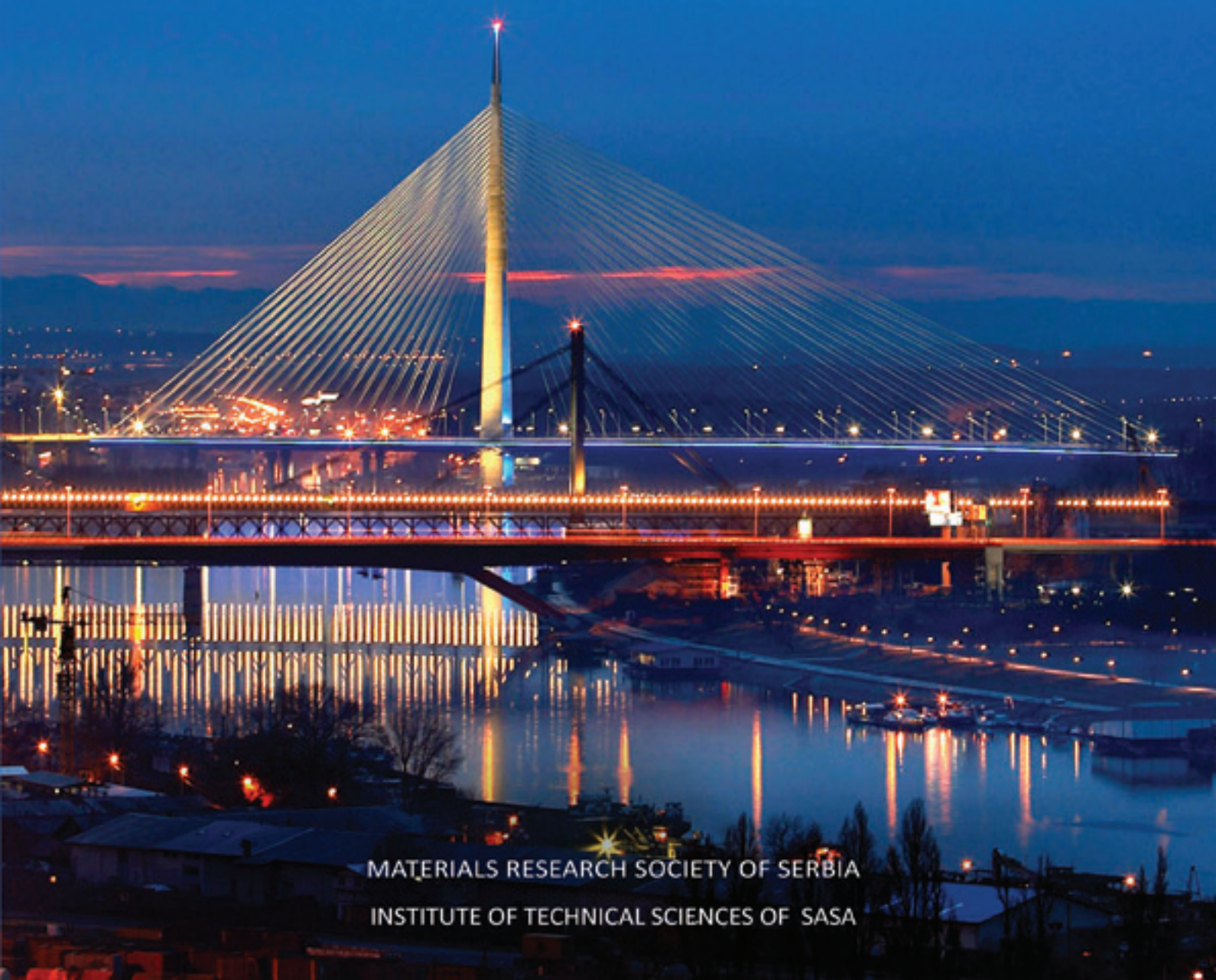
TWELFTH YOUNG RESEARCHERS' CONFERENCE
MATERIALS SCIENCE AND ENGINEERING

December 11-13, 2013, Belgrade, Serbia
Serbian Academy of Sciences and Arts, Knez Mihailova 36

PROGRAM AND THE BOOK OF ABSTRACTS



MATERIALS RESEARCH SOCIETY OF SERBIA
INSTITUTE OF TECHNICAL SCIENCES OF SASA

Twelfth Young Researchers' Conference
Materials Science and Engineering

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Program and the Book of Abstracts

Materials Research Society of Serbia
Institute of Technical Sciences of SASA

December 2013, Belgrade, Serbia

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Aim of the Conference

Main aim of the conference is to enable young researchers (post-graduate, master or doctoral student, or a PhD holder younger than 35) working in the field of materials science and engineering, to meet their colleagues and exchange experiences about their research.

Topics

Nanostructured materials
New synthesis and processing methods
Materials for high-technology applications
Biomaterials

Scientific and Organizing Committee

Results of the Conference

Beside printed «Program and the Book of Abstracts», which is disseminated to all conference participants, selected and awarded peer-reviewed papers will be published in journals "Tehnika – Novi Materijali" and "Processing and Application of Ceramics". The best presented papers, suggested by Session Chairpersons and selected by Awards Committee, will be proclaimed at the Closing Ceremony.

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Sponsors

Programme

Twelfth Young Researchers Conference
Materials Science and Engineering

Wednesday, December 11, 2013

08.30 Registration

09.00 – 10.00 Opening Ceremony of the Twelfth Young Researchers Conference – Materials Science and Engineering
Dr. Smilja Marković, President of the Programming and Organizing Committee
Prof. Dr. Dragan Uskoković, President of the Materials Research Society of Serbia
Academician Zoran Djurić, Director of the Institute of Technical Sciences of SASA
11th YRC 2012 Awards

10.00 – 11.45 1st Session –Biomaterials I
Chairpersons: Dr. Magdalena Stevanović and Nenad Filipović

10.00 – 10.15 Cytotoxicity of Ag/alginate nanocomposites: *in vitro* and *in vivo* studies
Jovana Zvicer[1], Lenart Girandon[2], Urška Potočar[2], Mirjam Fröhlich[2,5] Ivan Jančić[3], Biljana Bufan[3], Marina Milenković[3], Jasmina Stojkovska[4], Vesna Mišković-Stanković[1], Bojana Obradović[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Educell d.o.o. Ljubljana, Slovenia, [3]Department of Microbiology and Immunology, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia, [4]KreativTeh LLC, Belgrade, Serbia, [5]Department of Biochemistry, Molecular and Structural Biology, Jožef Stefan Institute, Ljubljana, Slovenia

10.15 – 10.30 Mathematical modeling of silver release from nanocomposite Ag/alginate microbeads
Danijela Kostić, Ivana Madžovska, Srdjan Vidović, Bojana Obradović
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

10.30 – 10.45 Effect of hydrogel composition on controlled release and antimicrobial activity of zinc(II) ions from zinc/poly(2-hydroxyethyl methacrylate/itaconic acid) hydrogels
Jelena D. Rusmirović, Jovanka M. Filipović, Simonida Lj. Tomić
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

10.45 – 11.00 Cellulose functionalization using atmospheric pressure dielectric barrier discharge (DBD) plasma

Ana Kramar[1], Mirjana Kostić[1], Bratislav Obradović[2], Milorad Kuraica[2]
[1]Faculty of Technology and Metallurgy, Department of Textile Engineering, University of Belgrade, Serbia, [2]Faculty of Physics, University of Belgrade, Serbia

11.00 – 11.15 Fullerenol nanoparticle in cytoprotection of antitumor drug-treated cells

Jasmina Katanić[1], Karmen Stankov[1], Nebojša Pavlović[1], Aleksandar Djordjević[2], Vesna Kojić[1], Gordana Bogdanović[1]
[1]Medical faculty of Novi Sad, University of Novi Sad, Hajduk Veljkova 3, 21000 Novi Sad, [2]Faculty of science, University of Novi Sad, Trg Dositeja Obradovića 3, 21000 Novi Sad

11.15 – 11.30 Cytotoxicity of single-walled carbon nanotubes to human lung carcinoma cells: the influence of N-acetylcysteine

Nikola Jojić[1], Vesna Kojić[2], Karmen Stankov[3], Gordana Bogdanović[2]
[1]European University-Faculty of Pharmacy, Trg Mladenaca 5, 21000 Novi Sad, [2]Department of Experimental Oncology, Oncology Institute of Vojvodina, Sremska Kamenica, [3]Medical faculty of Novi Sad, University of Novi Sad, Hajduk Veljkova 3, 21000 Novi Sad

11.30 – 11.45 Preparation and characterization of selenium nanoparticles incorporated within poly(ε-caprolactone)

Nenad Filipović[1], Magdalena Stevanović[1], Vladimir Pavlović[1,2], Dragan Uskoković[1]
[1]Institute of Technical Sciences of SASA, Knez Mihailova 35/IV, Belgrade 11000, Serbia, [2]Faculty of Agriculture, University of Belgrade, Nemanjina 6, Belgrade 11080, Serbia

11.45 – 12.15 Break

12.15 – 14.00 2nd Session –Biomaterials II

Chairpersons: Prof. Dr. Bojana Obradović and Nenad Petrović

12.15 – 12.30 Biomaterials and their application in preprosthetic surgical procedure

Zorica Ajduković[1], Nadica Djordjević[2], Nenad Petrović[1], Nenad Ignjatović[3], Dragana Kenić Marinković[1], Dragan Uskoković[3]
[1]University of Niš, Faculty of Medicine, Clinic of Dentistry, Department of Prosthodontics, Niš, Serbia, [2]University of Priština temporarily seated in Kosovska Mitrovica, Clinic of Dentistry, Department of Prosthodontics, Kosovska Mitrovica, Serbia, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia

12.30 – 12.45 Effects of post-polymerization treatments on the mechanical properties of a denture base resin

Dušan Petković[1], Milena Kostić[2], Miodrag Manić[1], Nebojša Krunić[2,3]
[1]Faculty of Mechanical Engineering, University of Niš, Aleksandra Medvedeva 14 Niš, Serbia, [2]Clinic of Dentistry, Department of Prosthodontics, Bul. dr Zorana Djindjića 52, Niš, *Serbia, [3]Faculty of Medicine, University of Niš, Bul. dr Zorana Djindjića 81*, Niš, *Serbia*

12.45 – 13.00 A comparative study of dissolution behavior of bioactive glass ceramics in SBF-K9 and r-SBF

Muhammad Usman Hashmi[1], Saqlain Abbas Shah[2]
[1]*Department of Applied Sciences, Superior University Lahore 54000, Pakistan*
[2]*Physics Department, F. C. College University, Lahore 54000, Pakistan*

13.00 – 13.15 Pectin and poly(ethylene glycol) based films: mechanical and structural properties

Sanja Šešlija[1], Aleksandra Nešić[2], Roberto Avolio[3], Maria Errico[3], Mario Malinconico[3], Sava Veličković[4]
[1]*Innovation Centre of the Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia,* [2]*Vinča Institute for Nuclear Sciences, University of Belgrade, Belgrade, Serbia,* [3]*Institute on Polymer Chemistry and Technology, Pozzuoli (Na), Italy,* [4]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*

13.15 – 13.30 Effect of starch gels preparation on the supercritical impregnation of Thymol

Stoja Milovanović, Jasna Ivanović, Irena Zizović
University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Belgrade, Serbia

13.30. – 13.45 Partial characterization of levan from *Brachybacterium sp.* CH-KOV3

Aleksandra Djurić[1], Branka Kekez[1], Jovana Stefanović-Kojić [1], Dragica Jakovljević[2], Gordana Gojgić-Cvijović[2], Ljubiša Ignjatović[3],Vladimir P. Beškoski[1,2], Miroslav M. Vrvić[1,2]
[1]*Faculty of Chemistry, University of Belgrade, Serbia,* [2]*Centre for Chemistry-Institute for Chemistry, Technology and Metallurgy, University of Belgrade,* [3]*Faculty of Physical Chemistry, University of Belgrade, Serbia*

13.45 – 14.00 Microbial polysaccharides as a prospective base for new materials

Branka Kekez[1], Marija Lješević[1], Aleksandra Djurić[1], Jovana Stefanović Kojić[2], Dragica Jakovljević[2], Gordana Gojgić-Cvijović[2] , Vladimir P. Beškoski[1,2], M.M. Vrvić
[1]*Faculty of Chemistry, University of Belgrade, Serbia,* [2]*Centre for Chemistry-Institute for Chemistry, Technology and Metallurgy, University of Belgrade, Serbia*

14.00 – 15.15 Lunch break with refreshments

15.15 – 17.15 3rd Session – Nanomaterials I: Synthesis and Characterization

Chairpersons: Dr. Smilja Marković, Prof. Dr. Nebojša Mitrović and Jelena Zagorac

15.15 – 15.30 Synthesis and characterization of cesium aluminosilicate phases from LTA zeolites as a precursor

Mia Omerašević[1], Maria Čebela[1], Andrija Savić[2], Vesna Maksimović[1], Nikola Vuković[4] , Slavko Mentus[3], Ana Radosavljević-Mihajlović[1]

