancer therapy.

Keywords: 3D printing, Doxorubicin, PLA, cancer, tumor dressing

Session VII. Biomaterials for Tissue Engineering and Regeneration

GELMA-Sodium Alginate Based Artificial Cornea

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ABSTRACT

Cornea, which is one of the major causes of blindness and eye problems in the world, is also the organ with the highest number of patients waiting for donors. It is known that 1.2 million people are awaiting corneal transplantation. There are various reasons for patients to wait for corneal transplantation, as well as various reasons for people not to donate their corneas. As a result of all these reasons, a major problem arises, such as the loss of a vital sense like vision.

In order to find a solution to this problem, scientists are trying to produce artificial corneas using various formulas with the approach of tissue engineering. With the significant technological advancements, the production of artificial corneas has become easier.

In this study, a new mixture consisting of previously used GelMA and sodium alginate was designed for the production of artificial corneas.The designed mixture is planned to be produced using the UV curing method. It is also intended to give the produced artificial cornea an antibacterial property with amoxicillin antibiotic.

In the project, which stands out with many unique features, it is desired to measure the suitability of a new artificial cornea formulation, which will be tested for the first time, through cytotoxicity and characterization tests.

Production of Essential Oil Coated Polycapralactone Scaffold with Antibacterial Properties

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ABSTRACT

Wound dressings are designed in a structure that can provide suitable environmental conditions for the healing of the wound that has occurred on any part of the skin. It can form an artificial tissue scaffold for cells and provides hygienic conditions for cells[1]. Wound dressing is used in the treatment of wounds formed after various injuries and surgical interventions. The dressing protects the wound, reducing the risk of infection and accelerating the healing process. The dressings fit snugly to the wound area, closing the wound, reducing the risk of infection, and supporting the healing of injured tissues, helping the formation of new cells. It is used in the treatment of various wounds such as wound dressing, burns, cuts, scratches, surgical wounds[2]. Extrusion bioprinting is based on the principle of extruding or dispersing material to build a 3D structure layer by layer. Typical extrusion bioprinting systems use pneumatic, screw-based or piston-based mechanisms. Pneumatic systems are preferred because of their simplicity, but printing characteristics are largely dependent on the viscosity of the material.3 Mechanical systems are attractive because of the precise control of material flow; however, these systems generate high pressure and can damage the cells contained in the bioink. Fine details of the dressing can be produced with 3D extrusion printers. This technology is a method that can be used to create precise and customized dressings.

In this proposed study, the wound dressing will be produced using an extrusion 3D printer (Hyrel 3D). In the next step, the produced wound dressings will be covered with polylactic acid (PLA) microparticles loaded with photosensitive, electrical properties and photodynamic activity of cardamom oil and St. John's wort oil nanoparticle using the electro-hydrodynamic atomization method (EDHA), which allows to produce micron-sized particles. Characterization tests of this sensitized wound dressing will be performed. Electron microscope (SEM) will be used to view the morphology of the wound dressing, Fourier transform infrared (FTIR) spectrometer device to learn about its molecular structure, differential scanning calorimetry (DSC) device to detect its thermal properties, tensile device to detect tensile strength, swelling and degradation tests. It will be tested on *S.aureus* and *P.acruginosa* bacteria to determine its antimicrobial property. In vitro cytotoxicity will be tested by performing a cell culture study. As a result, the proposed study aims to use an antimicrobial wound dressing with a surface coated with microparticles.

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From Theory to Practice: Synthesizing Bioglass for Bone Tissue Engineering

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ABSTRACT

The authors did not agree with the publishing of the abstract.

3D Printed Scaffolds Based on Biopolymers-Calcium Phosphates and Magnetic Nanoparticles for Bone Tissue Engineering

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ABSTRACT

Despite the outstanding self-regenerative property of bone, in case of congenital and acquired pathologies such as trauma, infections, tumors and degenerative diseases, assistive regenerative and repairing techniques are required, making bone the second most frequently implanted tissue globally [1]. Providing personalized products with controllable properties and interconnected porosity, in a fast and precise manner, three-dimensional (3D) printing technology is increasingly used to design scaffolds for bone tissue engineering field [2].

Ceramic materials, mainly calcium phosphate, were intensively studied as scaffolds for bone tissue engineering due to their osteoinductive and osteoconductive properties. Unfortunately, their brittleness negatively affects the *in vivo* mechanical behavior, and consequently restricts the calcium phosphates use in clinical practice. Calcium phosphates drawbacks can be improved by mixing with natural or synthetic polymers like: chitosan, collagen, cellulose and its derivates, hyaluronic acid, poly (lactic acid), poly (ε-caprolactone) and so on [3]. Magnetic nanoparticles are often incorporated in bone tissue engineering scaffolds due to their inherent magnetism in cellular microenvironments that improves osteoinductivity, osteoconductivity and angiogenicity [4].

Considering these key aspects, the aim of this study was to obtain and characterize composite scaffolds based on biopolymers, hydroxyapatite, and magnetic nanoparticles, by 3D printing technique. The composites were characterized in terms of morphology, composition and chemical structure, mechanical and biological properties. The prepared 3D architectures are moderate swellable and degradable in simulated body fluids and enzymatic solutions. The mechanical properties are dependent of their composition and cytotoxicity tests demonstrated their ability to sustain the cells proliferation. The obtained results highlighted that the scaffolds are promising tools for bone tissue engineering field.

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Development and Characterization of 3D-Printed Bioactive Glass-Doped Scaffolds

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ABSTRACT

Bone tissue is a complex type of tissue containing various microstructures with high regenerative properties. Depending on the extent of damage to the bone tissue damaged by various diseases and traumas, it may not be possible to completely heal on its own. In such cases, synthetic or natural materials called bone grafts are used instead of the damaged bone tissue, which will provide structural support to the surrounding tissues and provide a suitable environment for cells to attach and multiply. The contribution of bone graft to the treatment process depends on the success of the graft material, micro and macro structure, chemical structure and interaction with the tissues. Materials that are used in bone tissue engineering and have the ability to bond with the natural bone structure are called bioactive materials. Among bioactive materials, bioglasses have a very important place. Bioactive glass material and bone tissue with the right composition can support the tissue during regeneration by forming very strong bonds and can play an active role in the treatment of the tissue by providing the ions needed by the bone cells with the ions such as calcium and silicon in its content. In addition to the material used in bone tissue scaffolds for the growth and proliferation of bone cells, these materials must have the correct morphological properties (eg, surface structure, macro and micro porosity, graft shape size and physical strength). Although bioactive glass materials meet these criteria as a material, they can generally be used as powder additives in bone tissue scaffolds due to their low machinability, fragility, and synthesis methods. In this study, Sol-Gel is used to produce bone tissue scaffolds in the desired shape, size, porosity and morphology by shaping the bioactive glass material synthesized by Sol-Gel method using a 3-dimensional printer during the synthesis process and stabilizing it with additional processes such as curing and sintering. Synthesis parameters and 3-dimensional printing method were optimized to allow sol-gel material to be printed. A new production method was developed in the field of bone tissue engineering with the production of glass material by performing Sol-Gel bioactive glass synthesis and 3D printing together. In the study taken as an example by Valanezhad et al., 2021, bioglass, which was synthesized by the sol-gel method, was produced in gel form and impregnated on a polyurethane sponge, and a scaffold with low mechanical strength was produced. With this study, we aimed to produce scaffolds with high strength, whose morphological properties can be precisely controlled, thanks to the 3-dimensional biowriting technique. Characterisation tests such as FTIR, XRD, SEM and Cell Culture tests were studied on the produced tissue scaffolds. Using the combination of

Sol-Gel method and 3D printing technique is a novel method that allows to form bioglass material with specific geometry for optimum material performance in specific applications.

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Design and Development of a Nanofiber-based Scaffold with Antimicrobial Properties for the Repair of Damaged Tissue

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ABSTRACT

Infection is one of the well-known post-surgical complications that require a series of preventative or curative measures for mitigation. Generally, infections can be prevented by maintaining an aseptic surgical environment alongside the administration of antibiotic prophylaxis. The main issue, however, arises when the effect of antibiotics on infectious agents diminishes, a phenomenon known as antibiotic resistance. Resistance to antibiotics has been an ongoing issue in healthcare, causing serious problems for the well-being of patients and delaying treatment duration. One effective approach to remedy stubborn infections is the utilization of a combination treatment strategy that involves the application of two or more antimicrobial agents, thus providing a synergistic effect against infections. This study aims to fabricate an antimicrobial bone scaffold composed of polycaprolactone (PCL), polylactic acid (PLA), and hydroxyapatite that incorporates nigella sativa (NS) oil .The antimicrobial capability of this novel bone scaffold is investigated against bacterial strains commonly found in bone-related infections. The methodology of this study involves solvent electrospinning to produce the nanofibers with the mentioned composition (PCL/PLA/HA/NS Oil), and subsequently a thermally induced nanofiber self-agglomeration (TISA) technique to convert the structure of the nanofibers into a three-dimensional scaffold.

Key words: Bone, Tissue engineering, Electrospinning, Infection, Nigella Sativa, Antibacterial, Scaffold

Eco-Friendly Scaffold Design Made from Eggshell PCL/Strontium-Substituted Hydroxyapatite Composite for the Treatment of Bone Fractures

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ABSTRACT

Composite materials used in 3D tissue-like scaffolds are widely explored as a promising strategy in bone tissue engineering applications that aim to repair, replace or regenerate bone tissues damaged by any cause, such as disease, accident, and trauma. 3D scaffolds are prepared that make the bone tissue functional, mimic the bone mineral structure and adapt to the cell.

In this study, poly(ε-caprolactone) (PCL)/Sr-HA composite tissue scaffold was specially designed for patients with bone fracture problems with the three-dimensional bioprinting method, and has the same shape as the lost tissue due to its advantages such as easy customization and easy adaptation. As a bioactive supplement phase that mimics the mineral phase of natural bone, the HA compound is derived from eggshell to promote sustainability and use of environmentally friendly resources. The HA obtained is converted into Sr-HA composite by combining with the element strontium (Sr), which both provides bone formation and plays an important role in bone hardness and durability by reshaping the bone. In this way, the bioactivity and biocompatibility of biomaterials are increased and it contributes to the increase in the ratio of calcium ions provided by the increase of HA solubility. Also, poly (e-caprolactone) (PCL), an FDA-approved biodegradable material, has also been preferred in bone tissue engineering applications because it has stable properties at body temperature.

Composite material was obtained by mixing PCL, which was dissolved at a rate of 20% by weight in DCM, which was used as a solvent, and then mixed with 45% by weight of Sr-HA. Later, this composite material was printed with the help of a 3D printer. According to the FT-IR and swelling test results, it is promising for future use as an environmentally friendly material in various bone tissue engineering applications.

Fabrication and Characterization of Polylactic Acid/Hyaluronic Acid/Collagen Nanofibers for Tendon Tissue Engineering

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ABSTRACT

Tendon tissue engineering aims to integrate engineered, functional replacements with their native counterparts in order to repair tendon injuries. Responsible for body movement and stabilization of the joint structure, tendons stand out with their superior biomechanical properties. Collagen 1 (COL) is the main component that contributes these properties to the tendon structure organized in hierarchical bundles. Hyaluronic acid (HA) participates in the formation of the tendon extracellular matrix and enhances the viscoelasticity of the structure. Polylactic acid (PLA) is widely used in tendon tissue engineering due to its biocompatibility, biodegradability and mechanical properties. Therefore, a novel PLA/HA/COL hybrid scaffold was designed and fabricated by electrospinning for the repair of tendon defects. While 10% PLA is used as the control group, 4 scaffolds containing 1% HA and/or 1% COL were fabricated. One of the scaffolds was produced by coaxial electrospinning: the inner layer consists of 10% PLA and 1% COL, while the composition of the outer layer is 10% PLA and 1% COL. The morphological, thermal, chemical, and mechanical properties of the tendon scaffolds were evaluated using SEM, DSC, FT-IR, swelling-degradation test, and tensile testing test, respectively. *In vitro* cell culture experiments were performed on mesenchymal stem cells using MTT method. It is anticipated to confirm that PLA/HA/COL scaffolds promote cell adhesion, proliferation, and regeneration by characterisation and *in vitro* cell culture results.

Fabrication of Interpenetrating Network Hydrogel Scaffold Conjugated with Nanoparticles by Extrusion Type Three-Dimensional Printing

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ABSTRACT

Interpenetrating Network (IPN) polymer hydrogels are a class of materials that exhibit unique properties and have gained significant attention in various fields, including tissue engineering and drug delivery. IPN hydrogels are composed of two or more polymers that are chemically crosslinked independently to form a three-dimensional network structure. IPN hydrogels can be tailored to have desired properties such as tunable mechanical strength, swelling behavior, and biocompatibility, making them suitable for a wide range of biomedical applications. This study has been focused on ink development to fabricate IPN hydrogel scaffold by extrusion type 3D printing technologies. Promising results have been seen from the utilization of natural polymers such as Hyaluronic Acid- (HA) and Methyl Cellulose (MS) to synthesize hydrogel scaffolds ink by 3D bioprinting efforts. For this study, a HAMS-based blended ink was developed to fabricate IPN hydrogel scaffold. Subsequently, Graphene Oxide (GO) - Zinc Oxide (ZnO) hybrid nanoparticles were formulated and introduced to the HAMS-based ink to serve as soft tissue scaffold. Successfully fabricated HAMS ink was used for scaffold production by an extrusion based printer. The tissue scaffolds, obtained post-printing, were assessed for their swelling and degradation tendencies. Comprehensive morphological, thermal, and chemical evaluations of the produced scaffolds were conducted.

Keywords: Tissue scaffold, Interpenetrating network polymer, Hydrogel, Nanoparticles, 3B printing

Cartilage Repair with Bacterial Cellulose

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ABSTRACT

Bacterial cellulose is a biomaterial that offers optimum conditions for tissue engineering studies thanks to its chemical structure. Thanks to its biocompatibility and biodegradability, it provides great advantages in hard tissue engineering. At the same time, its ability to be synthesized naturally eliminates the problem of natural biomaterials required for areas in need of repair. For this, considering the classifications in the physiology of the human body, the critical importance of hard tissues in the continuity of anatomical and biochemical activities highlights the necessity of treatments. The sources and causes of damage to hard tissues are not always revealed for a specific reason. Therefore, a treatment approach is required according to the main source of the identified problems. Bone and cartilage tissues, which are classified as hard tissue, are damaged by many diseases and traumas. Arthritis, one of these diseases, affects the health of many people today. The treatments required for this can be inadequate and costly. At this point, it is possible to restore patient health by producing more affordable scaffolds thanks to the right tissue engineering approaches and the use of domestic materials. Among the preferred methods for the repair of hard tissues, 3D printing techniques are at the forefront, allowing development and functionalization. Among these techniques, it is possible to reach large-scale production and desired pore size in one go by using electron-spinning technology. At the same time, a functional structure is revealed by using more than one technique in order to obtain the desired design. Since the required design is in different sizes and thicknesses from patient to patient and from region to region, a design that is open to change has been preferred. The characterization and optimization processes to be carried out at the end of the required productions at this scale will allow the evaluation of the desired result. For characterization studies, morphological properties with scanning electron microscopy (SEM), molecular structure with Fourier transform infrared (FTIR) spectrometer, thermal properties with differential scanning calorimeter (DSC), mechanical strength using the tensile device, swelling, and degradation tests to simulate the behavior of living tissue. will be attempted. In addition to these, the antimicrobial effect against S. aureus will be observed by looking at the release graphs of the scaffolds loaded with drugs for treatment. In order to observe possible cytotoxicity and proliferation in living tissues, a cell culture study will be performed in vitro and the study will be finalized.

Keywords: Bone, Cartilage, Bacterial Cellulose, Arthit, Electro-spinning, Lyophilization

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Session VIII. Natural Bioactive Compounds

Mycotoxin Patulin: A Natural Compound of Comprehensive Review of Interest

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ABSTRACT

Naturally produced secondary metabolites namely patulin toxin takes its name from the fungus from which it was firstly isolated: *Penicillium patulum* [1]. To date there are other known mold *Aspergillus*, *Penicillium* and *Byssochlamysa* strains that are able to produce patulin. In many studies it has been reported that patulin is known characteristic of mutagenic, embriotoxic and immunotoxic in certain fruits and fruits products in particular in apple and apple products when affected by 'brown rot'. *P. expansum* is present on healthy fruit that produces significant amounts of patulin only by developing as disc necrosis on the fruit. Patulin is rarely found on undamaged fruits. For this reason, most of the countries have established regulatory limit of 50 ppb MPC (maximum permitted concentration) of patulin.

Patulin was originally used as an antibiotic against Gram-positive and Gram-negative bacteria, but after several toxicity reports, it is no longer used for that purpose and proved to be too toxic for use as an antimicrobial agent in humans [2]. However, it can act as quorum sensing inhibitor molecules that regulate biofilm formation.

Patulin is a very reactive compound that easily comes into association with proteins and nucleic acids. This property is the main cause of harmfulness for living organisms when ingest the contaminated food products e.g. apricots, grapes, grape fruit, peaches, pears, apples, olives and cereals [3]. For this reason, most of the countries have established a regulatory limit of 50 ppb MPC (maximum permitted concentration) of patulin. Because of this, many analytical methods have been developed for the analysis of fruits products as a quality indicator monitoring. Each methods have its own advantage and limitations over others. Identification and quantification of patulin in food could be accomplished by several means like thinlayer chromatography (TLC), gas chromatographymass spectrometry (GC-MS), high-performance liquid chromatography with ultraviolet detection (HPLC-UV), high-performance liquid chromatography tandem mass spectrometry (HPLC-MS), capillary electrophoresis (CE), fluorescence polarization, chemiluminescence assay, quantitative PCR assay, surface plasmon resonance (SPR), quartz-crystal microbalance (QCM),electrochemical reduction techniques and so on [4]. Now a days, easy to use commercial an enzyme-linked immunosorbent assay (ELISA) kit based on the recognition of patulin by specific monoclonal antibodies is available for the quantitative and/or qualitative detection of patulin industrial or domestic setup. Several novel and improved techniques for patulin detection are developing continuously indicating its importance for the interest of public health.

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New Methods of Cultivating of Cyanobacteria *Nostoc Halophilum* Hansg. with Antibacterial Effect

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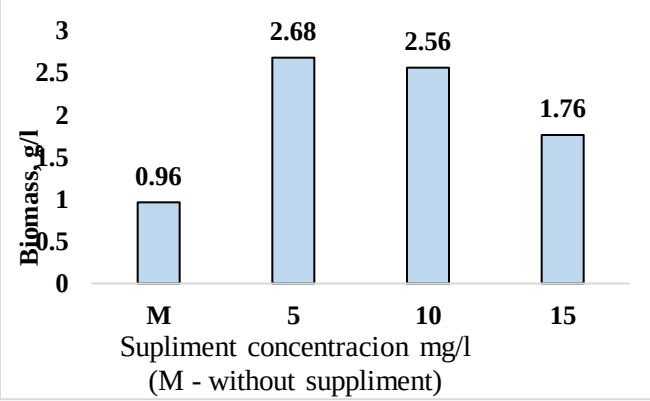
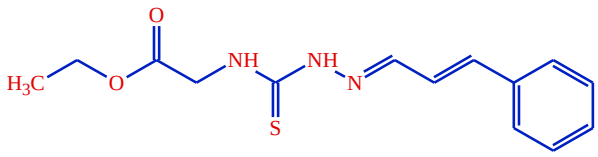
ABSTRACT

Cyanobacteria are an important source of bioactive substances such as phycobiliproteins. It shows a large spectrum of biological activities, for example, antibacterial, antioxidative and in some cases can inhibit human cancer cell-lines[1]. The main problem is obtaining in the large scale the biomass of the cyanobacteria strains, for its future utilization in process of phycobiliproteins extraction. This determines the scope of this article and necessity of developing of new methods of cyanobacteria cultivation.

In this article *Nostoc halophilum* was cultivated on the nutrient medium BG11 with balanced content of macro and microelements, with supplementation with ethyl ({2-[3-phenylprop-2-en-1-ylidene]hydrazinecarbothioyl}amino)acetate in different concentrations, at the first day of experiment. Cultivation of the strain was carried out in 250 ml flasks for 7 and 21 days.