[1]Laboratory for Material Science, Institute of Nuclear Sciences ″Vinča″, University of Belgrade, Belgrade, Serbia, [2]Laboratory of Chemical Dynamics and Permanent Education, Institute of Nuclear Sciences Vinča″, University of Belgrade, Belgrade, Serbia, [3]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia, [4]Faculty of Mining and Geology, University of Belgrade, Djušina 7, Belgrade, Serbia

15.30 – 15.45 Investigation of the yttrium doped $CaMnO_3$ nanopowders

Jelena Zagorac[1], Aleksandra Zarubica[2], Ana Radosavljević-Mihajlović[1], Dejan Zagorac[3], Branko Matović[1]

[1]Institute of Nuclear Sciences Vinča, Materials Science Laboratory, Belgrade University, Belgrade, Serbia, [2]Department of Chemistry, University of Niš, Niš, Serbia, 3Max Planck Institute for Solid State Research, Stuttgart, Germany

15.45 – 16.00 Synthesis and characterization of $BiFeO_3$ nanopowder

Maria Čebela[1], Radmila Hercigonja[2], Marija Prekajski[1], Mia Omerašević[1] and Branko Matović[1]

[1]Laboratory for Material Science, Institute of Nuclear Sciences ″Vinča″, University of Belgrade, Belgrade, Serbia, [2]Faculty of Physical Chemistry, University of Belgrade, Studentski trg 12-16, 11158 Belgrade 118, P.O. Box 47, Serbia

16.00 – 16.15 Synthesis of fine-dispersed chromium carbide powder using carbon nanofibers

Kseniya D. Dyukova, Ju.L. Krutskii, A.G. Bannov

Novosibirsk State Technical University, Pr. K. Marx 20, Novosibirsk 630092, Russia

16.15 – 16.30 Oxidation dynamics of the graphite during the graphite oxide synthesis

Alexander G. Bannov, Anastasia A. Timofeeva

Department of Chemistry and Chemical Technology, Novosibirsk State Technical University, Pr. K. Marx 20, Novosibirsk, 630092, Russia

16.30 – 16.45 The influence of mechanicall activation on the structure of ZnO

Adriana Peleš[1], Suzana Filipović[1], Vera P. Pavlović[2], Miodrag Mitrić[3], Nina Obradović[1], Vladimir B. Pavlović[1]

[1]Institute of Technical Sciences of SASA, Knez Mihailova 35/IV 11000 Belgrade, Serbia, [2]Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia, [3]Institute of Nuclear Sciences Vinca, Laboratory of Solid State Physics, 11001 Belgrade, Serbia

16.45 – 17.00 Synthesis and characterization of nanocomposite hyderogels based on poly(methacrylic acid) and SiO_2

Pavle Spasojević[1], Vesna Panić[1], Tijana Radoman[1], Enis Džunuzović[2], Sava Veličković[2]

[1]Innovation Centre of Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

17.00 – 17.15 High energy co-milling - method of polymer-based composite fillers synthesis
Teodora Sikora, Krystyna Wieczorek-Ciurowa
Cracow University of Technology, Faculty of Chemical Engineering and Technology, 24 Warszawska Str., 31-155 Cracow, Poland

17.15 – 17.30 Break

17.30 – 18.45 4th Session – Nanomaterials II: Catalysts
Chairpersons: Prof. Dr. Nebojša Mitrović, Erik Ortel and Ana Stanković

17.30 – 17.45 Photocatalytic and sonocatalytic degradation procedures of methylene blue dye using a ZnO nanostructured powders
Ana Stanković, Smilja Marković, Dragan Uskoković
Institute of Technical Sciences of SASA, Centre for Fine Particles Processing and Nanotechnologies, Knez Mihailovia 35/IV, Belgrade, Serbia

17.45 – 18.00 Design strategies for hydrogenation catalysts using colloidal and template-based synthesis routes
Erik Ortel, D. Bernsmeier, B. Paul, R. Kraehnert
Technische Universität Berlin, Berlin, Germany

18.00 – 18.15 Experimental and theoretical studies on photocatalytic degradation of metoprolol in the presence of electron acceptors
Sanja J. Armaković[1], Stevan Armaković[2], Jovan P. Šetrajčić[2], Biljana F. Abramović[1]
[1]*University of Novi Sad, Department of Chemistry, Biochemistry and Environmental Protection, Faculty of Sciences, Trg D. Obradovića 3, 21000 Novi Sad, Serbia,*
[2]*University of Novi Sad, Department of Physics, Faculty of Sciences, Trg D. Obradovića 4, 21000 Novi Sad, Serbia*

18.15 – 18.30 The influence of poly-4-vinylpyridine-co-divinylbenzene-Co^{2+} catalyst on the reaction pathways of the Bray-Liebhafsky reaction
Ana Stanojević[1], Jelena Maksimović[1], Željko Čupić[2], Ljiljana Kolar-Anić[1,2], Slobodan Anić[2]
[1]*Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia*
[2]*Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Department of Catalysis and Chemical Engineering, Belgrade, Serbia*

18.30 – 18.45 Influence of Fe and ZrO_2 presence in mechanochemically synthesized perovskite ceramics on its dielectric properties
Piotr Dulian [1], W. Bąk [2], Cz. Kajtoch [2], K. Wieczorek-Ciurowa[1]
[1]*Faculty of Chemical Engineering and Technology, Cracow University of Technology, 24, Warszawska Str., 31-155 Cracow, Poland,* [2]*Institute of Physics, Pedagogical University, 2, Podchorążych Str., 30-084 Cracow, Poland*

Thursday, December 12, 2013

09.00 – 10.30 5th Session – Theoretical Modelling of Materials I

Chairpersons: Dr. Boban Stojanović and Dr. Dejan Zagorac

09.00 – 09.15 Computational studies on advanced materials from bulk crystals to nanoscale structures

Dejan Zagorac[1,3], T. Milek[1], D. Zahn[1], J.C. Schön[2], M. Jansen[2], J. Zagorac[3], B. Matović[3]

[1]Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany
[2]Max Planck Institute for Solid State Research, Stuttgart, Germany
[3]Institute of Nuclear Sciences Vinča, Materials Science Laboratory, Belgrade University, Belgrade, Serbia

09.15 – 09.30 Computational methods for muscle modeling at the molecular level

Djordje Nedić[1], Marina Svičević[1], Boban Stojanović[1], Srboljub Mijailović[2]

[1]Faculty of Science, University of Kragujevac, Radoja Domanovića 12, 34000 Kragujevac, Serbia, [2]Northeastern University, Boston, USA

09.30 – 09.45 Verification of thermo-mechanical coupling implemented in software PAK Multiphysics on the example of radiofrequency ablation

Milan Blagojević, Miroslav Živković

University of Kragujevac, Faculty of Engineering, Sestre Janjić 6, Kragujevac, Serbia

09.45 – 10.00 Verification of electro-mechanical coupling implemented in software PAK Multiphysics on the example of piezoelectric transducers

Milan Blagojević[1], Miroslav Živković[1]

University of Kragujevac, Faculty of Engineering, Sestre Janjić 6, Kragujevac, Serbia

10.00 – 10.15 Integrity of the pipelines transporting oil and gas

Alfred Hasanaj

Department of Mechanical Engineering, Polytechnic University of Tirana, Albania

10.15 – 10.30 Determining the stress and strain distribution on complex mechanical structures using the strain gauges measurements

Mirjana Prvulović[1,3], Mileta Ristivojević[2] , Zlatan Milutinović[1]

[1]Institute Gosa, Milana Rakica 35, 11000 Belgrade, Serbia, [2]University of Belgrade, The Faculty of Mechanical Engineering, Kraljice Marije 16, 11120 Belgrade, Serbia, [3]Termoinzenjering, Ulica Oslobodjenja br. 39, 26000 Pancevo, Serbia

10.30 - 11.00 Break

11.00 – 12.45 6th Session – Theoretical Modelling of Materials II

Chairpersons: Dr. Željka Nikitović and Siniša Vučenović

11.00 – 11.15 Spin arrangements in quasi one-dimensional systems
Marko Milivojević, Nataša Lazić and Milan Damnjanović
NanoLab, Faculty of Physics, University of Belgrade, Studentski trg 12, 11000 Belgrade, Serbia

11.15 – 11.30 Advanced computational methodologies for modeling realistic polycrystalline magnetic films and devices
Marko V. Lubarda
Faculty of Polytechnics, University of Donja Gorica, 81000 Podgorica, Montenegro

11.30 – 11.45 Optimisation of *a-GaN/AlGaN* Bragg confined structures for frequency up-conversion relevant for GaAs-based solar cells
Slobodan Čičić, Jelena Radovanović, Vitomir Milanović
School of Electrical Engineering, University of Belgrade, Bulevar kralja Aleksandra 73, 11200 Belgrade, Serbia

11.45 – 12.00 Optical and aromaticity properties of sumanene modified with boron and nitrogen atoms; a DFT study
Stevan Armaković[1], Sanja J. Armaković[2], Igor J. Šetrajčić[1], Jovan P. Šetrajčić[1]
[1]University of Novi Sad, Faculty of Sciences, Department of Physics, Trg D. Obradovića 4, 21000 Novi Sad, Serbia, [2]University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Trg D. Obradovića 3, 21000 Novi Sad, Serbia

12.00 – 12.15 Modeling buckybowls with semi-empirical levels of theory
Stevan Armaković[1], Sanja J. Armaković[2], Taina Grujić[1], Jovan P. Šetrajčić[1]
[1]University of Novi Sad, Faculty of Sciences, Department of Physics, Trg D. Obradovića 4, 21000 Novi Sad, Serbia, [2]University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Trg D. Obradovića 3, 21000 Novi Sad, Serbia

12.15 – 12.30 Finite element solution of one-dimensional Stefan problem
Marina Svičević, Miloš Ivanović
Faculty of Science, University of Kragujevac, Radoja Domanovića 12, 34000 Kragujevac, Serbia

12.30 – 12.45 Ellipsometric data analysis and calculation of ellipsometric parameters of complex materials
Danka Stojanović[1,2], Jelena Radovanović[2], Vitomir Milanović[2], Zlatko Rakočević[1]
[1]Vinča Institute of Nuclear Sciences, Laboratory of Atomic Physics, University of Belgrade, Mike Alasa 12-14, Belgrade, Serbia, [2]School of electrical engineering, University of Belgrade, Bulevar kralja Aleksandra 73, Belgrade, Serbia

12.45 – 14.30 Lunch break with refreshments

14.30 – 16.00 7th Session – Metallurgy and Corrosion of Materials

Chairpersons: Dr. Irena Nikolić and Ionuţ Constantin

14.30 – 14.45 Strength and durability of bauxite based geopolymers
Jasmina Krivokapić[1], I. Janković-Častvan[2], Vuk V. Radmilović[2], Irena Nikolić[1]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Džordža Vašingtona bb, 81000 Podgorica Montenegro, [2]University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11120 Belgrade, Serbia

14.45 – 15.00 Anticorrosive Zn-Ni-P coatings electrodeposited on steel parts from sulfate baths
Ionuţ Constantin[1], Petru Moldovan[2]
[1]National R&D Institute for Nonferrous and Rare Metals – IMNR, 102 Biruinţei Blvd., Pantelimon, Ilfov County, C.P. 077145, [2]Polytechnic University of Bucharest, 313 Splaiul Independenţei, district 6, Bucharest, Romania, C.P. 060032

15.00 – 15.15 Investigation of Al-5083 alloy obtained by mechanical alloying
Vasile Soare, Marian Burada, Dumitru Mitrică, Ionuţ Constantin, Daniela Violeta Dumitrescu
National R&D Institute for Nonferrous and Rare Metals – IMNR, 102 Biruinţei Blvd., Pantelimon, Ilfov County, Romania, C.P. 077145

15.15 – 15.30 Experimental and theoretically investigation of the Ag-Ga-Sn phase diagram
Ljiljana Nedeljković[1] and Milena Premović[1]
[1]University in Priština, Faculty of Technical Science, Knjaza Miloša 7, 38220 Kosovska Mitrovica, Serbia

15.30 – 15.45 Al-Pb composite formation by low-frequency oscillations of its melts
Aleksey Dolmatov, Igor Ignat'ev, Edward Pastukhov
Institute of Metallurgy UB RAS, Yekaterinburg, Russia

15.45 – 16.00 Use of quartz crystal microbalance (QCM) measurements to investigate novel top-of-the-line corrosion (TLC) mitigation method
Ivana Jevremović[1], Feranando Farelas[2], Marc Singer[2], Srdjan Nešić[2], Vesna Mišković-Stanković[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia; [2]Institute for Corrosion and Multiphase Technology, Ohio University, Athens, OH, USA

16.00 – 16.15 Break

16.15 – 19.00 8th Session – Polymer Science

Chairpersons: Prof. Dr. Gordana Ćirić-Marjanović, Dr. Branka Hadžić and Rafał Poręba

16.15 – 16.30 The influence of the polybutadiene isomer to the structure of the triblock-copolymer SBM
Aleksandar P. Stajčić, Dragutin M. Nedeljković, Aleksandar S. Grujić, Lana S. Putić, Jasna T. Stajić-Trošić
University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoševa 12, 11000 Belgrade, Serbia