The structure of utilized supplement

Fig. 1 Comparing the results of cultivation of the cyanobacterium Nostoc halophilum with and without supplement, for 7 days

From the **Fig.1** we can observe that supplementation with ({2-[3-phenylprop-2-en-1-ylidene]hydrazinecarbothioyl}amino)acetate increase the growth of *Nostoc halophilum* in almost 3 times. The same situation was observed in 21 days experiment. In this case we obtained in the flask without supplement – 5,92 g/l of the biomass. In the flask with 5 mg/L supplement – 9,4 g/l of biomass; with 10 mg/L supplement – 7,76 g/l of biomass and with 15 mg/l supplement - 6,1 g/l of biomass. We can see that supplement significantly increased the cyanobacteria cell growth. The optimal concentration of it was found to be at 5 mg/l.

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Production of Nanofiber for Combination with Anticancer Tragopon Porrifolius L. Naringenin

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Glucose Level in Alloxan Diabetes on the Background of the Administration of Extract from Cyanobacteria *Nostoc Halophilum* Hansg. - As a Natural Nutritional Supplement

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ABSTRACT

In the present study, the integrity of the action of the extracts of *Nostoc halophilum* and the activity of the endocrine pancreas in the case of experimental diabetes was monitored. In order to carry out rigorous research, it is necessary that following the administration of alloxan will provoke apparition of classic symptoms of the aforementioned pathology. To treat experimental diabetes the cyanobacteria water extract was used. This was obtained from the biomass of the *Nostoc halophilum* strain.

As a rule, 2-3 days after the injection of the diabetogen, the urine was tested for glucosuria and it is considered that the animals are diabetic if this is present. But most of the time diabetes is confirmed at the end of the experiments, when the blood is collected for various tests including blood sugar. In the present study, we aimed to argue the presence of diabetes by testing several indices.

During our research, a considerable increase in blood glucose level was observed in the group with experimental diabetes compared to the norm. This increase is caused by the lack of insulin. Insulin increases the permeability of the cell membrane for glucose and accelerates its passage from the intercellular fluid into the cell. In the insulin-free environment, the speed of glucose passage inside the cell is 20 times lower than in the nucleus, which contains a sufficient amount of insulin. The intensification of glucose transport through the membranes of muscle fibers and liver cells under the action of insulin favors glycogen synthesis and its accumulation in liver and muscle cells. After the administration of higher doses of insulin, a considerable amount of glucose passes through the blood plasma inside the cells of the skeletal muscles, cardiac muscle, smooth muscles, etc., because of this, the level of glucose in the blood decreases and the intake of glucose in the cells of the nervous system, on the permeability in which insulin does not work. As a result, the brain and spinal cord understand the acute insufficiency of glucose, which is the necessary source for the activity of all cells, including organs.

Table 1 The level of glucose (mmol/l) after the administration of the aqueous extract of *Nostoc halophilum* against the background of experimental diabetes.

Clues	**Blank**	**Alloxan**	***Nostoc halophilum***	***Nostoc halophilum* + Alloxan**
Glucose (mmol/l)	5,5±0,62	16,9±1,75	5,3±0,71	10,5±1,88

As a result (Tabel 1) of the research, it was found that the normal glucose level is 5.5 ± 0.62 mmol/l, and in the group with experimental diabetes - 16.9 ± 1.75 mmol/l. Hypoglycemic effect was observed in the group where *Nostoc halophilum* - 5,3±0,71(mmol/l) was administrated and in *Nostoc halophilum*+ Alloxan group was observed the same effect (10.5 ± 1.88 mmol/l), in comparison with Alloxan group (16,9±1,75).

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Development and *In-Vivo* Evaluation of Niosomal Gel Containing Loxapine Succinate

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ABSTRACT

Daily usage of the antipsychotic medication Loxapine succinate is common. Today, there are two types of dosage forms available on the market: capsules and injectable (intramuscular). However, the psychotic patient finds it challenging to take these dosage forms on a daily basis, and occasionally they are difficult to administer. The current study's goal was to prepare a topical niosomal gel formulation of Loxapine succinate for the treatment of schizophrenia. By adopting a thin film (layer) hydration technique, niosomes were prepared using various ratios of surface-active chemicals (Span 60, Span 80). The vesicle size, entrapment effectiveness, in-vivo release study, stability study, pH, viscosity, drug content, and homogeneity of the gel were all evaluated for the topical niosomal gel formulations of Loxapine succinate.

The use of topical niosomal gels is favored for treating psychosis because the inclusion of Loxapine succinate into niosomes can improve patient compliance, the amount and duration of retention in the skin, and the therapeutic efficacy as well as the drug's toxicity. The potential of the niosomal drug delivery system, which offers steady, sustained release of Loxapine succinate and also minimizes its side effects related to oral administration, is the focus of this research.

The study's findings support the idea that Loxapine succinate can be released consistently and for a long time when applied topically. It will result in a sustained activation of the drug that is entrapped, lowering the adverse effects brought on by frequent oral administration of the drug. We can infer that Loxapine succinate may be used topically. This suggests that topical niosomal gel-based drug delivery systems could be a useful vehicle for Loxapine succinate delivery.

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Evaluation of Gallic Acid and Quercetin-Loaded Mesoporous Silica Nanoparticles for Potential Treatment of Colorectal Cancer: A Novel Approach

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ABSTRACT

Colorectal cancer (CRC) represents one of the most prevalent malignancies globally, currently being the third most diagnosed and the second deadliest type of cancer. It has been projected that by the year 2030, the occurrence and mortality rate of CRC will enhance by 60% [1]. Chemotherapy is currently one of the most frequently used treatment options, but it presents significant downsides, causing considerable side effects and systemic toxicity. Nowadays, natural compounds and especially polyphenols are being intensively studied for their wide range of bioactivities, showing promising pharmacological and therapeutic properties such as antioxidant, anti-inflammatory, and anti-cancer activities. Despite their promising capabilities, the biomedical implications of polyphenols are highly limited by their poor water solubility, bioavailability, and rapid degradation and clearance rate. To overcome these limitations, researchers focused on developing nanoparticles capable of encapsulating biologically active compounds and delivering them at the tumoral site in a targeted manner. During the past three decades, Mobil Composition of Matter No.41 (MCM-41) has been proposed as a potential drug delivery system, showing good biocompatibility, the capacity for drug encapsulation, large surface area and tunable pore size, the capacity for functionalization, and high stability. This study aimed to evaluate MCM-41 as a drug delivery system for gallic acid and quercetin as a potential new therapeutical strategy for the treatment of CRC. Herein we synthesized the mesoporous material, loaded it with different ratios of the polyphenols (1:0,5, 1:0,25, 1:0,125) using a vacuum-assisted method, and proceeded to carry out the characterization of the pristine and loaded powder using XRD, SEM, FT-IR, DLS, DSC, and BET in order to demonstrate the hexagonal ordered mezostructure. Afterward, the drug delivery system was evaluated using the HT-29 human adenocarcinoma cell line and the normal intestinal cell line CCD 841 CoN. Cell viability and toxicity were evaluated at 24, 48, and 72h after the treatment using the MTT and LDH assays. The results suggested a successful synthesis of MCM-41 that was able to encapsulate the polyphenols predominantly in the material's pores. As expected, the pristine material showed no toxicity during the biological in vitro evaluation in either of the two cell lines, and the MCM-41 loaded with gallic acid and quercetin statistically decreased the viability of the tumoral cells, but induced no statistically significant effect on the normal intestinal cells.

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Production and Characterization of a Dual Drug Delivery System of Memantine and Naringenin by Electrospinning Method

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ABSTRACT

The combination of multiple therapeutic agents within a single drug delivery system has emerged as a promising approach in enhancing the treatment outcomes of complex diseases. In this study, we focused on the production of a dual drug delivery system consisting of memantine, an N-methyl-D-aspartate receptor antagonist used in the treatment of neurodegenerative disorders, and naringenin, a flavonoid with neuroprotective properties. The drug-loaded nanofibers were fabricated through the electrospinning technique, enabling the production of nanoscale fibers with high surface area-to-volume ratio and tunable drug release kinetics. Optimization of electrospinning parameters, such as polymer concentration, solvent system, and processing conditions, resulted in the production of uniform and well-defined nanofibers. Scanning electron microscopy (SEM) analysis revealed the morphology and diameter of the nanofibers, demonstrating their suitability for drug delivery applications. Fourier-transform infrared spectroscopy (FTIR) analysis confirmed the successful incorporation of both memantine and naringenin within the nanofiber matrix. The integration of memantine and naringenin within electrospun nanofibers offers a synergistic approach for enhanced therapeutic effects in neurodegenerative disorders. This study contributes to the development of innovative drug delivery systems, providing a foundation for future research in the field of combination therapy and highlighting the potential of electrospun nanofibers as a platform for dual drug delivery.

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Ibuprofen and Centaury Oil Loaded Foam Wound Dressing Production for Burn Injuries

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ABSTRACT

Deep second-degree and third-degree burns are types of wounds that generally require surgery, can cause serious diseases and may leave scars after traditional treatments. In this project, after first aid to the patient, a wound dressing will be placed on the burn wound.

The wound dressing produced is in foam form and contains an anti-inflammatory (Ibuprofen) drug. In this way, the wound will be prevented from becoming infected, the bacteria in the burn area (if any) will be killed, and the formation of bullae that may spread inflammation to the burn area will be prevented. The wound dressing will also contain centaury oil, which will ensure rapid healing and re-epithelialization of the wound, ensuring scarless healing. The hydrogel dressing to be produced will cover the entire wound area caused by the burn and supply a moist area due to its foam form. The polymers to be used must be biodegradable and biocompatible. For this purpose, alginate and gelatin polymers were chosen. Gelatin enhances cell migration and differentiation and prevents inflammation. In addition, Alginate can reduce allergic side effects and improve the healing process.

While protection from microorganisms in the burn wound is provided with a wound dressing that will be applied to the burn after the first treatment and will completely fill the area, the patient will be able to continue his life with minimal scarring after the treatment process, with the release of centaury oil. With this wound dressing, the life standards of the patient both during and after the treatment will be increased. The aim of the unique wound dressing design is to shorten the treatment period, prevent possible sequential diseases, prevent the formation of burn scars and increase the living standards of the patient as a whole.

Magnetite-Enhanced Polysulfone Membranes Loaded with Resveratrol for the Treatment of Peripheral Nerve Injury

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ABSTRACT

Peripheral nerve injuries, which can result from trauma, compression, or disease, have a significant impact on daily activities and on patients' quality of life. These can lead to permanent loss of sensory and motor functions, as the intrinsic ability of the peripheral nervous system (PNS) to regenerate is limited [1]. In recent years, researches were focused mainly on the development of systems to facilitate regeneration.

Tissue engineering strategies explore the properties of biomaterials and, more recently, natural compounds for their integration into hybrid systems for nerve tissue repair. In this context, resveratrol has attracted attention for its neuroregenerative effects because it exhibits antioxidant, anti-inflammatory, and neuroprotective properties while promoting neuronal differentiation [1]. However, these compounds' poor bioavailability, low solubility, and short half-lives limit their activity. These drawbacks are overcome by incorporating polyphenols into nanoparticles (NPs) or polymeric membranes, which create materials that can deliver drugs to specific locations over an extended period of time. Due to their excellent biocompatibility, good mechanical attributes, and simplicity of processing, polysulfone-based (PSF) biomaterials have been used in biomedical applications. Additionally, useful in the improvement of therapeutic efficacy and targeted drug delivery are magnetic nanoparticles (MNPs). In light of the foregoing, the current study aims to develop a resveratrol-loaded magnetite-enhanced polysulfone material for potential use in nerve tissue engineering studies.

The polysulfone membranes were synthesized by the phase inversion method and the MNPs were synthesized using co-precipitation method. The resveratrol-loaded magnetite-enhanced polysulfone membranes obtained were characterized from a compositional and morphological point of view by SEM, FTIR and infrared spectroscopy, with the analyses showing a uniform distribution of the components in the membranes, as well as their porosity and purity. The materials also revealed good stability in acidic and basic media, thus being suitable for a wide range of applications in the biomedical industry. The biocompatibility and potential cytotoxicity of the materials were tested on NE-4C neural stem cells by quantitative MTT and LDH assays at 2 and 7-day intervals. Neither composition induced toxicity at the cellular level, and cells seeded on PSF-MNP2%-Rsv2% membranes demonstrated significant proliferation after 7 days of culture. Therefore, the materials developed in this study may be ideal candidates for future nerve tissue regeneration studies.

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Poster Sessions

Development of Natural Extracts through the Valorization of Agrotechnical Waste from Vineyards

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ABSTRACT

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The Influence of Natural Deep Eutectic Solvents and Ionic Liquids on the Formation of the Biphasic Water Systems

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ABSTRACT

Aqueous biphasic systems (ABS) represent a green alternative to classic liquid-liquid extraction. New ABS containing triblock polymer Pluronics (PL10R5 or PL17R4), ionic liquid cholinium lactate ([Ch][Lac]) or natural deep eutectic solvent (NADES) made of cholinium chloride and lactic acid in 1:1 ratio (ChCl:LA) as the biocompatible salting-out reagent were studied in this work. The ability of [Ch][Lac] and ChCl:LA as the salting-out reagent on ABS formation with Pluronics is approximately the same. The effect of the IL and NADES on the composition of PL and IL/NADES rich phases was also investigated. Insight into the composition of the phases, it can be concluded that the composition depends on concentrations of both the polymer and the salting out reagent [Figure 1.]. The IL-rich phase in system {PL17R4 + [Ch][Lac] + H2O} has a high water content (75%) and a low polymer content (8%), while in the case of ABS {PL10R5 + [Ch][Lac] + H2O}, the polymer content in IL-rich phase is significantly higher (25%) and H2O content is lower (60%).

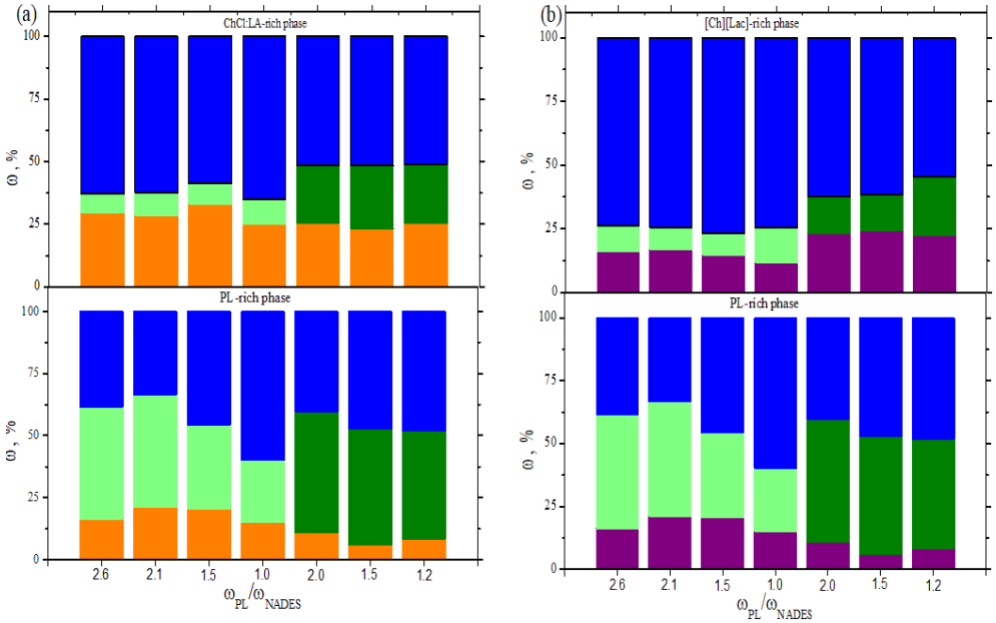

Figure 1. Graphical representation of phase compositions in mass fraction at 23 °C and atmospheric pressure: a) {PL + ChCl:LA + H2O}; b) ABS{PL + [Ch][Lac]+ H2O}. Legend: PL17R4 (light green); PL10R5 (dark green); ChCl:LA (orange), water (blue), and [Ch][Lac] (purple).

The Use of Hydroxyapatite and its Derivatives in the Depollution of Wastewaters

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ABSTRACT

The diversity of non-biodegradable and toxic antibiotics in aqueous effluents led to the poor efficiency of conventional depollution methods (i.e., physical, chemical, or biological) [1,2].

Advanced oxidation processes can solve this problem by creating reactive species following solar irradiation, which is an efficient and sustainable technology for removing non-biodegradable contaminants from aqueous effluents. To improve the photocatalytic response in the visible light, coupling of metal oxides with other metals to form heterojunctions has been approached. In this work, hydroxyapatite was used as support due to its high level of activity in many photocatalytic reaction systems.

Therefore, the aim of this work is to examine the photocatalytic degradation of the pharmaceutical product - ceftriaxone, using hydroxyapatite doped with various metal oxides.

For this purpose, we synthesized five metal-oxide photocatalysts, using copper acetate, cobalt acetate, chromium acetate, nickel acetate and ferric chloride as metal-oxide precursors and hydroxyapatite as supporting material using a Discover 2.0 Microwave Flow Reactor, at the temperature of around 160°C, 300 W power, for 10 min. After characterizing the obtained materials through several modern techniques, the synthesized photocatalysts were mixed with a styrene-acrylic film-forming material and deposited on glass plates [3]. The photocatalytic activity was evaluated by a Xenotest 150 S- lamp.

As a conclusion, photocatalytic degradation of drugs in the presence metal-oxide/HAP composites is an effective technique for the treatment of aqueous effluents. The reaction mechanism suggests that the degradation occurs starting with 2-aminothiazole, verified by yellowing of the photocatalytic plate, HAP–Cu presenting the highest photocatalytic performances.

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Eco-Friendly Formulations for the Stabilization of Natural Pigments with pH Sensitivity by Encapsulation and Adsorption

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ABSTRACT

Natural pigments, curcumin and red beet extract rich in betacyanin were encapsulated in porous silica and aluminosilicate carriers. Two approaches were used for loading the plant derived agents in the matrices. The direct incorporation assumes introducing the dye solution containing solubilizing and stabilizing agents in a colloidal silica sol from which by gelation powders were obtained. For post loading, two mesoporous supports were prepared using structure directing surfactants, one from colloidal silica by a sol-gel reaction and the other from colloidal silica and $Na_2O{\cdot}Al_2O_3$ by a hydrothermal process which generated aluminosilicate. The beet extract was adsorbed by these supports.

The unloaded powders were structurally characterized (XRD). UV-vis and fluorescence studies evidenced the presence of the enol form of curcumin and of betanin food colorant in the matrices. Variations of color and fluorescence generated by exposure to ammonia in a sealed vessel were investigated.

The studied eco-friendly formulations could find potential application in monitoring environmental conditions of food, pharmaceuticals and other products.

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Biostimulatory Effect of Some Micro-Algae on the Growth and Development of Tomato Plants

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ABSTRACT

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Detection of Ammonia Using Polymer Based Chemiresistive Sensors

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ABSTRACT

Ammonia (NH3) is a hazardous and odorous gas, toxic for human health and environment. Its accurate detection and monitoring have become crucial especially in current times [1].

The objective of this research is to detect NH3 within a range of concentrations from 1 to 1000 ppm using chemiresistive gas sensors based on conducting polymers, which offer a promising alternative to other sensitive materials in gas sensing applications due to their ability to operate effectively at room temperature [2]. Two conducting polymers, namely polyaniline (PANI) and polypyrrole (PPy), were selected due to their high sensitivity to NH3 [3,4]. They were synthesized using a simple and fast method which involved the chemical polymerization of their monomers directly onto interdigitated gold electrodes on an alumina substrate. Subsequently, scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS) were employed to characterize the active surface of the sensors, providing morphological and chemical insights to confirm the presence of the polymers.

To evaluate the sensors' functionality, a custom gas testing setup was utilized, allowing real-time monitoring of the changes in their electrical properties at room temperature. The measurements were conducted using a source-meter and the variations of the electrical resistance were analyzed as they are directly related to the concentration of the gas to which the sensors were exposed, enabling a qualitative interpretation of each sensor's response and sensitivity to ammonia.