16.30 – 16.45 The preparation of elastomeric poly(lactide) nanocomposite thin films
Aleksandra Miletić[1], Branka Pilić[1], Ivan Ristić[1], Suzana Cakić[2], Nemanja Martić[1], Djordjije Tripković[1]
[1]University of Novi Sad, Faculty of Technology, Novi Sad, Serbia,
[2]University of Niš, Faculty of Technology, Leskovac, Serbia

16.45 – 17.00 Curing of epoxy resins modified with thermoplastic polycarbonate-based polyurethane elastomers
Vesna Teofilović[1], Jelena Pavličević[1], Mirjana Jovičić[1], Oskar Bera[1], Milena Špírková[2], Radmila Radičević[1]
[1]University of Novi Sad, Faculty of Technology, Novi Sad, Serbia, [2]Institute of Macromolecular Chemistry AS CR v.v.i., Prague, Czech Republic

17.00 – 17.15 Influence of pH values on synthesis of PMAA-graft-starch copolymers
Vladimir Nikolić[1], Sava Veličković[2], Aleksandar Popović[3]
[1]Innovation Center, Faculty of Chemistry, University of Belgrade, Studentski trg 12-16, 11000 Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia, [3]Faculty of Chemistry, University of Belgrade, Studentski trg 12-16, 11000 Belgrade, Serbia

17.15 – 17.30 Preparation and characterization of waterborne polyurethane dispersions and films
Rafał Poręba, Magdalena Serkis and Milena Špírková
Institute of Macromolecular Chemistry AS CR, v.v.i., Heyrovskeho nam. 2, 162 06 Prague 6, Czech Republic

17.30 – 17.45 Synthesis and application of novel copolymer of methacrylic acid and 2-acrylamido-2-methylpropane sulfonic acid
Aleksandra Nešić[1], Sava Veličković[2], Dušan Antonović[2], Antonije Onjia[1]
[1]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade
[2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade

17.45 – 18.00 Break

18.00 – 18.15 Optical properties of CdTe/ZnTe self-assembled quantum dots
Martina Gilić[1], N. Romčević[1], M. Romčević[1], J. Trajić[1], D. Stojanović[1], R. Kostić[1], W.D. Dobrowolski[2], G. Karczewski[2] and R. Galazka[2]
[1]Institute of Physics, University of Belgrade, 11080 Belgrade, Serbia
[2]Institute of Physiscs, Polish Academy of Science, 02-668 Warsaw, Poland

18.15 – 18.30 Optical properties of $Cd_{1-x}Mn_xS$ nanoparticles
Milica Petrović[1], M. Romčević[1], N. Romčević[1], W.D. Dobrowolski[2], M. Čomor[3]
[1]Institute of Physics, University of Belgrade, 11080, Serbia, [2]Institute of Physics PAS, Warsaw, 02-668, Poland, [3]Institute Vinča, University of Belgrade, 11000, Serbia

18.30 – 18.45 Raman scattering study of $K_xCo_{2-y}Se_2$
Marko Opačić[1], N. Lazarević[1], M. Radonjić[2], M. Šćepanović[1], Hechang Lei[3], D. Tanasković[2], C. Petrović[3], Z.V. Popović[1]
[1]Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia, [2]Scientific Computing Laboratory, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia, [3]Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, New York 11973-5000, USA

18.45 – 19.00 Surface states of the topological crystalline insulator $Pb_{0.4}Sn_{0.6}Te$
Shiva Safaei, P. Kacman, R. Buczko
Institute of Physics PAS, al. Lotników 32/46, 02-668 Warsaw, Poland

Friday, December 13, 2013

09.00 – 11.00 9th Session – Electrochemistry and Magnetic Materials

Chairpersons: Dr. Dragana Jugović and Miloš Milović

09.00 – 09.15 Electrochemical intercalation of lithium in $Li_4T_{i5}O_{12}$ /C composite with different percentage of carbon
Aleksandra Lilić
Faculty of Physical Chemistry, Belgrade University, Studentski trg 12-16, 11158 Belgrade, Serbia

09.15 – 09.30 Sol-gel synthesis of Li_2FeSiO_4/C
Miloš Milović[1], Dragana Jugović[1], Miodrag Mitrić[2], Bojan Jokić[3], Robert Dominko[4], Dragan Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [4]Laboratory for Materials Electrochemistry, National Institute of Chemistry, Ljubljana, Slovenia

09.30 – 09.45 Nafion membrane humidity monitoring and fault detection in PEMFC
Mila N. Krstajić[1], Vladimir Yufit[2], Nigel P. Brandon[2]
[1]Institute of Chemistry, Technology and Metallurgy, Department of Electrochemistry, University of Belgrade, Njegoseva 12, 11000 Belgrade, Serbia, [2]Faculty of Engineering, Department of Earth Science and Engineering, Imperial College London, South Kensington Campus, London SW7 2AZ, United Kingdom

09.45 – 10.00 Formation of Silver Nanoparticles in Poly(vinyl alcohol) Solution by Electrochemical Synthesis
Rade Surudžić, Željka Jovanović, Vesna Mišković-Stanković
Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade

10.00 – 10.15 Freeze-drying method for $LiFePO_4$/C composite processing
Maja Kuzmanović[1], Dragana Jugović[1], Miodrag Mitrić[2], Bojan Jokić[3], Nikola Cvjetićanin[4], and Dragan Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]The Vinča Institute of Nuclear Science, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [4]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

10.15 – 10.30 Spin glass like behaviour of magnetite nanoparticle system obtained by thermal decomposition of acetylacetonate precursor
Violeta Nikolić, Vojislav Spasojević, Vladan Kusigerski, Marija Perović, Ana Mraković, Marko Bosković, Jovan Blanuša
The Vinča Institute, Condensed Matter Physics Laboratory, University of Belgrade, P.O. Box 522, 11001 Belgrade, Serbia

10.30 – 10.45 Nanostructured materials with magnetic properties in stable colloidal form
Claudia Nadejde[1], Maria Andries[1], Emil Puscasu[1], Gabriel Oanca[1], Laura Ursu[2]
[1]"Alexandru Ioan Cuza" University, Physics Faculty, Iasi, Romania
[2]"Petru Poni" Macromolecular Chemistry Institute, Iasi, Romania

10.45 – 11.00 Magnetic and magnetotransport behavior of $Ge_{1-x-y}Pb_xMn_yTe$ nanocomposite crystals
Arkadiusz Podgórni[1], L. Kilański[1], W. Dobrowolski[1], V. Domukhovski[1], A. Reszka[1], B.J. Kowalski[1], B. Brodowska[1], V.E. Slynko[2], E.I. Slynko[2]
[1]Institute of Physics, Polish Academy of Sciences, Warsaw, Poland
[2]Institute of Materials Science Problems, UAS, Chernovtsy, Ukraine

11.00 - 11.15 Break

11.15 – 13.20 10th Session – Sintering of Materials

Chairpersons: Dr. Djordje Veljović and Miodrag Lukić

11.15 – 11.30 DSC-TG-MS study of hydroxyapatite nanopowders
Miodrag J. Lukić[1], Ljiljana Veselinović[1], Srečo Davor Škapin[2], Marjeta Maček-Kržmanc[2], Smilja Marković[1], Dragan Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Jožef Stefan Institute, Ljubljana, Slovenia

11.30 – 11.45 Hydroxylapatite synthesis and low temperature sintering methods
Miljana Mirković, Vesna Maksimović, Branko Matović and Anja Došen
Vinča Institute of Nuclear Sciences, University of Belgrade, Serbia

11.45 – 12.00 Structural, morphological and electrical properties of sintered Fe_2O_3/TiO_2 nanopowder mixtures
Zorka Z. Djurić[1], Obrad S. Aleksić[2], Maria V. Nikolić[2]
[1]Institute of Technical Sciences of SASA, Knez Mihailova 35, Belgrade, Serbia
[2]Institute for Multidisciplinary Research, University of Belgrade, Kneza Viseslava 1, 11000 Belgrade, Serbia

12.00 – 12.15 Comparation of mechanical behaviour of SiC sintered specimen to analysis of surface defects

Nataša Z. Tomić, Marija M. Dimitrijević, Bojan I. Medjo, Marko P. Rakin, Radmila M. Jančić – Heinemann, Radoslav R. Aleksić
University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11120 Belgrade, Serbia

12.15 – 12.30 The influence of the sol-gel method of powder synthesis to the properties of cordierite ceramics

Vladimir Topalović, Djordje Veljović, Snežana Grujić, Djordje Janaćković, Rada Petrović
Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11120 Belgrade, Serbia

12.30 – 13.00 Testing concepts in nano mechanics

Krish Narain
Agilent Technologies UK Ltd, Stevenage, United Kingdom

13.00 - 14.30 Lunch break with refreshments

14.30 – 16.15 11th Session – Environmental Science

Chairmen: Prof. Dr. Bojana Obradović and Dr. Smilja Marković

14.30 – 14.45 Novel membrane adsorbers incorporating cross-linked poly(glycidyl methacrylate-*co*-2-acrylamido-2-methylpropane sulfonic acid)

Tanja Tomković[1], Filip Radovanović[1], Aleksandra Nastasović[1], Dana Vasiljević-Radović[1], Antonije Onjia[2]
[1]University of Belgrade, Institute for Chemistry, Technology and Metallurgy, Njegoševa 12, Belgrade, [2]University of Belgrade, Vinča Institute of Nuclear Sciences, P.O. Box 522, Belgrade

14.45 – 15.00 Molybdenum sorption by porous copolymer

Bojana M. Ekmeščić[1], Danijela D. Maksin[2], Jelena P. Marković[2], Z.M. Vuković[3], Antonije E. Onjia[2], Aleksandra B. Nastasović[1]
[1]University of Belgrade, Institute of Chemistry Technology and Metallurgy, Department of Chemistry, Njegoševa 12, Belgrade, [2]University of Belgrade, Vinča Institute of Nuclear Sciences, P.O. Box 522, Belgrade, [3]University of Belgrade, Institute of Chemistry Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Njegoševa 12, Belgrade

15.00 – 15.15 Pectin as biosorbent for the removal of copper ions from aqueous salt solutions

Sanja Šešlija[1], Goran Zebić[2], Sava Veličković[3]
[1]Innovation Centre of the Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Institute of Chemistry, Technology and Metallurgy, Department of Ecology and Technoeconomics, Belgrade, Serbia,[3]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

15.15 – 15.30 Research of application possibilities of different sorption materials for Cu (II) removal from aqueous solutions
Marija Petrović, Jelena Milojković, Marija Mihajlović, Tatjana Šoštarić, Zorica Lopičić, Jelena Petrović, Mirjana Stojanović
Institute for Technology of Nuclear and Other Mineral Raw Materials ITNMS, Franchet d'Esperey St, 11 000 Belgrade, Serbia

15.30 – 15.45 Biosorption efficiency of Cu (II) ions from aqueous solution by corn cob
Marija Petrović, Tatjana Šoštarić, Jelena Milojković, Marija Mihajlović, Jelena Petrović, Mirjana Stojanović
Institute for Technology of Nuclear and Other Mineral Raw Materials ITNMS, Franchet d'Esperey St, 11 000 Belgrade, Serbia

15.45 – 16.00 Asymmetric hydrogel membranes for heavy metal adsorption
Aleksandar Stajčić[1], Filip Radovanović[1], Aleksandra Nastasović[1], Jasna Stajić-Trošić[1], Jelena Marković[2], Antonije Onjia[2]
[1]University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoševa 12, 11000 Belgrade, Serbia, [2]University of Belgrade, Vinča Institute of Nuclear Sciences, P.O. Box 522, 11000 Belgrade, Serbia

16.00 – 16.15 Removal of model heavy metal ions (Ni^{2+}) by hybrid hydrogels based on poly(methacrylic acid) and casein
Vesna Panić[1], Pavle Spasojević[1], Mihajlo Jović[2], Sava Veličković[3]
[1]Innovation Centre of Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

16.15 - 16.30 Break

16.30 – 18.00 12th Session – Various Problems in Materials Science

Chairpersons: Dr. Edin Suljovrujić and Mihael Bučko

16.30 – 16.45 Laser assembling of thin bioceramic and biocomposite films on titanium utilizing Pulsed laser deposition (PLC) and Matrix-assisted pulsed laser evaporation (MAPLE) techniques
Sanja Eraković[1], Ana Janković[1], Carmen Ristoscu[2], Liviu Duta[2], Natalia Serban[2], Anita Visan[2], George E. Stan[3], Catalin Luculescu[2], Djordje Janacković[1], Ion N. Mihailescu[2], Vesna Mišković-Stanković[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]National Institute for Lasers, Plasma and Radiation Physics, Magurele, Ilfov, Romania, [3]National Institute of Materials Physics, Bucharest – Magurele, Romania

16.45 – 17.00 Magnetic and optical properties of the nickel thin film deposited by GLAD technique
Jelena Potočnik, Miloš Nenadović, Zlatko Rakočević
Institute of Nuclear Science Vinča, Laboratory of Atomic Physics, University of Belgrade, Mike Alasa 12-14, 11001 Belgrade Serbia

17.00 – 17.15 The cataphoretic deposition of epoxy coating on Zn–Mn alloy substrate
Mihael Bučko[1], Vesna Mišković-Stanković[2], J. B. Bajat[2]
[1]Military Academy, University of Defence, Pavla Jurišića Šturma Street 33, Belgrade, Serbia [2]Faculty of Technology and Metallurgy, University of Belgrade, P.O.Box 3503, YU-11120 Belgrade, Serbia