Finally, a comparative analysis was realised in order to assess the stability, repeatability, and sensitivity of both developed PANI and PPy based chemiresistive sensors.

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Nonstationary Behaviour of the Upconversion Processes for the Y_2O_3 Ceramic Doped with Er^{3+} Yb^{3+} Ions Pair

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ABSTRACT

The study of the energy transfers between Er^{3+} and Yb^{3+} ions (emitter-sensitizer pair doping the Y_2O_3 ceramic), when involved in the upconversion process for the 976nm (IR) incident wavelength to the visible domain (red-green), reveals an unusual behaviour which displays nonstationarity.

When measuring the upconversion spectra for prolonged durations (minutes to hours), oscillations in the intensities of the various regions of the spectra (in absolute and relative terms), either erratic or uniform, are revealed. The preliminary observations indicates that these oscillations are linked to the temperature of the probe and the relative concentrations of the dopants.

The literature on the upconversion process, even if quite extensive, is, to our knowledge, in lack of information regarding this behaviour. This fact is a strong indication that further research in this direction is beneficial both for deepening the understanding of the involved energy conversion mechanisms and for practical applications.

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Polymeric Membranes Containing Nanoparticles for Water and Wastewater Treatment

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ABSTRACT

Polymeric membranes are of great interest both academically and industrially due to many advantages, such as: various types of synthetic (e.g. polyvinyl alcohol, polystyrene, polysulfone, polyethersulfone) or natural polymers (i.e., cellulose, chitin, chitosan, alginate) are commercially available; larger surface area; selectivity; good mechanical, thermal, and chemical stability; can be used in many applications like hydrogen separation, desalination, membrane separation processes (i.e., electrodialysis, ultrafiltration, nanofiltration, microfiltration) [1-3]. In the last years, researchers have prepared polymeric membranes using different types of polymers with nanoparticles (i.e., SiO_2, TiO_2, ZnO, Al_2O_3) for water and wastewater treatment applications, due to their advantages: excellent permeability, higher selectivity, chemical stability and thermal resistance, high hydrophilicity, higher separation performance [2,3].

The present work was aimed to prepare and characterize various polymeric membranes blended with different loadings of nanoparticles (SiO_2 and TiO_2). The synthesized polymeric membranes were characterized by FTIR Spectroscopy and Scanning Electron Microscopy (SEM). FTIR spectra indicated that the incorporation of nanoparticles into the polymer mixture conducting to a polymer-metal ion complex formation inside the membrane. In all spectra of polymeric membranes loaded with SiO_2 nanoparticles were observed characteristic peaks at ~1079 cm^{-1} assigned to the asymmetric stretching vibration of Si-O-Si, at ~943 cm^{-1} assigned to the bending vibration of Si-OH groups and at ~806 cm^{-1} attributed to the symmetric stretching vibration of Si-O. The spectra of polymeric membranes with TiO_2 nanoparticles showed that the peak at ~595 cm^{-1} was assigned to the stretching band of Ti-O. SEM images of polymer membranes based on nanoparticles indicated that the inclusion of nanoparticles in the casting solutions allows the development of a dense layer, obtaining a homogeneous distribution of nanoparticles in the polymer matrix and presenting a dense and uniform structure with many pores.

The results demonstrated that the synthesized polymeric membranes could be used in different fields of water and wastewater treatment (i.e., desalination, membrane separation processes).

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Laser Pyrolysis of Iron Oxide Nanoparticles and the Influence of Laser Power

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ABSTRACT

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Apatitic Materials Improve with Heavy Metals with Potential Antimicrobial Properties for the Treatment of Wood and Stone Cultural Heritage Objects

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ABSTRACT

The tangible part of the concept of cultural heritage is subject to sometimes irreparable degradation or destruction. the causes of the degradation of heritage objects are multiple and often uncontrollable. They can be divided into two large categories: natural disasters (geophysics, meteorology, hydrology, climatology, biology) or man-made (wars, ideology, corruptions, pollution). In the last decades, most of the previously listed factors have become more frequent and more aggressive, leading to an acceleration of the degradation of heritage objects. For this reason, finding a quick solution to stop or slow down the degradation of monuments has become a necessity. In the last decades, multiple materials have been developed with the role of protecting the heritage objects, but the most promising results were offered by phosphate materials, especially if they are on the nano scale, either simple or in different combinations with polymers or heavy metals. The most important rule when developing a material with a role in consolidating heritage objects is that it does not affect or change the appearance of the treated object [1-3].

In this study we synthesized apatitic materials substituted with heavy metals at different Ca/metal molar ratios by the method of co-precipitation. The obtained materials were morpho-structurally characterized by modern techniques (XRD, XRF, FTIR, TGA, SEM) and in terms of antimicrobial properties were used different qualitative and quantitative assays. To test the efficiency of the materials, they were brought into solutions and applied to different types of bricks and wood, on which different color and gloss measurements were performed, in order to study the influence of the materials on the aesthetic characteristics of the artifacts. For future works, we aim to apply the obtaining apatitic materials on underwater wood simulating the characteristics of waterlogged cultural artifacts.

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Innovative Composite Membranes Based on Alginate Biopolymers and Antibacterial Nanoparticles as Adsorbent Materials for Water Treatment

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Polyethylene/ZnO Nanoparticles Composite – A Novel Antimicrobial Packaging Film

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ABSTRACT

Nowadays food preservation, quality maintenance and safety are major growing concerns of the food industry. It is evident that over time consumers' demand for natural and safe food products with stringent regulations to prevent food-borne infectious diseases. Active antimicrobial food packaging systems are supposed not only to passively protect food products against environmental factors, but also to inhibit or retard microbial growth on food surfaces, extending food shelf life. Replacing conventional packaging with some antimicrobial ones could reduce food loss (30% of food is wasted in developed countries at retail and consumer level). Nanostructured antimicrobials have a higher surface area-to-volume ratio when compared with their higher scale counterparts. Therefore, antimicrobial nanocomposite packaging systems should be particularly efficient in their activities against microbial cells. ZnO has found its way in many applications in daily life such as in drug delivery, cosmetics, medical devices, dentistry and orthopedics. The use of ZnO in cosmetics is not limited to the sunscreens, while in dentistry, ZnO is used as a fill material due to its ability to block microbial leakage and is considered an antiseptic material. ZnO containing products are non-toxic to oral tissues when they come into direct contact. There is a need to develop new antimicrobials to ensure food safety and extend shelf life of packed foodstuff. The present research aims to modify the existing packaging, so that the manufacturers can easily adopt the innovation, through minimal modifications of the existing equipment. The use of antimicrobial agents through packaging is one effective approach.

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Applications and Properties of Honey, Propolis and Royal Jelly in Skin Tissue Engineering

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Nanotechnology and Modern Methods of Prevention for Infections Associated with Mesh Repairs of Abdominal Wall Hernias

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ABSTRACT

Introduction: abdominal wall hernias have always been a challenge for the surgery field, multiple surgical procedures being implemented over time to obtain better outcomes [1-3]. For several decades now, alloplastic procedures, fitting of mesh implants, have represented the gold standard in the surgical treatment of abdominal wall hernias, demonstrated to have a lower recurrence rate. However, this procedure is not without risks, the most important complications being the infectious ones. [1-2] Mesh infections occur at approx. 1-4% of open surgery cases and approx. 0.1% of laparoscopic surgery cases [1], but with important implications both financial and on the patient's quality of life. The role of this article is to analyze the latest research and look for new directions in order to develop new technologies that allow us to decrease the number of infectious complications of mesh implants used in abdominal wall hernia repair.

Methods: A comprehensive literature search was performed using PubMed. 10 articles were analyzed, 1 that studied the biodiversity of biofilm formed on removed infected surgical mesh, using DNA sequencing, corelating it to the patient's oral, enteral and skin flora [3], 1 that studied the antibacterial efficiency of the XENMATRIX AB mesh, containing Minocyclin and Rifampin nanomolecules [2], and 8 studies on the various antimicrobial and antiseptic nanoparticles and the main methods used in the manufacturing of bioactive meshes [1,4-10]. This article outlines the various bacterial species involved in mesh infections and types of meshes and materials used for infection prevention, emphasizing on the integration of nanomolecules in surgical meshes.

Results: The main bacterial agents that colonized surgical meshes were found to be oral bacteria (55,7%), significantly more frequent than skin flora (19,9%) or enteral flora (11,5%) [3], but the most frequent agents that produced the infection of the mesh were S. Aureus, S. Epidermidis and E. Coli [1]. Antimicrobial coated meshes (XENMATRIX AB) have been significantly effective, in vitro and in vivo, against isolated MRSA and E. Coli [2].

Conclusions: Multiple studies [4-10] have shown great potential in using various nanoparticles in the manufacturing of surgical meshes [4], for decreasing the bacterial load and risk of mesh associated infections, such as antibiotics (vancomycin, rifampin, ofloxacin, ciprofloxacin), antimicrobial agents (triclosan, silver, zinc, copper) and antimicrobial peptides (lisostaplin) [10].

Keywords: mesh infection, coated mesh, abdominal wall hernia

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Recent Approaches Towards Silicate Biomaterials Inspired by Nature

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ABSTRACT

Worldwide, bone tissue represents the second most transplanted tissue, after blood, and due to the very high demands that cannot be satisfied by bone grafts collected from patients, it was necessary to introduce the concept of tissue engineering to try to find solutions for this issue. The development of this concept mainly involves the study of scaffolds or three-dimensional structures made of various biomaterials such as: certain metallic materials, polymers, bioceramics, functional materials and their combinations. Among them, according to literature data, bioceramics represent the main material used for the fabrication of three-dimensional structures for bone tissue replacement due to its special properties such as good chemical and thermal stability, biocompatibility, bioactivity, biodegradability and good compressive strength.

The most well-known materials used to obtain porous scaffolds for BTE (bone tissue engineering) are hydroxyapatite (HAp), composites based on HAp and different biopolymers but also bioceramics based on calcium silicates, which have attracted the attention of researchers for applications in orthopedic implants due to their adequate properties such as excellent bioactivity and biocompatibility. However, a major problem with Ca-Si bioceramics is their too rapid dissolution, which could decrease stability and eventually lead to disintegration of the implant in the host body. As a result, the service time of the implant could be reduced due to the decrease in both the bond strength and the fixation of the implant.