17.15 – 17.30 Core-shell fibers for compsite materials with self-healing ability
Ivana Radović, Vesna Radojević, Petar S. Uskoković, Dušica B. Stojanović, Aleksandar Kojović and Radoslav Aleksić
University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

17.30 – 17.45 Effect of diamond paste finishing on AFM surface texture parameters of dental nanofilled and nanohybrid composites polished by two different procedures
Tijana Lainović[1], Larisa Blažić[1,2], Marko Vilotić[3], Dragan Kukuruzović[3], Damir Kakaš[3]
[1]Faculty of Medicine, School of Dentistry, University of Novi Sad, Novi Sad, Serbia, [2]Clinic of Dentistry of Vojvodina, Novi Sad, Serbia, [3]Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia

17.45 – 18.00 Dependence of high density polyethylene XPS spectrum on electron flood gun parameters
Danilo Kisić, Maja Popović, Zlatko Rakočević
University of Belgrade, "Vinča" Institute of Nuclear Sciences, Laboratory of Atomic Physics, Mike Petrovića Alasa 12-14, Belgrade, Serbia

18.00 Closing Ceremony

I/1

Cytotoxicity of Ag/alginate nanocomposites: *in vitro* and *in vivo* studies

Jovana Zvicer[1], Lenart Girandon[2], Urška Potočar[2], Mirjam Fröhlich[2,5], Ivan Jančić[3], Biljana Bufan[3], Marina Milenković[3], Jasmina Stojkovska[4], Vesna Mišković-Stanković[1], Bojana Obradović[1]

[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Educell d.o.o. Ljubljana, Slovenia, [3]Department of Microbiology and Immunology, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia, [4]KreativTeh LLC, Belgrade, Serbia, [5]Department of Biochemistry, Molecular and Structural Biology, Jožef Stefan Institute, Ljubljana, Slovenia

In this study we have investigated cytotoxicity of novel nanocomposites based on alginate with silver nanoparticles (AgNPs) in forms of colloid solutions and dry films using two in vitro techniques (extraction and contact test) at two different cell types, namely cell line L929 and human Adipose-derived Stem Cells (hASCs). Furthermore, the same colloid solution was investigated for wound treatment in a rat burn model. Results have indicated optimal non-cytotoxic AgNP concentrations, positive effects of Ag/alginate nanocomposites in wound healing and confirmed higher sensitivity of cells in monolayer cultures as compared to in vivo conditions.

I/2

Mathematical modeling of silver release from nanocomposite Ag/alginate microbeads

Danijela Kostić, Ivana Madžovska, Srdjan Vidović, Bojana Obradović

Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

Novel nanocomposite alginate microbeads with incorporated, electrochemically synthesized silver nanoparticles (AgNPs) were developed recently with the aim to steadily release AgNPs and/or ions and induce antimicrobial activity. In this work, we have studied the silver release kinetics in water in 3 different systems: static dishes, shaken flasks (125 rpm) and packed bed bioreactors (0.4 ml/min perfusion flowrate). The first two systems were shown to be diffusion limited with the AgNP diffusion coefficient of ~10^{-17} m^2/s. However, in the packed bed bioreactor the influence of convective mass transport was evident inducing the increase in the apparent diffusion coefficient to ~10^{-14} m^2/s.

I/3

Effect of hydrogel composition on controlled release and antimicrobial activity of zinc(II) ions from zinc/poly(2-hydroxyethyl methacrylate/itaconic acid) hydrogels

Jelena D. Rusmirović, Jovanka M. Filipović, Simonida Lj. Tomić

Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

The aim of our work was to study the controlled release of zinc(II) ions from zinc/poly(2-hydroxyethyl methacrylate/itaconic acid) (Zn/P(HEMA/IA)) hydrogels and their antimicrobial activity. The P(HEMA/IA) samples, with different HEMA/IA ratio, were prepared by free radical polymerization/crosslinking. Zn/P(HEMA/IA) hydrogels were formed by immersing dried gel disks in zinc(II) salt solution. The *in vitro* controlled release of zinc(II) ions from (Zn/P(HEMA/IA)) gels, and antimicrobial activity during the release period were studied. The release profiles have shown a two-phase exponential profile, with fast initial phase, followed by a much slower release rate. Kinetic parameters determined, have indicated Fickian transport of Zn(II) ions for the initial phase. It is perceived that the antimicrobial activity of the Zn/P(HEMA/IA) depends on IA content, and the release time. The obtained results for Zn/P(HEMA/IA) hydrogels indicate their good potential for a wide variety of biomedical applications because zinc ions play a key role in body processes such as building DNA and RNA, producing energy, regulating the immune system, and cell metabolism..

Acknowledgement: This work has been supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grants No 172026 and 172062).

I/4

Cellulose functionalization using atmospheric pressure dielectric barrier discharge (DBD) plasma

Ana Kramar[1], Mirjana Kostić[1], Bratislav Obradović[2], Milorad Kuraica[2]

[1]Faculty of Technology and Metallurgy, Department of Textile Engineering, University of Belgrade, Serbia, [2]Faculty of Physics, University of Belgrade, Serbia

This work presents a study on cellulose functionalization using DBD plasma generated in different gasses. DBD functionalized cellulose was treated with metal ions to impart antimicrobial effect. SEM/EDX, ICP-OES and various laboratory methods were used to assess the surface changes and durability of the achieved treatment effects. Antimicrobial effect was investigated using agar diffusion test. Results showed that sorption and antimicrobial properties of cellulose are depending on gas used in DBD, and aging effect which occurs due to post-plasma reactions on the material surface.

I/5

Fullerenol nanoparticle in cytoprotection of antitumor drug-treated cells

Jasmina Katanić[1], Karmen Stankov[1], Nebojša Pavlović[1],
Aleksandar Djordjević[2], Vesna Kojić[1], Gordana Bogdanović[1]

[1]Medical Faculty of Novi Sad, University of Novi Sad, Hajduk Veljkova 3, 21000 Novi Sad
[2]Faculty of Science, University of Novi Sad, Trg Dositeja Obradovića 3, 21000 Novi Sad

The main cause of the toxic effects of broadly used antitumor drugs doxorubicin (DOX) is the reactive oxygen species (ROS) generation during the DOX metabolism. The aim of our study was to investigate the possible role of fullerenol nanoparticle (FNP) in cytoprotection of antitumor drugs-treated normal (CHO) and malignant (K562) cells. We analysed the cell vitality in cells pre-treated by FNP and N-acetylcysteine (NAC) 30 minutes prior to treatment by DOX. According to our results we may conclude that FNP and NAC exert the cytoprotective activity in both cell lines treated by DOX.

I/6

Cytotoxicity of single-walled carbon nanotubes to human lung carcinoma cells: the influence of N-acetylcysteine

Nikola Jojić[1], Vesna Kojić[2], Karmen Stankov[3], Gordana Bogdanović[2]

[1]European University-Faculty of Pharmacy, Trg Mladenaca 5, 21000 Novi Sad
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[3]Medical faculty of Novi Sad, University of Novi Sad, Hajduk Veljkova 3, 21000 Novi Sad

Single-walled carbon nanotubes (SWCNTs) have been reported to induce cytotoxicity in different cells. Although mechanisms underlying cytotoxicity are not fully understood, ROS accumulation and oxidative damage is considered to be the most plausible route. Human lung carcinoma cells (A549) and human fetal lung fibroblast cells (MRC-5) were used to assess SWCNT cytotoxicity using the MTT assay, in combination with an antioxidant, GSH precursor N-acetyl-L-cysteine (NAC). At ≤250μg/ml, SWCNT induced a nearly three-fold greater loss of viability in A594 cells versus MRC-5 cells. Interestingly, SWCNT cytotoxicity toward A549 cells was significantly decreased when combined with low concentrations of the antioxidant NAC.

I/7

Preparation and characterization of selenium nanoparticles incorporated within poly(ε-caprolactone)

Nenad Filipović[1], Magdalena Stevanović[1], Vladimir Pavlović[1,2], Dragan Uskoković[1]

[1]Institute of Technical Sciences of SASA, Knez Mihailova 35/IV, Belgrade 11000, Serbia, [2]Faculty of Agriculture, University of Belgrade, Nemanjina 6, Belgrade 11080, Serbia

Drug delivery systems of nano- and micro-size represent a new generation of therapeutics that hold promise to become excellent tool in treatment of various diseases and disorders, which are resistant to currently available drugs. This study was performed in order to develop the selenium nanoparticles coated with poly(ε-caprolactone) (PCL), as a potential anticancer agent. Selenium nanoparticles (SeNp) were first synthesized by chemical reduction of sodium selenite, using ascorbic acid as reductant and bovine serum albumin as stabilizer. Obtained SeNPs, with average diameter of ~80 nm, were then incorporated within PCL applying emulsification and freeze drying methods. The final microparticles of PCL/SeNp were characterized by Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). Efficiency of encapsulation of SeNp within PCL particles was determined with inductively coupled plasma atomic emission spectroscopy (ICP-AES) analyses.

II/1

Biomaterials and their application in preprosthetic surgical procedure

Zorica Ajduković[1], Nadica Djordjević[2], Nenad Petrović[1], Nenad Ignjatović[3], Dragana Kenić Marinković[1], Dragan Uskoković[3]

[1]University of Niš, Faculty of Medicine, Clinic of Dentistry, Department of Prosthodontics, Niš, Serbia, [2]University of Priština temporarily seated in Kosovska Mitrovica, Clinic of Dentistry, Department of Prosthodontics, Kosovska Mitrovica, Serbia, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia

The loss of teeth and damage to the jaw bone occur under different circumstances. The deficit may be the result of wearing inadequate dentures, residual ridge resorption, osteoporosis, periodontal disease, trauma, tumors, radiation, etc. The deficit of bone tissue can be a substantial problem because it prevents adequate prosthetic patient care and restoration of disturbed functions of stomatognathic system. With such patients, there is often a need for preprosthetic surgical procedure through the application of various techniques and materials in order to resolve aftermentioned bone shortcomings. The most appropriate biological materials for the reconstruction are autogenous bone graft and artificial bone. With the development of technology and specific biomaterials it is tried to avoid situations that require autogenous bone grafting, since it involvs long surgical procedure with the possibility of postoperative complications. The application of synthetic biomaterials, whose properties are similar to natural hydroxyapatite, promotes the biological potential for bone tissue repair. Synthetic biomaterials have great biocompatibility and sterility and do not act antigenicaly. The disadvantages of this material are overcome by the addition of organic polymers. Thanks to the stability and flexibility of hydroxyapatite structure, a large number of ionic changes are possible, both cationic and anionic, which improve the characteristics of synthetic hydroxyapatite. Biomaterials that include different drugs, such as antibiotics, vitamins and other preparations, could be used for the treatment of complications after surgical procedures and infection of bone tissue. Our experimental studies indicate that biomaterials based on hydroxyapatite are valuable materials that can be used for preprosthetic surgical preparation.

II/2

Effects of post-polymerization treatments on the mechanical properties of a denture base resin

Dušan Petković[1], Milena Kostić[2], Miodrag Manić[1], Nebojša Krunić[2,3]

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[3]*Faculty of Medicine, University of Niš, Bul. dr Zorana Djindjića 81, Niš, Serbia*

The aim of this work was to identify the effects of post-polymerization on the mechanical properties of the cold polymerized denture base resin (ORTOPOLI, PoliDent). Also, the effect of glittering particles addition into the resin on mechanical properties was analyzed. Before mechanical testing, five groups of specimens were subjected to post-polymerization such as: boiling, microwaving and water storage for 1, 7 and 30 days at 37 ^{0}C. Both the flexural strength and elasticity modulus values were calculated. Significant strength improvement was appeared after 7 days of water soaking. Addition of the particles into the resin did not have any impact on the tested mechanical properties.

II/3

A Comparative Study of Dissolution Behavior of Bioactive Glass Ceramics in SBF-K9 and r-SBF

Muhammad Usman Hashmi[1], Saqlain Abbas Shah[2]

[1]*Department of Applied Sciences, Superior University Lahore 54000, Pakistan*
[2]*Physics Department, F. C. College University, Lahore 54000, Pakistan*

A comparative study of dissolution behavior of three bio-active glass ceramics samples was performed using conventional SBF (SBF-K9) and revised SBF (r-SBF) that has ionic concentration exactly equal to that of human blood plasma. For that purpose, samples were immersed in fluids for different time periods upto 25 days. Characterization through Thin film XRD, Fourier Transform Infrared Spectroscopy, Energy Dispersive Spectroscopy and Atomic Absorption Spectroscopy revealed the importance of CO3-content in the physiological fluids for the in-vitro assessment of samples. So, r-SBF seems more beneficial for the assessment of samples in-vitro, to clearly understand their behavior in-vivo.

II/4

Pectin and poly(ethylene glycol) based films: mechanical and structural properties

Sanja Šešlija[1], Aleksandra Nešić[2], Roberto Avolio[3], Maria Errico[3], Mario Malinconico[3], Sava Veličković[4]

[1]Innovation Centre of the Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Vinca Institute for Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [3]Institute on Polymer Chemistry and Technology, Pozzuoli (Na), Italy, [4]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

The aim of this study was to produce biodegradable films intended for food packaging with the final result that the conventional films such as polypropylene, polyethylene etc. can be replaced. Samples were prepared with different amounts of poly (ethylene glycol) (PEG-400, PEG-1000), while the type and concentration of pectin (4 mass %) were constant. Mechanical properties of the obtained films were tested: tensile strength, elongation at break and Young's modulus of elasticity. FTIR spectroscopy confirmed the establishment of hydrogen bonds between pectin and polyethylene glycol. SEM microscopy showed the differences in the film's structure.

Acknowledgement: This work was supported by Executive programme for scientific and technological cooperation between the Italian Republic and the Republic of Serbia for the years 2013-2015. Project title and code: Innovative pectin-based films for food packaging: preparation and characterization, 680-00-566/2013-09/4.

II/5

Effect of Starch Gels Preparation on the Supercritical Impregnation of Thymol

Stoja Milovanović, Jasna Ivanović, Irena Zizović

University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Belgrade, Serbia

Process of supercritical solvent impregnation of thymol into selected polysaccharide gels (corn and tapioca starch) was investigated in order to develop solvent-free materials for use in food and pharmaceutical industry.

Temperature of hydrogel preparation as well as drying method, for obtaining xero- and aerogels, was varied. Morphology of obtained xero- and aerogels was analyzed by scanning electron microscopy.

High pressure view cell was used for batch impregnations of dry gels with thymol using superctitical carbon dioxide. Temperature and drying methods used for preparation of xero- and aerogels influenced morphological properties and consequently the yield of thymol impregnation.

II/6

Partial characterization of levan from *Brachybacterium sp.* CH-KOV3

Aleksandra Djurić[1], Branka Kekez[1], Jovana Stefanović-Kojić [1], Dragica Jakovljević[2], Gordana Gojgić-Cvijović[2], Ljubiša Ignjatović[3], Vladimir P. Beškoski[1,2], Miroslav M. Vrvić[1,2]

[1]Faculty of Chemistry, University of Belgrade, Serbia, [2]Centre for Chemistry-Institute for Chemistry, Technology and Metallurgy, University of Belgrade, [3]Faculty of Physical Chemistry, University of Belgrade, Serbia

Microbial polysaccharides are characterized by high structural diversity leading to their applications in various fields: food industry, agriculture, pharmacy and medicine. In recent years, much attention was given to bacterial exopolysaccharide levan, due to specific physical and chemical properties and non-toxicity, for which it could be applied as a emulsifier, flavor and fragrance carrier, prebiotic, antioxidant and antitumor agent.

The aim of this work was to investigate structure of exopolysaccharide produced by *Brachybacterium sp*. CH-KOV3 by planar chromatography, elemental analysis, FTIR, NMR and conduct basic rheological characterization. It has been shown that the investigated biopolymer belongs to levan-type polysaccharide.

II/7

Microbial polysaccharides as a prospective base for new materials

Branka Kekez[1], Marija Lješević[1], Aleksandra Djurić[1], Jovana Stefanović Kojić[2], Dragica Jakovljević[2], Gordana Gojgić-Cvijović[2], Vladimir P. Beškoski[1,2], M. M. Vrvić[1,2]

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Microbial polysaccharides (MP_S) have high structural variety which leads to a wide diversity of their applications. Main characteristics of these polymers produced by microorganisms are non-toxicity, biocompatibility and biodegradability, which is a significant advantage compared to synthetic polymers. Many of the MP_S show a number of attractive properties. Among the most studied MP_S is the β-glucan from *S. cerevisiae*, due to its antitumor/antiviral activity and possessing a ***bifidogenic effect***. Pullulan from *A. pullulans* has excellent properties as the result of its unique structure. Levan from *B. licheniformis* strain has potential for many applications, including synthesis of nanoparticles.

III/1

Synthesis and characterization of cesium aluminosilicate phases from LTA zeolites as a precursor

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^{137}Cesium is considered as one of the most hazardous radiotoxic elements for the environment. The aim of this study is to find out the best method to remove radio-active cesium from nuclear waste streams and safely store in non-leaching solids. Cs^+ exchanged forms of two synthetic zeolites (4A and 5A) were prepared by standard procedure and investigated by SEM/EDS analysis. Thermal-transformations of Cs^+ exchanged zeolites (LTA) have been studied by means of differential thermal analysis (DTA), thermo-gravimetric analyis (TGA) and x-ray powder diffraction. Based on obtained data, it was concluded that above 1000 ^{0}C Cs-LTA (4A and 5A) frameworks recrystallized in a stabile pollucite phase.

III/2

Investigation of the yttrium doped $CaMnO_3$ nanopowders

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Nanostructured compounds with general formula $Ca_{1-x}Y_xMnO_3$ ($0 \leq x \leq 1$) were synthesized by modified glycine nitrate procedure. Afterwards, we have investigated crystal structure and microstructure of the synthesized samples using X-ray methods and Rietveld analysis. The main focus of this research was the structural stability of the yttrium doped $CaMnO_3$ perovskite phases, which crystallize in orthorhombic space group *Pnma*. We observed that the unit cell volumes of the investigated compounds increase proportionally with yttrium amount. Furthermore, we investigated the influence of yttrium amount on Mn–O bond angles and distances, tilting of MnO_6 octahedra and deformation due to the presence of Jahn-Teller distortion around Mn cation. Finally, the photoelectron spectroscopy (XPS) method was applied in order to follow yttrium concentration in the perovskite phases.

III/3

Synthesis and characterization of $BiFeO_3$ nanopowder

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Well-crystallized single-crystal $BiFeO_3$ (BFO) nanopowder has been successfully synthesized by the hydrothermal and solid state synthesis methods. We analyzed the particles size using granulometric analysis and scanning electron microscopy (SEM). The phase composition of the sintered samples was determined by x-ray diffraction (XRD) analysis. It revealed that synthesized material crystallize in space group *R3c* with cell parameters a = b = 5.5780(10) Å and c = 13,863(3) Å. The powders behavior was characterized by TG/DTA and ***Heating stage microscope***. The magnetic behavior of synthesized material is done by means of SQUID device and using a vibrating sample magnetometer (VSM).

III/4

Synthesis of fine-dispersed chromium carbide powder using carbon nanofibers

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The fine-dispersed powders of chromium carbide were synthesized using the chromium oxide and carbon nanofibers in an induction furnace. The synthesis was carried out in temperature range 1200–1400°C in argon atmosphere. The study of the temperature of synthesis influence on composition, crystallite size and particle size of the obtained powder was carried out. The morphology of powders obtained and their phase composition were characterized by X-ray diffraction and scanning electron microscope. The results showed that increase of temperature leaded to growth particle size as well as crystallite sizes while the phase composition of samples change from mixture of Cr_7C_3+Cr_3C_2 to pure Cr_3C_2.

III/5

Oxidation dynamics of the graphite during the graphite oxide synthesis

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The synthesis of the graphite oxide using various reaction parameters was carried out. The stepwise evaluation of the graphite oxidation dynamics was carried out during the synthesis using the sampling method and thermogravimetric analysis. Thermally expanded graphite with high textural characteristics was obtained using graphite oxide. The properties of graphite oxide and expanded graphite were determined using scanning electron microscopy, X-ray diffraction, thermogravimetric analysis, differential scanning calorimetry, energy dispersive spectroscopy and low temperature nitrogen adsorption.

III/6

The influence of mechanicall activation on the structure of ZnO

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In this paper, the authors investigated the influence of mechanicall activation of ZnO powder on crystal and micro structure. Because of its structure, ZnO could be used like filler in polymer ceramics nanocompozites. Performances of these material depend on filler morphology, surfaces, texture and size particle. According to this, ZnO powder was activated in a planetary ball mill for 2, 5, 10 and 30 minutes. Changes in crystal and micro structure were observed by SEM, XRD, Raman spectroscopy and UV-Vis Reflection. SEM micrographs show increase of agglomerates size with prolonged milling time. XRD patterns indicate that the peak intensities getting lower and expend with activation time. UV-Vis reflection shows that there is a clear difference in the spectra with increasing activation time. The results we got by the investigation of dinamical structure by Raman spectroscopy are in corelation with the other results of structures analysis. Results presented here enable further optimisation of the polymer nanocompozite based on ZnO and PVDF making process.

III/7

Synthesis and characterization of nanocomposite hyderogels based on poly(methacrylic acid) and SiO_2

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We have applied a simple synthetic strategy to obtain nanocomposite (NC) hydrogels made from relatively high amounts of unmodified silica nano-spheres (silica/monomer weight ratio from 0.05 to 0.75) and yet capable to uptake high amounts of water.

Characterization of derived NC hydrogels revealed that their properties were highly dependent on silica nano-spheres diameter and silica/MAA weight ratio indicating the existence of polymer/nanoparticle interactions. Uniform distribution of single nano-silica particles at lower silica content and nano-scale spherical aggregates at moderate filer concentrations was confirmed by SEM and optical transparency analysis, as well as existence of homogenous 3D network which consisted of interconnected nano-silica particles coated with PMAA at higher silica concentrations.

III/8

High energy co-milling - method of polymer-based composite fillers synthesis

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Mechanochemical synthesis of powdered materials is an alternative for traditional, “wet” manufacturing of ceramic composite powders.

The main goal of research is a determination of composite filler influence on mechanical properties of material. Study focuses on the creation of polymer composites strengthened by inorganic particles. Fillers - ceramic composite powders (TiO_2/SiC) are synthesized via the mechanochemical treatment and used to modify the mechanical properties of thermoset resin.

The role of composite filler type on tribological properties of material was determined by tribo-test on pin-on-disc apparatus.

The work is in progress.

IV/1

Photocatalytic and sonocatalytic degradation procedures of methylene blue dye using a ZnO nanostructured powders

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The elimination of organic pollutants from wastewater is an important procedure in environmental protection. Dyestuffs and other commercial pigments have emerged as a focus of environmental recovery efforts. Various chemical and physical processes, such as chemical precipitation and separation of pollutants, coagulation, and elimination by adsorption on activated carbon are applied for elimination of organic pollutants. The main disadvantage of these methods is that they only change the contamination from one phase to another. In recent years, semiconductor-assisted photocatalysis and sonocatalysis has been extensively investigated, primarily due to its capability to degrade a great number of chemicals in gaseous or aqueous systems, through relatively in-expensive procedures.

In this work we have investigated heterogenic photocatalytic and sonocatalytic degradation of methylen blue (MB) aqueous solution, as a common organic pollutant, in the presence of nanosized ZnO powder as a catalyst. The phase composition of synthesized ZnO nanopowder was identified by XRD, particles morphology was characterized by FE–SEM. The optical properties of ZnO nanocrystals were investigated by ultraviolet–visible (UV–Vis) diffuse reflectance spectroscopy (DRS). Concentration of the MB dye in the water solution containing ZnO nanoparticles before and after photocatalytic or sonocatalytic degradation was calculated according to the absorbance maxima value at 665 nm characteristic for MB. The experiments were performed on a UV–Vis spectrophotometer in the wavelength range of 300–800 nm.

IV/2

Design strategies for hydrogenation catalysts using colloidal and template-based synthesis routes

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Achieving optimal catalyst performance requires control over the number and structure of metal nanoparticles (NP) as well as over the pore morphology. The optimum balance between high surface area and fast pore diffusion can be realized in hierarchical pore systems, where large pores facilitate fast transport whereas small pores provide a high surface area and stabilize the active metal-particles.

We present a new general synthesis strategy for hierarchically structured catalytic coatings with ordered porosity. The strategy employs size-controlled metal-nanoparticle colloids as active sites and polymer-based pore templates to control the materials pore structure. The effect of catalyst composition and structure will be related to catalytic performance in gas-phase hydrogenation of butadiene.

IV/3

Experimental and theoretical studies on photocatalytic degradation of metoprolol in the presence of electron acceptors

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The objective of this work was to study the photocatalytic degradation of metoprolol in UV illuminated aqueous suspension of TiO_2 in the presence of different electron acceptors by LC and TOC methods. Metoprolol belongs to a group of frequently used β_1-blockers, present in waste waters. It was found that the degradation rates are strongly influenced by the mentioned parameters. Employing DFT computations influence of the most reactive radicals and their interactions with metoprolol are investigated from the aspect of structural considerations, charge distribution and NBO analysis.

IV/4

The influence of poly-4-vinylpyridine-co-divinylbenzene-Co^{2+} catalyst on the reaction pathways of the Bray-Liebhafsky reaction

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The Bray-Liebhafsky (BL) reaction is the decomposition of hydrogen peroxide into water and oxygen in the presence of hydrogen and iodate ions. It has been successfully applied as matrix for the characterization of catalysts. For this purpose, the influence of poly-4-vinylpyridine-co-divinylbenzene-Co^{2+} catalyst on the reaction pathways of the BL reaction was analyzed. By stoichiometric network analysis (SNA) it is shown that addition of this catalyst increases the number of the reaction pathways of BL reaction. Consequently, because of the presence of catalyst, the time evolution of the species included in the BL reaction mechanism is changed.

IV/5

Influence of Fe and ZrO_2 presence in mechanochemically synthesized perovskite ceramics on its dielectric properties

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Both $CaTiO_3$ and $BaTiO_3$, electroceramic with the perovskite structure, were synthesized by high-energy ball milling technique using vessels and balls of steel or ZrO_2.