The dissolution and stability behavior of Ca-Si bioceramics has been improved by doping with metals or metal oxides such as zirconium (Zr), barium (Ba), strontium (Sr), zinc (Zn) and aluminum (Al). Moreover, it has been demonstrated that, by incorporating ions such as Zr^{4+}, Mg^{2+}, Zn^{2+} into the calcium silicate network, the biological performance and mechanical properties of the scaffolds obtained from this type of bioceramics can be controlled [1].

In this work, the main goal was to obtain a new biomaterial based on calcium silicate in which barium ions were incorporated through the sol-gel technique, inspired by a compound discovered in nature since the 1960s in sanbornite deposits of Big Creek and Rush Creek, Fresno County, California [2]. Thus, the compound known in the literature as walstromite was chosen, and several experimental sol-gel synthesis variants were carried out to determine the most suitable precursors for obtaining a compound with adequate properties for the final application in the field of additive manufacturing of scaffolds for BTE.

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Black Phosphorus-Based Scaffolds

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ABSTRACT

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Novel Developments in the Synthesis of Natural Hydroxyapatite-Based Materials for Bone Tissue Engineering

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ABSTRACT

Numerous people today suffer from bone deficiencies generated by bone injuries or trauma. For this purpose, bone tissue engineering is the interdisciplinary research field of biomaterials and tissue engineering to address these issues to improve the quality of life. 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. Lately, a unique and effective strategy for obtaining functionalized biomaterials with complex structures from natural origins (bovine/fish bones, seashells, and eggshells) were demonstrated to be an effective source to obtain hydroxyapatite with increased availability, thus enhancing orthopedic applications. The developed materials were proven to preserve 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. All these dopants could increase *in vitro* and *in vivo* bioactivity and biocompatibility, enhancing bone regeneration, and at the same time improving the mechanical properties of the synthesized material. The aim of this study is to present the ideal 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.

Green Synthesis of Metal Oxide Nanoparticles Applied in Soft Tissue Engineering

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ABSTRACT

In the last years, nanotechnology application in materials science field has greatly increased due to their easy applicability in environmental (photodegradation, pollutant and toxin detection, water remediation and treatment) and pharmaceutical (cancer therapy, tissue repair, drug delivery, etc.). Hence, nanoparticles (NPs) are considered the most researched materials for their unique characteristics due to their nanometric morphology. Correlated with their application in the biomedical domain, metal oxide NPs can be effortlessly incorporated into the fabrication of scaffolds, due to their ability to enhance the antibacterial, anticancer, antioxidant, or antifungal effects of the developed material.

The most studied metal oxide NPs that have an extensive range of applicability in wound healing and soft tissue engineering are gold (Au), nickel (Ni), platinum (Pt), silver (Ag), palladium (Pd), zinc (Zn) and copper (Cu) nanoparticles. These NPs can be synthesized through many routes of fabrication such as conventional (physical or chemical methods) or green synthesis methods. However, the main concern about the synthesis method of metal oxide NPs is represented by the environmental impact. Chemical and physical synthesis methods are the most highly used routes. Their main drawback is the use of toxic precursors that could provoke carcinogenicity and environmental toxicity. The green synthesis method represents a solution to surpass these limitations, by using non-toxic and reagent precursors such as fungi, plants, bacteria, yeasts, and algae. The phytochemicals and extracted biomolecules from plants are the main active compound that has the role of stabilizing and reducing agents for the formation of nanoparticles. Additionally, the active molecules could decrease toxicity, avoid nanoparticle agglomeration, and improve the antimicrobial activity of the scaffolds, leading to a potential synergistic effect.

This study aims to present the successful development of zinc, magnesium and copper oxide nanoparticles by using green synthesis. In this direction, orange peel has been used as a capping and reducing agent for both types of nanoparticles.

Surface Functionalization of Cellulose Acetate Membranes with Crown Ether for Biomedical Applications

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ABSTRACT

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Supermacroporous Cryogels as Promising Materials for Antibiotics Retention

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ABSTRACT

Introduction: Water is the most important source and, due to pollution with various agents (antibiotics, dyes, etc.), the purification process becomes extremely difficult. For this reason, numerous studies have been carried out to remove antibiotic residues from wastewaters [1-2]. Cryogels are superabsorbent porous materials that have the ability to retain large amounts of antibiotics. They are formed by cryotropic gelation using polymers or monomers as precursors, with the actual formation resulting from freeze-drying steps [3]. Tetracycline (TC) and Penicillin G (PG) are two of the most important antibiotics commonly used in human and veterinary medicine in the treatment of bacterial infections, respiratory problems, as an agricultural fertilizer or as a feed additive [4]. Because of their widespread use, some of them end up in wastewaters. To solve this problem, new polymer- and silicate-based crogels have been studied.

Materials and methods: For the development of the aimed supermacroporous cryogels, silicates (Kaolin organophilized and SDS) and two types of chitosan were used, as follows: commercial chitosan (CC) and chitosan prepared in laboratory from shrimp shell waste (SHC). Other reagents: acetic acid, was used in mixture with water, for chitosan dissolution; crosslinking agent; kaolin (Acros Organics); γ-methacryloxypropyltrimethoxysilane (MAPTES), the organophilization agent and two antibiotics (PG and TC). The cryogels were lyophilized and tested for their adsorption capacity towards TC and PG.

Results: In order to highlight the preparation of the aimed materials and their adsorption capacity for both antibiotics several characterization techniques were needed (FTIR, SD, UV-VIS). The FTIR spectra confirmed the incorporation of the silicates into the polymer matrix, by the appearance of the characteristic bands for the materials. The UV-Vis analysis allowed the determination of the retention capacity of the cryogels on two types of antibiotics (PG and TC). Following this study, it was demonstrated that samples based on CC as well as those based on SHC have superabsorbent properties, especially for PG at a concentration of 0.02 mol/L.

Conclusions: In conclusion, following the results obtained, the properties of supermacroporous cryogels based on Chitosan with Silicate content (K-MAPTES/SDS) and superabsorbent properties for PG and TC were obtained. These cryogels are able to be further used in water purification for antibiotics retention.

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In Vitro Evaluation of the Anti-Alzheimer's Effects of Donepezil-Loaded Poly(lactic-co-glycolic acid) Nanoparticle Embedded Sodium Alginate/Polyethylene Glycol Scaffolds Produced by 3D Printer

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ABSTRACT

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Towards Smart SARS-CoV-2 Detection Using a Plasmonic Sensor

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ABSTRACT

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is a virus with RNA genome, responsible for the outbreak of the COVID-19 respiratory disease pandemic, causing so far over 68217 deaths in Romania (worldometers.info/coronavirus/). The disease is extremely contagious and can have manifestations with an evolution towards acute respiratory distress, the main cause of mortality[1]. In this context, an early, specific and sensitive method of diagnosis is essential so that suspected patients can be properly evaluated and treated. Without doubt, fast and accurate identification of this virus will greatly contribute to the control of the pandemic.

Cell culturing, enzyme-linked immunosorbent assay (ELISA), or reverse transcription polymerase chain reaction (RT-PCR) are some of the conventional methods used for disease diagnosis. However, a majority of these methods require expensive reagents and equipment, long processing time, as well as well-trained personnel. In addition, they often have limited speed, sensitivity or specificity[2]. Therefore, it is advantageous to thoroughly investigate suspected patients by another reliable diagnosis system. In this context, biosensors are ideal for providing an alternative and reliable solution to clinical diagnosis, real-time detection, and continuous monitoring[3]. Among the different biosensing techniques, fiber optic surface plasmon resonance (FO-SPR) biosensing systems are applicable to different classes of analytes of clinical interests[4,5].

Herein, we propose the validation of a smart point-of-care detection platform (POC) based on FO-SPR technology, capable of providing an accurate and fast diagnosis in case of COVID-19 infection, without requiring complex and very expensive equipment.

Keywords: SARS-CoV-2, virus detection, fiber-optic sensors, real-time detection, diagnosis

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Ara H1 Peanut Allergen Detection Using an Optical Fiber Based Sensor

Iulia Antohe

ABSTRACT

The authors did not agree with the publishing of the abstract.

Cerium Oxide Nanoparticles – A versatile Oxide with Antimicrobial Properties

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ABSTRACT

The resistance to antibiotics of therapeutically important bacteria is the application of nanoparticles that has attracted the greatest attention. Recently, extremely drug-resistant bacteria that can withstand even the strongest medicines have arisen. As a result, the health sector is under a great deal of strain, and mortality and morbidity rates have increased globally. Consumption of antibiotics is out of control, and the route to market for new antibiotic breakthroughs is closing, prompting alarms that call for immediate action to halt this looming menace. One option to the creation of new antibiotics that is gaining interest is the reversal of antibiotic resistance and subsequent revival of the existing antibiotic stockpile.

One of the most versatile and useful oxide nanoparticle developed for antimicrobial purposes is representd by the cerium oxide nanoparticles (CeNPs) due to the fact that it exhibit antioxidant properties both in vitro and in vivo. This is based on other exquistie properties such as self-regeneration of their surface, which is based on redox-cycling between 3+ and 4+ states for cerium, in response to their immediate environment. Additionally, oxygen vacancies in the lattice structure allow for alternating between CeO_2 and CeO_{2-x} during redox reactions.Extensive research to identify and characterize the biomedical applications of CeNPs has been heavily focused on investigating their use in treating diseases that are characterized by higher levels of reactive oxygen species (ROS).

Furthermore, these type of nanoparticle present antibacterial activity and are able because of their electrostatic properties and morphology to make the proteins linked to the bacterial cell membrane's thiol groups more accessible for the CeO_2 NPs to attach to. The interaction with the thiol groups kills the bacteria by denatureing the proteins in the cell membranes and making them impermeable to outside substances. Another widely accepted idea claims that the increased reactive oxygen species (ROS) in the bacterial cells is due to the electrostatic attraction of the CeO_2 NPs.

This study aims to provide a thoughtful context in which CeO_2 NPs are being used and further insights on how they can be optimized from the synthesis to their applications.