Impurities on the form of metallic iron decreases the dielectric permittivity of $CaTiO_3$ and in $BaTiO_3$ diffuses the ferroelectric phase transition in contrast to ZrO_2 which improves the functional properties.

V/1

Computational studies on advanced materials from bulk crystals to nanoscale structures

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The first part of our research focuses on the computational studies of bulk materials. Here, we have performed crystal structure prediction using simulated annealing in the lead sulfide compound. The results were in good agreement with previous theoretical and experimental observations, and we have found some additional structure candidates as function of pressure. In addition, structural, electrical and vibrational properties of PbS were investigated. In the second part of the research, our focus was on the nanostructured materials. Therefore, we have performed calculations in the ZnO system using the prescribed path algorithm, where we have investigated the connectivity among experimental ZnO crystal structures on the energy landscape. With the results of this study we were able to understand more about the influence of temperature in ZnO, to connect our results to the actual synthesis routes and get additional crystal and nanostructured candidates. Finally, we show the molecular dinamics (MD) simulations of various nanoscale structures of SiO2 compound, which should give us a unique level of insights into self-organisation on template surfaces.

V/2

Computational methods for muscle modeling at the molecular level

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In this paper, various methods for muscle modeling at the molecular level are presented. As the basis, the methods for modeling biochemical processes during actomyosin cycle, which allow us to determine model parameters, are shown. Using obtained parameters, a probabilistic model has been developed to handle various boundary conditions and several types of muscle activation. As the most comprehensive, a stochastic multimodel is described. In addition to biochemical processes of actomyosin cycle, this model considers deformability of muscle fibers using finite element method. Finally, comparison between calculated and experimental results is given and discussed.

V/3

Verification of thermo-mechanical coupling implemented in software PAK Multiphysics on the example of radiofrequency ablation

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Radio frequency ablation (RFA) is a medical procedure in which part of the electrical conduction system of the heart, tumor or other dysfunctional tissue is ablated using the heat generated from high frequency alternating current. Basic equations which governs the problem of in terms of finite element method are presented. Realistic RFA simulation for endocardial radiofrequency ablation using software PAK Multyphisics is presented. Temperature distribution through the heart during ablation for the cases when blood flow through the coronary artery exists and not exists are investigated. It is shown that blood flow in the coronary artery does not have significant influence on the temperature distribution. The numerical experiments confirmed the feasibility of RFA modeling, simulation, planning and prediction of treatments results.

V/5

Verification of electro-mechanical coupling implemented in software PAK Multiphysics on the example of piezoelectric transducers

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In this paper the finite element formulation for piezoelectric body in vacuum using Galerkin-weighted residual method taking into account the initial and boundary conditions, implemented in simulation tool PAK Multiphysics, is given. As example, an analysis of the piezoelectric actuation of an aluminum structure (two piezoceramics actuators are bonded to each of the upper and lower surfaces of the beam) is presented. The nonlinear constitutive relation reported in literature is used in this analysis. Finite element analysis is performed using software Adina and PAK Multiphysics. The strain component at observed point calculated from the finite element analysis compares well with the value reported in literature.

V/6

Integrity of the pipelines transporting oil and gas

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Pipelines are becoming a very important tool for transporting gas and oil in large amount in a short time. Pipelines are competitive compare to other methods of transport; however those are more dangerous due to the damages which can be made to the due to atmospheric, land and human contacts. In order to secure their integrity several analyses have to be made while projecting and maintaining them during their operation. One of the main problems which theoretically can happen is the fracture mechanics. Those are related to the quality of the material used to construct the pipes. Another problem which has to be taken into consideration is the evaluation of the integrity of the pipelines. Quantitative methods should be used in order to predict the possible damages.

Further more the defects of the pipelines transporting oil and gas defects depend on the region they operate, quality of the material used and the pressure of the liquid. For example the terrain where the pipe passes through is very important whether it is mountain or a field. Also the material of construction of the pipes is important whether it is steel or iron. One of the factors mention above can cause damage or combination of them. The aim of our study is to predict, identify and make the necessary repair for the pipes. We will use date which makes several calculations and than compare them in order to achieve the best result. All the possible factors should be analyzed; such are mass off corrosion, material, environment, failures etc. in order to make the appropriate repairs. Intervention without making all the factor failure analyses may lead to further damages or short term repairs.

Keywords: *Fracture Mechanics, Integrity of the Pipelines.*

V/7

Determining the stress and strain distribution on complex mechanical structures using the strain gauges measurements

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Strain gauges measurement and determination of the stress distribution on the mechanical structures during exploitation enables prediction of structural behavior in the period of exploitation. For strain determination on the mechanical system of the vehicle in the area of the bolt connection, was used a method of and no-load vehicles. The measurements were carried out for the several cases of climbing vehicle on the obstacle of 150 mm simulating the real critical situation.

The results of measurements provide knowledge of the stress distribution on the structure as well as the identification of areas with maximum stress.

Keywords: Stress distribution, strain gauges, bolt connection.

VI/1

Spin arrangements in quasi one-dimensional systems

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Magnetic chains, several legs spin ladders and nanotubes are physically interesting quasi one-dimensional magnetic systems with pronounced symmetry described by line groups. We derive spin line groups, describing their various spin arrangements. Using them we classify all possible ordered arrangements of quasi one-dimensional magnetic systems. These basic results are applied to determination of the classical ground state and analysis of neutron diffraction of such compounds.

VI/2

Advanced computational methodologies for modeling realistic polycrystalline magnetic films and devices

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Polycrystalline thin-films are the basis for a number of magnetic nanotechnologies, including magnetic recording, magnetic random access memories, and spin torque nano-oscillators. Careful tailoring of the microstructure of such films involves precise modulation of grain parameters, layer thicknesses, and can also involve patterning. In this work, new methodologies are presented which allow high fidelity computational modeling of complex magnetic polycrystalline multilayer films and lithographically defined devices. Hybrid discretization schemes involving Vononoi, tetrahedral, and hexahedral elements are used for structural representation. Material properties and physical interactions are accordingly modeled. This allows for economical simulations of fundamental magnetization processes on the nanoscale, as well as material and device characterization.

VI/3

Optimisation of *a-GaN/AlGaN* Bragg confined structures for frequency up-conversion relevant for GaAs-based solar cells

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Solar cells are unable to absorb photons with energies lower than the constituent material's band-gap, which eliminates a significant part of the spectrum. The efficiency of the process may be increased by converting low-energy photon pairs, via nonlinear optical effects, into photons optimal for the solar cell. The converter structures consist of *GaN/AlGaN* superlattice series perturbed by asymmetric quantum wells which form the Bragg confined structures (BSCs). BCS support additional bound electron states in the superlattice minigaps, including states above the barrier. Parameters of the structure are optimised for each photon pair, by using the genetic algorithm, to obtain a continual converter.

VI/4

Optical and aromaticity properties of sumanene modified with boron and nitrogen atoms; a DFT study

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Changes of optical and aromaticity properties of sumanene resulting from substitution of its benyzlic positions with boron and nitrogen atoms were investigated by means of density functional theory (DFT) computations. The aim of this study was to confirm that various important properties for the practical application of sumanene can be finely tuned in the described manner. It was shown that non-linear optical (NLO) properties (polarizabilities and hyperpolarizabilities), exciton binding energies, dielectric constant and nucleus independent chemical shifts (NICS) of sumanene buckybowl are significantly influenced by substitution of its benzylic carbon atoms.

VI/5

Modeling buckybowls with semi-empirical levels of theory

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Typical representatives of buckybowls (also known as molecular bowls or π-bowls), corannulene and sumanene were investigated employing semi-empirical levels of theory and the obtained results were compared with the results obtained within Hartree-Fock (HF) and density functional theory (DFT) computations. The purpose of this study was to conclude to what extent computationally inexpensive semi-empirical levels of theory can be used for the modeling of buckybowls. Obtained results indicate that semi-empirical levels of theory are reliable tool when it comes to the initial investigation of buckybowls.

VI/6

Finite Element Solution of One-Dimensional Stefan Problem

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Stefan problem aims to describe the distribution of temperature in a homogeneous environment that goes through a phase change. We considered one-dimensional Stefan problem, describing the ice melting process. We used two independent methods, the finite difference (FDM) and finite element (FEM), in order to determine the evolution of the temperature distribution and phase boundary during the process. Our aim was to produce highly accurate results which could be validated against the exact solution. As a result, the temperature distribution and position of the moving boundary were evaluated and FEM proved to be a better solution than FDM.

VI/7

Ellipsometric data analysis and calculation of ellipsometric parameters of complex materials

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Optical and structural properties of materials can be characterized by spectroscopic ellipsometry which represents an experimental technique that measures polarized light reflected from a material surface. Since the most complicated part of this method is data analysis and modeling, the principles of standard ellipsometric modelling will be explained. Additionaly, we will consider the ellipsometric model of complex materials which require not just permitivity like in conventional model, but also magnetic permeability and magneto-electric coupling. In order to find the best model, we will present our calculation of ellipsometric parameters for these materials.

VII/1

Strength and durability of bauxite based geopolymers

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The effect of alkali cation (Na^+ and K^+) on the strength and durability of low grade bauxite based geopolymers was investigated. The results have shown that Na-based geopolymers are characterized by higher compressive strength in comparison to the K-based geopolymers which is influenced by its porosity. Moreover, Na- based geopolymers show the better durability in a different aquatic media (distilled water, sea water, simulated acid rain and 1 M HCl) in comparison to the K-based geopolymers. Both Na- and K-based geopolymers exhibit the strength loss after exposure to the attack of aggressive environment.

VII/2

Anticorrosive Zn-Ni-P coatings electrodeposited on steel parts from sulfate baths

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The study presents the electrodeposition of Zn-Ni-P thin films on steel substrates from sulfate electrolytes. The thin films were deposited at 50^0C for 30 minutes. The coatings were characterized using EDAX and SEM. The corrosion characteristics were measured by open circuit potential, Tafel and potentiodynamic polarization curves.

The corrosion current densities were 13.4 – 26.19 μA/cm^2, much lower than 41.56 μA/cm^2 for the uncoated sample. Calculated values of 36.98%, 54.76 % and 67.76% for the corrosion protection efficiency are superior to those of the uncoated sample. Steel samples coated with Zn-Ni-P films present superior corrosion resistances to the uncoated steel sample.

VII/3

Investigation of Al-5083 alloy obtained by mechanical alloying

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The microstructure and characteristics of an Al-Mg-Mn alloy obtained by mechanical alloying of elemental powders ball-milled for 3, 5 and 8 h were studied. Scanning electron microscopy and X-ray diffraction were used to investigate the microstructure. The obtained results revealed that ball milling for 8 h led to a nanocrystalline structure with a grain size of 28 nm. The microstructure of the compacted samples was studied by optical microscopy.

Microhardness and density measurements performed for the compacted specimens revealed that the microhardness and density of the mechanically alloyed and compacted alloy was superior to values of a conventional Al-5083 alloy.

VII/4

Experimental and theoretically investigation of the Ag-Ga-Sn phase diagram

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The ternary Ag-Ga-Sn system was investigated experimentally and theoretically. The experimentally investigated by DTA and SEM-EDS methods and theoretically by CALPHAD method.

The liquidus projection, invariant equilibria, three vertical sections: Ag-$Ga_{50}Sn_{50}$, Ga-$Ag_{50}Sn_{50}$ and Sn-$Ag_{50}Ga_{50}$ as well as isothermal sections at 200 ^{o}C and 300 ^{o}C were predicted using thermodynamic binary data from COST MP0602 database. All optimized thermodynamic parameters for assessed binary subsystems used in present study were taken from literature. Thermodynamic data for the Ag–Ga binary system were taken from W. Gierlotka and D. Jendrzejczyk-Handzlik. Correspondingly, used data for the binary Ag–Sn system were reported by C.-S. Oh et al. and for binary Ga–Sn system by T. J. Anderson and I. Ansara.

In the experimental part of the work, phase transition temperatures of the selected samples with compositions along calculated isopleths were measured using Differential Thermal Analysis (DTA). Experimentally determined phase transition temperatures were found to be in reasonable agreement with the results of thermodynamic calculation. Predicted isothermal sections at 200 ^{o}C and 300 ^{o}C were validated by comparing them with experimental data obtained using combined scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS).

VII/5

Al-Pb composite formation by low-frequency oscillations of its melts

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Al-10%Pb composite was successfully prepared by low-frequency oscillations (amplitude 1-1,2mm, frequency 50Hz) of its melts. Impact on the initial immiscible Al-Pb melts was carried out for 2, 5 and 10 minutes at temperatures of 700, 860 and 1060 °C. Treated alloy was rapidly cooled in a copper mold to avoid separation because of the difference of phases density. Microstructure of the alloy was investigated by scanning electron and optical microscopy with image analysis software SIAMS Photolab. Lead spherical particles with 20-60 μm size are dispersed homogeneously in aluminium matrix. Therefore, the low-frequency oscillations can be used to obtain composites with special properties, such as wear resistance, damping capacity, superconductivity.

VII/6

Use of Quartz Crystal Microbalance (QCM) Measurements to Investigate Novel Top-of-the-Line Corrosion (TLC) Mitigation Method

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A novel top-of-the-line corrosion (TLC) mitigation method includes foam as a carrier for corrosion inhibitor. The objective of this research was to develop a non-standard quartz crystal microbalance (QCM) measurement technique that would be employed in the top of the line conditions. The thickness of foam layer adsorbed on the crystal surface and its persistency with time was investigated on inert gold coated quartz crystals, while the corrosion measurements were performed on the corroding iron coated quartz crystals. Corrosion rate as measured in the vapor phase was around 0.2 $mmyr^{-1}$ and was significantly reduced by periodic treatment by the foam.

VIII/1

The Influence of the Polybutadiene Isomer to the Structure of the Triblock-Copolymer SBM

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In this work correlation between morphology and the structure of the polybuthadiene isomers in the triblock SBM terpolymers was investigated. The structure of the polybutadiene block is determined by solvent polarity. The samples were obtained by sequential anionic polymerization. The samples with the molar masses between 70 and 160 kg/mol show well segregated domains for different lamellar type. The length of the lamellar domains depends on the molar mass, with lower molar mass indicating shorter domains and higher amount of 1,4 isomer. Transitional morphology is observed in the samples with predominant 1,2 isomer and high amounts of precursor residual.

VIII/2

The preparation of elastomeric poly(lactide) nanocomposite thin films

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The study of the physical properties of biobased polymer thin films has been the subject of the investigation in this work. Poly(lactide) thin films were covered with styrene-butadiene copolymer, in order to achieve desired elastic properties. Silica nanofiller (5 and 10 wt%) were used to improve mechanical properties of PLA thin films. Styrene-butadiene elastomer increasing elongation of PLA films, while addition of nanoparticles increase the tensile strength by 30% of pure PLA films and 40% of PLA films coated with elastomer. Also, nano-reinforcement has influence on thermal properties of films.

VIII/3

Curing of epoxy resins modified with thermoplastic polycarbonate-based polyurethane elastomers

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The epoxy hybrids were prepared by curing of homogenous mixture containing polyurethane melts, epoxy resin and Jeffamine D-2000. The influences of different weight and hard segments content of elastomers on the curing of epoxy systems were studied by differential scanning calorimetry (DSC), in the range from room temperature to 300 °C, at three heating rates. Obtained DSC data were analyzed using different kinetic models. Activation energy values were significantly increased for the reaction degrees higher than 60 %. Polyurethane addition retarded the curing process due to decreased mobility of reactant molecules caused by higher viscosity of reaction mixture.

VIII/4

Influence of pH values on synthesis of PMAA-graft-starch copolymers

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PMAA-graft-starch copolymers have different potential applications, such as matrix for drug delivery, in textile industry and in waste water treatment.

The aim of this study was to investigate the influence of pH values on share of PMAA in graft copolymers which were synthesized using new initiator/activator pair. pH values were adjusted with *p*-toluenesulfonic acid. It is known (from literature) that with pH decreasing, polymerization of MAA was more expressed, so the share of PMAA in copolymer should be higher. The main conclusion in this study was opposite. Reason for this anomaly was found in starch behavior in acidic environment.

VIII/5

Preparation and characterization of waterborne polyurethane dispersions and films

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Waterborne polyurethane dispersions (PUD) were prepared in four successive steps; prepolymerization, chain extension, neutralization and water dispersion by the phase inversion. Negatively charged spherical nanometer-size PUD particles were formed. The average particle size ranged between 40 and 60 nm and zeta potential between -45 and -65 mV. PUDs were also modified by mixing with colloidal silica. Transparent or opaque elastic polyurethane (PU) or PU nanocomposite films were prepared by water evaporation from PUDs. The functional (e.g., mechanical and surface) properties of PU and PU nanocomposite films will be presented as well.

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VIII/6

Synthesis and application of novel copolymer of methacrylic acid and 2-acrylamido-2-methylpropane sulfonic acid

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This study presents a synthesis of novel copolymer hydrogel of methacrylic acid (MAA) and 2-acrylamido-2-methylpropane sulfonic acid(AMPS) and its application in coloured wastewater treatments. As a sorption model, cationic dyes Basic Yellow 28 and Basic Red 46 were chosen. The adsorption of these dyes onto hydrogel P(MAA-co-AMPS) was investigated in single and binary systems at different inital dye concentrations, pH and temperatures. The percentages of removal of Basic Yellow 28 for PMAA, PAMPS and P(MAA-co-AMPS) at pH8 are 77%, 76% and 90% respectively, while the percentage of removal of Basic Red 46 for the same hydrogels are 68%, 89% and 82%.

VIII/7

Optical properties of CdTe/ZnTe self-assembled quantum dots

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The properties of 3 monolayers (ml) CdTe self-assembled quantum dot (SAQD) sample are investigated by means of Raman and photoluminescence (PL) spectroscopy. The PL spectrum is characterized by two main emission peaks, both connected with the existence of QDs. One presents direct deexcitation to ground state and the other one is optical phonon (ω = 204.2 cm^{-1}) assisted deexcitation. One - phonon Raman spectra at room temperature show surface-optical phonon at 201 cm^{-1}. At temperatures below 200 K, multiphonon processes are registered. Multiphonon maximum depends on the temperature, and laser energy.

VIII/8

Optical properties of $Cd_{1-x}Mn_xS$ nanoparticles

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$Cd_{1-x}Mn_xS$ quantum dots of average size 4.5 nm with various composition, have been synthesized by using aqueous solution precipitation.

In Raman spectra of $Cd_{1-x}Mn_xS$ nanoparticles asymmetric Raman line was observed. Dominant line was at about 300 cm^{-1} asymmetric broader for $\omega < 300$ cm^{-1}.

The photoluminescence spectra of studied samples for various excitation energies in magnetic field (up to 5T) are also presented. Beside emission from defect states at about 1.7 eV and from surface states at 2.3 eV, we registered two emission bands at 2.0 and 2.13 eV that correspond to the $^4T_1$-$^6A_1$ transitions of Mn^{2+} ions.

VIII/9

Raman scattering study of $K_xCo_{2-y}Se_2$

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The lattice dynamics study of the KCo_2Se_2 is presented together with polarized Raman scattering spectra of the $K_{0.6}Co_{1.73}Se_{2.00}$ single crystals. Two out of four Raman active phonons, predicted by the symmetry analysis for our scattering configuration, have been observed and assigned. Calculated energies of the observed modes are in good agreement with the experimental results. Absence of additional phonon peaks suggests that there are no vacancy ordering in the $K_{0.6}Co_{1.73}Se_{2.00}$ single crystals. Temperature dependence of energy and linewidth for the observed Raman modes is in accordance with the standard anharmonicity model, except for the B_{1g} mode linewidth at low temperatures. Large values of intrinsic linewidth in comparison to the anharmonic constant for both phonons is most probably caused by nonstoichiometry of the considered single crystals. The additional broadening of the B_{1g} mode, which has been observed below ferromagnetic phase transition temperature, occurs due to activation of another scattering channel, arising from collective spin fluctuations. Considerable change of B_{1g} mode energy in three isostructural compounds KM_2Se_2 (M = Fe, Co, Ni), is a consequence of different electronic configuration of the transition metal ions.

VIII/10

Surface states of the topological crystalline insulator $Pb_{0.4}Sn_{0.6}Te$

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Lately, it has been shown by angle-resolved photoelectron spectroscopy (ARPES) studies, that IV-VI substitutional alloys, $Pb_{(1-x)}Sn_xTe$ and $Pb_{(1-x)}Sn_xSe$ with Sn content *x* higher than a critical value, are topological crystalline insulators (TCIs). Very recently, spin-resolved photoelectron spectroscopy (SRPES) allowed the observation of chiral spin textures of (001) surface states in the TCI phase of these alloys.

Here, using a tight-binding approach, we study theoretically the nature of surface states in $Pb_{(1-x)}Sn_xTe$. The Sn content x=0.6 assures the band inversion and, thus, the newly discovered TCI phase in the (Pb,Sn)Te material. In this rock-salt TCI, the surface states with nontrivial Dirac-like energy spectrum can form at any surface of the crystal. The number of Dirac points in the surface Brillouin zone corresponds to four L-points. At least two of these Dirac points are topologically protected only at crystal surfaces symmetric about any of {110} mirror planes. These are {n n m} surfaces. We study thus, apart from the (001)-oriented surface, the surface states for the two other surface families, {011} and {111}, in which the mirror symmetry of the crystal's rock-salt structure plays the same role.

For {n n m} surfaces the four L-points in the 3-dimensional Brillouin zone project to four different points in the 2-dimensional Brillouin zone, but only when n and m have the same parity (it means of course that they are both odd numbers). When the parities of n and m are different, the L-points are projected in pairs. In this case, two protected Dirac points appear on the mirror symmetry line in the vicinity of the L-projection. Only for (001) surface there are two such lines and four Dirac points are topologically protected. Indeed, our calculations show that while in (111) $Pb_{0.4}Sn_{0.6}Te$ four single topologically protected Dirac-cones should appear, for the (011) surface states the protection is lifted for two L points projections. In this case, instead of the Dirac points energy gaps for the surface states occur, due to the interaction between the two L valleys.

The spin polarization of metallic surface states in the TCI phase of $Pb_{0.4}Sn_{0.6}Te$ has been studied by calculating the in-plane spin texture along the constant-energy lines of the surface states. For all studied surfaces, (001), (011) and (111), chiral spin textures have been obtained.

IX/1

Electrochemical intercalation of lithium in $Li_4Ti_5O_{12}$/C composite with different percentage of carbon

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$Li_4Ti_5O_{12}$/C composites with different content of carbon black (16 wt.% LITX200L, 32 wt.% LITX200L, 60 wt.% LITX200L, 61 wt.% PBX51) were prepared in two steps under identical conditions: hydrothermal reaction at 130 ^oC and post-calcination at 400 ^oC. The accent is on electrochemical measurements and how carbon content influences on electrochemical properties of $Li_4Ti_5O_{12}$/C composites. The $Li_4Ti_5O_{12}$/60% LITX200L composite showed best electrochemical performance: the cyclovoltammograms consisted of well defined reversible redox peaks at a scan rate as high as 10 mV/s, while, galvanostatic cycling showed coulombic capacity of 162 mAh/g at a discharging rate of 1C.

IX/2

Sol-gel synthesis of Li_2FeSiO_4/C

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Lithium transition-metal orthosilicates with general formula Li_2MSiO_4 (M = Fe, Mn, Co, etc.) have attracted a lot of interest due to their potentially high theoretical capacities arising from the possibility of the extraction of two Li-ions per formula unit. Li_2FeSiO_4 takes prominent position among this family of compounds due to its structural stability and natural abundance of iron. In this study, Li_2FeSiO_4/C composite was synthesized by simple method which involves rapid heating, short high-temperature delay, and subsequent quenching. Starting materials were Li_2CO_3, $Fe(NO_3)_3 \cdot 9H_2O$, $Si(OC_2H_5)_4$ (TEOS) and water-soluble methylcellulose. Precursor preparation is based on the sol-gel processing and provides homogenous mixing at the molecular level. Structural analysis, morphology examination and electrochemical test of thus obtained powder were performed.

IX/3

Nafion membrane humidity monitoring and fault detection in PEMFC

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The aim of the study was to monitor membrane humidification and water distribution in a single air/H_2 proton exchange membrane fuel cell operating at room temperature, and detect faults caused by flooding or drying of the Nafion membrane. Electrochemical methods, such as electrochemical impedance spectroscopy, chronoamperommetry and chronopotentiommetry were used for this purpose. Gas flows and ways of humidifying the gas inlets were variated. All experiments were performed in Energy Futures Lab, Imperial College London, on BioLogic potentiostat, using Sensirion humidity sensors. Investigations showed that membrane humidification at room temperature usualy leads to flooding of the cell, and fuel starvation.

IX/4

Formation of Silver Nanoparticles in Poly(vinyl alcohol) Solution by Electrochemical Synthesis

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Electrochemical reduction of Ag^+ ions was utilized for successful enabling of silver interaction with poly(vinyl alcohol), PVA, yielding colloid dispersion, Ag/PVA. Electrochemical synthesis was performed at constant current density of 25 mA cm^{-2}, synthesis time 10 min, in two different aqueous solutions of 5 and 10 wt. % PVA, containing 0.1 M KNO_3 and 3.9 mM $AgNO_3$. Thus formed silver nanoparticles were confirmed by UV-vis spectroscopy. Interaction between silver nanoparticles and PVA molecules was evidenced by cyclic voltammetry analysis and FTIR spectroscopy. TEM images revealed spherical shape of the obtained silver nanoparticles, mean diameter of 15 ± 9 nm.

IX/5

Freeze-drying method for $LiFePO_4$/C composite processing

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Based on its high capacity, stability, low toxicity and low cost of raw materials, phospho-olivine $LiFePO_4$ became a material of great interest for Li-ion battery application. Synthesis of $LiFePO_4$/C cathode material was performed by freeze-drying method using different organic acids as carbon source. Freeze-drying process consists of freezing of a precursor solution, elimination of solvent by sublimation (vacuum drying) and final calcinations of as-dried powder under slightly reductive atmosphere. The main advantage of this synthesis method is possibility of introducing a carbon source and mixing of reactants at atomic level which provides homogeneity of precursor solution. Synthesized materials were characterized by X-ray powder diffraction, scanning electron microscopy, particle size analyzer and galvanostatic charging/discharging.