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"Green" Polyols Based on Recycled Polymers and Renewable Feedstock with Various Applications in Industrial and Biomedical Fields

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ABSTRACT

Because of its versatility and also its chemical and mechanical properties, polyurethane is one of the most used polymers in the world, ranking fifth in the most produced polymers in the world by volume, with approximately 21.4 Mt produced in 2022[1]. The typical synthesis involves the polyaddition reaction between an isocyante or polyisocyanate and a polyol. By altering the chemical and physical structure (such as chain length, degree of crosslinking, the length of the polymer blocks used etc.) of the polyurethanes, thermoplastic[2], thermoset and elastomeric polyurethanes[3] can be produced. The majority of polyols and polyisocyanates used in the manufacturing of polyurethanes uses petroleum as the raw material. As crude oil is getting ever more scarce, and also because of the environmental implications of oil extraction and usage, alternatives are getting more and more sought after.

Polyols used in the manufacturing of polyurethanes can be derived from renewable feedstock such as vegetable oils using various chemical reactions to modify the double bond of the unsaturated fatty acids into a hydroxyl moiety: thiol-ene reaction[4], epoxidation and ring-opening[5], catalytic hydroformilation and hydrogenation, ozonolysis among others. Polyols can also be synthesized through chemical recycling (glycolysis) of various polymers: polyesters such as poly(ethylene therephthalate)[6], polyamides[7], polyurethanes[8].

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Potential Application and Upcycling Process of Thermoset Polyurethane Based Automotive Wastes Combined with TPU via Electrospinning Method in Automotive Industry

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ABSTRACT

Automotive industry one of the major sector that have to lead circular economy according to gigantic production capacities all around the world. Mainly preference of recycling of materials instead of destruction and regaining of wastes into more valuable materials that have capacity to serve same level of functionality, can describe the aim of automotive industry nowadays. Nanoscience on the other hand is indispensable for automotive industry regarding to creating new technologies what automotive industry is seeking for. Nano-objects provide significant improvement of material properties mainly thermal, chemical and mechanical especially in material intensive automotive industry via high surface area to volume ratios. In this study, thermoset based polyurethane production wastes in automotive industry, grinded until a few micrometer sizes via liquid nitrogen grinder. The combination of grinded waste particles and Thermo Plastic Polyurethane (TPU) solved in 3:1 N,N-Dimethylformamide (DMF) and Tetrahydrofuran THF mixture and prepared for electrospinning method with the parameter of 600 rpm rotational speed of collector, 22kV Voltage, 18cm distance between needle and collector, 0,6ml/h flowrate and 17G conductive needle. DSC, TGA, FTIR, SEM, Mechanic and Acoustic properties of electrospun mat is investigated. According to tests material showed 2,6MPa tensile strength, 103% elongation, 556% water absorption, -360C Tg. When electrospun film used as a skin layer to the polyurethane foam, transmission loss property of material has increased %37 between 250-6300Hz and %68,6 better sound absorption property observed between low frequencies at 250-800Hz. Additionally potential applications of electrospun mat in automotive industry is discussed in results and discussion section.

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In Situ Monitoring of the Materials Degradation in Concrete-based Structures by means of Portable Raman Spectroscopy

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ABSTRACT

There is an increasing interest in the design and development of smart sensor systems for the monitoring the chemical environment of concrete, as well as to obtain non-destructive (and time dependent) information concerning the condition of concrete structure [1, 2]. Some of them are aimed at the identification of Non-destructive monitoring methods and continuous monitoring systems based on electrochemical, piezoelectric, fiber-optic, control of chloride content approaches [3]. The on-site monitoring of the chemical changes of concrete-based structures play an important role in structure health monitoring as it provide crucial information about the cause (and evolution) of the degradation mechanisms of structures, thus furnishing valuable information for the diagnosis of of health-condition and performance of concrete structures. In this respect, portable Raman scattering technology offers a unique opportunity for developing a novel approach capable of monitoring the service-condition of concrete in situ. More specifically, Raman spectroscopy is able to detect the rotational and vibrational modes (of the chemical bonds) of molecules inside a material system, by using specific laser wavelengths which are not absorbed by the material sample under investigation [4]. In this study, the deterioration of reinforced concrete samples subjected to multi-environmental factors are a investigated by means of a portable Raman spestroscopy set-up. The approch may attract increasing interest for the investigation of various phases in concrete-based structures due to its unique capability to investigate various environmental attacks like carbonation [5] and sulfate attack [6].

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Surfactant Assisted Dispersion of Carbon Nanotubes into Cement Mortars for Structural Monitoring Applications

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ABSTRACT

Multi-wall carbon nanotubes (MWCNTs) exhibit exceptional (electrical and mechanical) properties that can be employed to improve the mechanical and (piezo-)electric performances of cement-based materials. However the poor dispersion in acqueos media is a major critical issue that limit the practical application of carbon nanotubes (CNTs) in cement based composites. In the present study, the effect of two different types of surfactants (namely Triton X 114 and Sodium Dodecyl Sulphate) on MWCNT dispersion properties were investigated. The surfactants chemical structures and concentration and the MWCNTs-surfactant ratios directly affect the adsorption behaviours of the surfactants on MWCNTs surface, thus exhibiting significant impacts on the final dispersion effect, as evidenced by preliminary light scattering experiments. Notably, the excess amounts of surfactants above an optimum amount causes the agglomeration (or entanglement) of MWCNTs, owing to the interactions between unfavourable micellar aggregates units. The main obtaind results suggest possible mechanisms of interaction between the surfactants and the MWNTs, in order to account for the structural properties observed. This study may provide useful insights for the selection of optimal surfactants for MWCNTs dispersion in concrete-based structural applications.

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Carbon Quantum Dots-Modified Electrodes For D-Fructose Detection

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Motion Capacities of Exosomes

Israfil Kucuk, Esra Mutlu

ABSTRACT

The authors did not agree with the publishing of the abstract.

Enhanced Osteogenic Differentiation of Human Adult Mesenchymal Stem Cells Cultured on Plate-Like Hydroxyapatite Coatings

Vasile Pruna, Daniela-Madalina Ghetu, Diana Vranceanu, Cosmin Cotrut, Alina Vladescu (Dragomir) , Irina Titorencu

ABSTRACT

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ZnO Assisted Photocatalytic Removal of a Pharmaceutical Pollutant: Preliminary Evaluation of the Toxicity of Treated Solutions

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ABSTRACT

Emerging pharmaceutical compounds are commonly identified in wastewater treatment plant effluents worldwide due to the difficulty in effectively removing them through secondary biological processes. Furthermore, numerous studies have confirmed the significance of their widespread presence in aquatic environments because of their negative effects on organism development and human health. The present work highlights the applicability of a photocatalytic process based on the use of a ZnO/ visible light system to degrade the emergent water pollutant pentoxifylline (PTX). The literature suggests that, in some cases, during the photocatalytic treatment the transformation products generated in reaction may be more toxic than the parent compound. With this in mind, great emphasis has been placed on studying the toxicity of PTX phototreatment solutions to analyze the potential impact of photocatalytic processes on the environment. Therefore, a series of preliminary phytotoxicity tests were carried out using seeds from the higher plant species *Lepidium sativum* to evaluate the environmental impact of the solutions resulted after the treatment using ZnO/visible light system. Photocatalytic results colected in our study confirmed the successful elimination of PTX under visible light irradiation conditions. Also, the phytotoxicity data revealed for example that in the case of solution having an initial concentration of 40 mg/L, induce an inhibition of the seed germination (80%) as well as radicle and leaf length. Such behavior is probably due to the toxicity of the target molecule. Moreover, a significantly decrease on the growth of *L. sativum* seedlings components was observed for the phytotoxicity assays conducted with the solutions colected after the photocatalytic treatment. A posible explanation in the reduction of the noticed toxicity found for the treated solution is certainly the conversion of toxic reaction intermediates into less toxic reaction by-products.

Keywords: emergent water pollutant; photocatalysis; degradation; phytotoxicity; *Lepidium sativum.*

Studies on the Behavior and Phytoremediation Potential of Rapeseed (*Brassica Napus* L.) Growing on Soil Polluted with Cadmium Ions

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ABSTRACT

The presence of cadmium in soil in higher concentration can generate negative impacts in the environment and for human health because of its high solubility, mobility, high half-time and bioaccumulation along the food chain. Literature studies reported rapeseed (*Brassica napus* L.) as a suitable plant for phytoremediation of soils polluted with several heavy metals such as cadmium, nickel, chromium and lead (Roșca et al., 2021; Rizwan et al., 2018). In this context, in the present study we have tested the tolerance and phytoremediation potential of rapeseed growing on soil polluted with cadmium ions at different concentrations (10 mg/kg, 48 mg/kg, 110 mg/kg, 209 mg/kg). The experiments were carried out in triplicate, in plastic pots (height 13 cm, inner diameter 14.5 cm) containing 600 grams of peat soil and 434 mL solutions of different cadmium ions. The plants were grown during 11th of September until 21th of October 2021 in greenhouse conditions. After 40 days, the roots and shoots length were measured and photosynthetic pigments contents were determined. Also the samples were subjected to acid digestion using nitric and hydrochloric acids in ratio 3:1 and further analyzed by Atomic Absorption Spectrometry in order to determine the amount of cadmium ions accumulated in roots and shoots. The results showed that, at cadmium concentration in soil of 10 mg/kg, the tolerance index was 90.47% for roots, and 93.90% for shoots, respectively, while at a concentration of 209 mg/kg, the tolerance index was 74.77% for roots, and 86.17% for shoots. In case of photosynthetic pigments, a decreases with 15.94% for chlorophyll a, 27.06% for chlorophyll b and respectively, 26.61% for carotenoids was observed at the highest cadmium concentration (209 mg/kg). Considering the bioconcentration factor (BCF) and translocation factor (TF) values which were higher and respectively lower than 1, it can be stated that rapeseed presented the capacity for Cd immobilization in roots. In conclusion, *Brassica napus* L. may develop a good cadmium tolerance in the range of tested concentration with no significant effects on morphological and physiological state of the plant. Morever, it may be a suitable candidate for Cd accumulation and phytostabilization of polluted soil.

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Potential Role of Green Iron Oxide Nanoparticles in Diagnosing and Treating Neurodegenerative Diseases

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ABSTRACT

Neurodegenerative diseases pose a considerable burden on patients, families, and society due to the progressive degeneration of the nervous system. Consequently, the development of novel detection methods and therapeutic strategies is urgently needed. Existing drugs often face challenges in effectively crossing the blood-brain barrier (BBB), resulting in unfavorable prognosis and less effective treatments. However, the field of nanomedicine offers promising avenues for diagnosing and treating central nervous system (CNS) diseases. Nanoparticles provide a versatile solution by integrating targeting, imaging, and therapy into a single system, enabling the delivery of drug molecules across the BBB. This advancement instills hope in patients seeking innovative treatments. In this study, we propose the utilization of green synthesized iron oxide nanoparticles (GIONPs) for the diagnosis and treatment of neurodegenerative diseases. Specifically, we focus on the synthesis and optimization of GIONPs as magnetic resonance imaging (MRI) contrast agents and drug carriers. The integration of targeting, imaging, and therapy within the field of nanomedicine has garnered significant attention for CNS diseases. Consequently, we introduce the potential application of GIONPs in neurodegenerative diseases, aiming to contribute to early theranostics (treatment, Diagnosis and follow-up). Through this approach, we strive to pave the way for improved outcomes in the management of neurodegenerative diseases.

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Coronary Stents – From Past to Future

Teodor Băjeu, Ecaterina Andronescu

ABSTRACT

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Phytoniosome Antidiabetic Nanoformulations as Promising Paradigm for Effective Therapy

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ABSTRACT

Diabetes mellitus is a common metabolic disorder characterised by elevated blood glucose levels. Effective and safe antidiabetic agents with increased bioavailability and therapeutic efficacy are required for the management of diabetes. Nanotechnology has emerged as a promising field with numerous applications, such as the eco-friendly synthesis of nanoparticles (NPs) using medicinal plants. These green-synthesized NPs have the potential to demonstrate remarkable efficacy in a variety of biological activities, including the management of diabetes, the treatment of cancer, antioxidant properties and antimicrobial effects. Plant extracts contain naturally occurring compounds that can modulate blood glucose levels. However, these compounds' limited stability, solubility and bioavailability hinder their effective application. In this study, we aimed to increase the antidiabetic activity of papaya seed extract (PSE) by incorporating zinc oxide nanoparticles (ZnONPs) created via green synthesis into a niosome formulation. Niosomes are lipid-based vesicles that provide benefits for drug encapsulation, stability, and targeted delivery. The ZnONPs and niosome-encapsulated ZnONPs (Nio-ZnONPs) will be characterised using a variety of methods, including UV-visible spectroscopy, dynamic light scattering (DLS), Fourier transform infrared spectroscopy (FTIR) and others. In addition, we will evaluate the in vitro biological properties of the green Nio-ZnONPs, such as their antidiabetic, antioxidant and cytotoxic properties. Through this research, we hope to contribute to the expanding body of knowledge on green synthesis techniques and highlight the potential biomedical applications of green Nio-ZnONPs.

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Force Field Comparison for In Silico Analysis of Gene Carrier

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ABSTRACT

The authors did not agree with the publishing of the abstract.

Decellularized Amniotic Membrane: An Innovative Solution for Tissue Regeneration and Ulcer Therapy

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ABSTRACT

Introduction: Decellularized amniotic membrane has become a promising technology in regenerative medicine, with a wide range of therapeutic applications in the treatment of various conditions. This review explores the potential and prospects of decellularized amniotic membrane in the medical field.

Objective: To present and highlight the potential and uses of decellularized amniotic membrane in the treatment of various conditions and injuries.

Materials and Methods: Several methods of decellularization of amniotic membrane are used for therapeutic purposes: mechanical peeling, involving the removal of cells by applying mechanical force to the amniotic membrane. Enzymatic treatment, using enzymes such as trypsin, dispase or collagenase, is applied to the membrane to degrade the cell structure and release the cells. Chemical treatment involves the use of chemicals such as detergents or hypertonic solutions to remove cells from the membrane. Freeze-thawing cycles cause cell rupture and destruction. Combined techniques: sometimes, multiple methods are combined to achieve efficient and complete decellularization.

Conclusions: Each decellularization method may have specific advantages and disadvantages, and the choice of the appropriate method depends on considerations such as the purpose of using the decellularized membrane, the type of amniotic tissue used, and the available resources. Further research and quality testing are important to validate the effectiveness and safety of the decellularization method used in a particular therapeutic context.

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Synthesis and Characterization of Magnetic Bioactive Glass Nanostructure

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ABSTRACT

Given the rising rates of antibiotic resistance in pathogens, there is an urgent need for effective antibacterial alternatives to address the problem of inefficient antibiotics. [1] Bioactive glasses offer great potential for repairing and engineering soft and hard tissues due to their excellent biocompatibility and bioactivity. In recent years, there has been significant interest in developing highly porous and nano-sized materials, as their bioactivity is closely tied to their specific surface area. [2]

This study focuses on the synthesis and characterization of magnetic bioactive glass nanoparticles (Fe_3O_4-MBG NPs).

The first section provides a comprehensive overview of the soft chemistry processes that aim to produce iron oxide (Fe_3O_4) nanoparticles using chemical co-precipitation (CCP). This straightforward and convenient method is used for synthesizing iron oxides from aqueous Fe^{2+}/Fe^{3+} salt solutions by the addition of KOH at room temperature. [3]

The second section explores the preparation of magnetic bioactive glass nanoparticles (Fe_3O_4-MBG NPs) by sol–gel method. The potential of sol-gel-derived bioactive glass nanoparticles as innovative therapeutic and regenerative agents has sparked significant interest. [4]

Sol-gel-derived bioactive glass nanoparticles within the $51SiO_2{\cdot}18CaO{\cdot}20Na_2O{\cdot}4P_2O_5$-$7Fe_3O_4$ (mol%) system were obtained and characterized for their structural, morphological, and elemental properties. Analytical techniques such as X-ray diffraction analysis and scanning electron microscopy (SEM) with elemental analysis were employed for characterization.

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Antioxidant and Antibacterial Activity of *Pistacia Lentiscus L* Aqueous Extract Mediated Bioactive Silver Nanoparticles

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ABSTRACT

The current investigation focused on the environmentally friendly fabrication of silver nanoparticles (AgNPs) using an aqueous extract of *Pistacia lentiscus L* cultivated in Oued sefioune (Sidi Bel Abbes, Algeria). AgNPs was observed visually when the mixture of silver nitrate and plant extract changed color from yellow to brown colloidal suspension and UV Visible examination detected the surface plasmon resonance band at 460.50 nm. The extract of *Pistacia lentiscus L* leaves included phytochemical components that greatly influenced the formation of silver nanoparticles (AgNPs) as a bioreduction agent. AgNPs were studied using X-ray difraction (XRD), SEM, EDX, UV visible spectroscopy techniques that revealed their crystalline spherical shape and elemental composition. The antibacterial properties of the bioactive silver nanoparticle were also investigated. Excellent antibacterial activity of the AgNPs was demonstrated against both the gram-negative pathogen *Escherichia coli* and the gram-positive *Staphylococcus aureus*. Because *Pistacia lentiscus L* leaves are abundant in phytochemicals with antioxidant and antibacterial properties, the AgNPs also exhibited stronge antioxidant activity. Then, this silver nanoparticle has potential uses in medicine and pharmaceuticals because of its bioactivity.

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Preparation and Characterization of Composite Bone Substitutes

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ABSTRACT

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3D Printed Wound Dressings

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ABSTRACT

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Kombucha: Tradition Turned into Science

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ABSTRACT

Kombucha is a fluid fermeted product, based on a *Camellia sinensis* infusion, that is slightly sweet and mildly effervescent. Although it was used in traditional chinese homeopathic medicine, recent studies have shown that, besides using Kombucha only for consumption, it has biologic effects on one's systems and apparatus. We intend to highlight the therapeutic properties of the fermented tea.

The information summarised in this research paper was collected from original articles, published from 2011 to 2022, by accesing scientific search engines such as: Google Academic, ScienceDirect, using keywords eg. kombucha, fermented tea, therapeutic effects etc..

After researching, 20 articles were excluded based on nonconcludent information, there were 10 articles used for the research paper.

The microbiological profile consists of bacteria from *Acetobacteraceae* family: *Acetobacter aceti*, *Komagataeibacter kombuchae* and *Lactobacillus sp.*, and osmophile levures (fungi) such as *Brettanomyces*, *Candida sp.*, *Saccharomyces* and *Zygosaccharomyces*. This symbiosis can be found in literature as *Medusomyces gisevii.* Specilaty literature cites this complex to have antioxidant, antimicrobial and wound healing effects, given their physico-chemical characteristics, including it's ability to create new biofilms. The last effect being the most important, as it can be used to formulate new pharmaceutical products, especially for burns, given the low toxicity and biocompatibility of this symbiosis.

Symbiotical organisms are extremely challenging when talking about composition and bioactivity. Hence, the biological and therapeutic potential of Kombucha offers a new view on a broad spectrum of afflictions in the modern medical field.

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Loading and Release of Gentamicin Sulphate from Mesoporous Silica Nanoparticles FDU-12

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ABSTRACT

Different processes such us migration, urbanization, pollution, influence the spreading of infectious disease agents. The increase rate of spreading lead to improve the resistance of bacteria to antibiotics putting the humanity in new challenges to maintain the public health in a safe zone [1]. The development of drug delivery systems was a big step in this battle, making the drug administration more efficient. Mesoporous silica nanoparticles are a class of this type of systems due to their properties such us high specific area, high porosity, controlable pore size which induce programable and efficient delivery characteristics of the loaded drugs. In the literature there are numerous examples of such materials loaded with different antibiotics [2,3], these systems being developed to assure a better administration over time and from the point of view of the released dose. In this study FDU-12 mesoporous silica nanoparticles was obtained according to the method developed by Yu et al. [4] using Pluronic F-127 tri-block copolymer and trimethylbenzene as template for the generation of the ordered porous system and HCl aqueous solution as reaction medium. Loading of gentamicin sulphate solution was done under vacuum. The loading capacity was calculated after interpretation of results from FT-IR spectroscopy, TG-DSC analysis and BET surface area determination. The release of gentamicin was done in simulated body fluid and was evaluated using UV-VIS spectroscopy.

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