IX/6

Spin glass like behaviour of magnetite nanoparticle system obtained by thermal decomposition of acetylacetonate precursor

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The research aim was to investigate the magnetic properties of strongly interacting Fe_3O_4 nanoparticles. Monodisperse nanoparticles were prepared by thermal decomposition of iron (III) acetylacetonate. Transmission electron microscopy pointed to the narrow particle size distribution with the mean particle size of (4.87±1.10) nm. The magnetic properties were studied by means of SQUID magnetometer, with AC and DC measurements carried in the wide range of applied magnetic field, temperature and frequencies. Magnetic characterization proved superparamagnetic behaviour at high, as well as spin glass like (SGL) properties at low temperatures. The experimental fingerprints for SGL behaviour were found in the observed memory effects.

IX/7

Nanostructured materials with magnetic properties in stable colloidal form

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The aim was to synthesize of nanosized magnetic cores stabilized with organic molecular shell in deionized water for biomedical and environmental applications. Chemical route was applied starting from Massart method adapted for the optimization of the preparation protocol. Mixed iron oxides were precipitated from different pairs of iron salt precursors. Microstructural investigation (SEM, AFM, DLS) was carried out on the prepared samples with focus on colloidal particle dimension since biomedical applications require nanometric sized particles able to penetrate peripheral tissue and small vessel network. Based on the nanoparticle mean diameter, an hierarchy of the used experimental methods was established.

IX/8

Magnetic and Magnetotransport behavior of $Ge_{1-x-y}Pb_xMn_yTe$ Nanocomposite Crystals

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The structural, magnetic and magnetotransport properties of bulk $Ge_{1-x-y}Pb_xMn_yTe$ samples with variable chemical composition were investigated. The XRD and SEM characterization indicate the presence of two GeTe based phases. Two magnetic phase transitions to spin-glass-like state were found in the studied system with critical temperatures of 70 and 120 K respectively. The magnetometric measurements below T_C showed negative magnetoresistance and anomalous Hall effect. The role of different intrinsic and extrinsic mechanisms responsible for the magnetotransport effect will be discussed.

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X/1

DSC-TG-MS study of hydroxyapatite nanopowders

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Hydroxyapatite nanopowders have been widely studied for biomedical application due to excellent biocompatibility. It attaches chemically to bone tissue providing fixation of artificial implant materials. Main research objectives during last few decades is to obtain hydroxyapatite based material which can withstand mechanical loadings generated in physiological conditions. One of the possible pathway is fabrication of dense nanostructured hydroxyapatite through approprate sintering process, which is strongly correlated with thermal behaviour of starting nanopowders.

In this study, extensive analyses of thermal behaviour of three hydroxyapatite nanopowders prepared with different methods will be presented. Differential Scanning Calorimetry (DSC), Thermo-Gravimetry (TG) with simultaneous Mass Spectrometry (MS) studies have been performed. The obtained results are discussed in the sense of energy-related events, mass loss and water and carbon dioxide molecules evolution to give better understanding of their thermal behaviour.

X/2

Hydroxylapatite synthesis and low temperature sintering methods

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Calcium phosphate (CaP) minerals are the most abundant biomineral group in the human body. Biologic hydroxylapatite differ in stochiometry from the ideal formula. The main inorganic component of teeth and bones is poorly-ordered carbonate-rich hydroxylapatite (CO_3Ap). Moreover, they usually have Na, K, Mg, Sr, Cl, F and other trace amounts of different ions incorporated in their lattice. Due to their similarity synthesized CaP have excellent biocompatibility, therefore they are widely used as biomaterials for hard tissue repair as implants and bone scaffolds. Bio-hydroxylapatite $Ca_5(PO_4)_3OH$ was synthesized by a simple precipitation method. Phase composition of the obtained powders was analyzed by X-ray powder diffraction (XRD), and the morphology was recorded by Scanning electron microscopy (SEM). In order to improve the properties of these biomaterials pressed powders were sintered at low temperatures in order to prevent the phase transitions and the alteration of their structures.

X/3

Structural, morphological and electrical properties of sintered Fe_2O_3/TiO_2 nanopowder mixtures

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Starting nanopowders of TiO_2 (anatase 99.7%) and α-Fe_2O_3 (hematite) were mixed in the weight ratio 60:40 and 40:60. Green samples were sintered in the temperature range 750-1250^oC in air. Structural, morphological and electrical studies were carried out using XRD, SEM and EDS analysis and Hall measurements with the aim of analyzing the influence of the starting nanopowder structure on the resulting sample composition, density, grain size and electrical resistivity. Compared to pure anatase samples, the presence of hematite lowered the temperature of completion of the anatase to rutile phase transformation to 850^oC. Formation of pseudobrookite was also noted at this temperature. Further increase in the sintering temperature lead to increase in sample density and grain size and decrease in the electric resistivity, Hall coefficient and mobility.

X/4

Comparation of mechanical behaviour of SiC sintered specimen to analysis of surface defects

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This research examined SiC sintered specimens with high hardness and strength. This material is used to protect of projectile impact for military purposes. The testing procedure consists of structure examination obtained using XRD analysis, surface examination by SEM analysis and optical microscopy, examination of mechanical properties and density determination. Analysis confirmed surface irregularities characterized using image analysis. The sample is subjected to bending. Finite element modeling was used to simulate the behavior of sample subjected to bending in presence of critical damage on surface. It is confirmed that there is correlation between the largest irregularities determined on surface and measured strength of sample. Simulations show the significance of damage size. The size of damage on surface is considered to be the critical parameter for quality determination.

X/5

The influence of the sol-gel method of powder synthesis to the properties of cordierite ceramics

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The sinterability of cordierite powders obtained by alkoxide hydrolitic and non-hydrolitic method, colloidal method and starting from silicic acid was studied and compared. The properties of sintered materials were observed by SEM of the fracture surfaces and polished and thermally etched samples. The mechanical properties of obtained materials were determined by microindentation method. The best sinterability showed powder obtained by colloidal method (sintering temperature of 1370 °C for 2 h), and powder obtained by Si-acid method (sintering temperature of 1400 °C for 2h).

X/6

Testing concepts in nano mechanics

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Progressive miniaturization has led to a growing need to determine the physical properties of microscopic volumes of materials. Nanoindentation has become a valuable method for testing the mechanical properties of thin films, MEMS devices and other features in the micro and nano scale. Originally developed for the determination of Young's modulus and hardness of materials, the methodology has been continuously extended to characterize properties like adhesion, fracture, creep, scratch and wear.

The nano mechanical investigation of material characteristics often require advanced testing schemes with precise control of the test parameters that govern material deformation and failure. By adequately designing the test sequence, emulating alternative control paths (displacement, stress, etc.), and utilizing alternative data analysis, some limitations of "classical" techniques can be overcome. As a result, new testing techniques has been developed to address the complexity of modern engineering materials and structures used in areas such as aeronautics, semiconductor manufacturing, biomedical research, and optical applications.

Traditional approaches will be discussed and the some of the advanced approaches will be discussed in more detail and illustrated by recent experimental results.

XI/1

Novel membrane adsorbers incorporating cross-linked poly(glycidyl methacrylate-*co*-2-acrylamido-2-methylpropane sulfonic acid)

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Membrane adsorption has started to replace fixed bed chromatography for separation and purification of small quantities of valuable species in biotechnology and related areas. Membrane functionalization is usually required to introduce affinity groups for these applications. In this work novel membranes adsorbers were prepared by combining liquid phase inversion with photopolymerization of the solution comprising polyethersulfone, glycidyl methacrylate, sodium salt of 2-acrylamido-2-methylpropane sulfonic acid and a cross-linker. Membranes were characterized using SEM, AFM, FTIR, titration and water permeability measurements. Dynamic adsorption of Toluidine blue as a model dye was used to demonstrate suitability of these novel membranes for membrane adsorption.

XI/2

Molybdenum sorption by porous copolymer

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Although being essential for biological functions, molybdenum high concentrations (>5 ppm) in wastewater and groundwater cause an environmental problem, so its removal becomes greatly significant. In this study, Mo(VI) sorption ability of amino-functionalized macroporous copolymer (PGME-deta) from aqueous solutions was investigated. Batch Mo(VI) sorption was investigated by varying pH, initial concentration and temperature. The Mo(VI) ions concentration was monitored by inductively coupled plasma atomic emission spectroscopy (ICP-OES). Sorption kinetics data were fitted to seven chemical-reaction and particle-diffusion models. Thermodynamic parameters revealed spontaneous and endothermic nature of Mo(VI) sorption by PGME-deta. Best fit of equilibrium data was obtained for Langmuir isotherm.

XI/3

Pectin as biosorbent for the removal of copper ions from aqueous salt solutions

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Biosorption is becoming a potential alternative to the existing technologies for the removal of toxic metals from wastewater. The major advantages of biosorption technology are its effectiveness in reducing the concentration of heavy metal ions and the use of inexpensive biosorbent materials. The aim of this study was to determine the sorption capacity of pectin particles during the cross-linking process in aqueous copper salts solutions. Concentration of copper ions remaining in solution after cross-linking process was measured using atomic absorption spectroscopy. Sorption capacity of particles was determined depending on concentration and type of copper salts: $CuCl_2$; $CuSO_4$; $Cu(C_2H_3O_2)_2$; $Cu(NO_3)_2$.

XI/4

Research of application possibilities of different sorption materials for Cu (II) removal from aqueous solutions

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(Bio)sorption efficiency of different materials for the removal of copper ions from aqueous solution has been investigated. Concentration of cooper ions in solutions was 2mmol/l, M/V ration 10 g/l and pH of the solutions were adjusted at 5,00. SEM-EDX analyses of some materials indicate that copper binding occurs mainly through ion exchange mechanism. Removal of copper ions was investigated in the following materials: *M.spicatum*, peach stones, apricot stones, corn cobs, bentonite, zeolite, apatite, apatite and NH_4 modified zeolite. Best results showed bentonite and *M.spicatum*. Therefore, the possibility of using combined adsorbents is being examined.

XI/5

Biosorption efficiency of Cu (II) ions from aqueous solution by corn cob

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Solid waste from the corn milling process - corn cob was investigated for the removal of Cu(II) from aqueous solutions. Experiments were performed to determine optimum pH, contact time and biosorbent dosage. Results showed that the removal efficiency increased from 3.5 % to 40.1 % at pH ranging 2.0-6.0 within first 10 min. To investigate the effect of biosorbent dosage on biosorption, the experiments were conducted with different biosorbent dosages ranging from 0,1 to 1,0 g. The results show that the removal efficiency increased rapidly as the biosorbent dosage rises from 0,1 to 0,7 g.

XI/6

Asymmetric hydrogel membranes for heavy metal adsorption

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Hydrogels containing strong acid groups have been used in the past for the removal of heavy metals. Unfortunately such hydrogels exhibit poor mechanical properties and are generally difficult to handle. In this work we prepared asymmetric membranes incorporatingcross-linked 2-acrylamido-2-methyl-1-propane sulfonic acid (AMPS) hydrogel by combining photopolymerization and liquid phase inversion. An experimental design measuring water content and ion-exchange capacity of these membranes was used to select the optimal membrane composition for the removal of Pb^{2+}, Ni^{2+}, and Cd^{2+} ions from aqueous solutions. The results demonstrated fast sorption kinetics and high capacity for the investigated metals.

XI/7

Removal of model heavy metal ions (Ni^{2+}) by hybrid hydrogels based on poly(methacrylic acid) and casein

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Hybrid hydrogels based on poly(methacrylic acid) (PMAA) and casein have been synthesized via free-radical polymerization. Combining well the strong interaction between PMAA/casein and cationic species, accessibility of active sites in swollen network and fine mechanical stability, prepared hybrids were considered as promising candidates for removal of cationic species, such as Ni^{2+}, from an aqueous solution.

Very good adsorption properties from initial Ni^{2+} concentrations of 0.05 ppm to 100 ppm and easy and complete regeneration without significant decrease in adsorption capacities makes these low-cost materials highly sensitive adsorbents attractive for use in real conditions where it is necessary to avoid environmental risks and provide recover and reuse of the metal.

XII/1

Laser assembling of thin bioceramic and biocomposite films on titanium utilizing Pulsed laser deposition (PLC) and Matrix-assisted pulsed laser evaporation (MAPLE) techniques

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In modern medicine, golden strandards for hip and knee replacements are still titanium implants. Aiming for improved biocompatibility of these metallic devices, the research has focused on depositing hydroxyapatite and hydroxyapatite/biopolymer coatings on titanium, applying new techniques. Pulsed laser deposition (PLD) is a novel technique that has proved efficient in the fabrication of CaP films. Matrix-assisted pulsed laser evaporation (MAPLE) was developed for controlled assembly of biopolymer thin films. The obtained coatings were characterized by various methods. Extended improvement of osteointegration was achived through surface modification of Ti by forming a nanotubular layer of TiO_2 (100 nm in diameter).

XII/2

Magnetic and optical properties of the nickel thin film deposited by GLAD technique

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In this work, nickel thin film was deposited on glass sample using Glancing Angle Deposition (GLAD) technique, to a thickness of 1 μm. Glass sample was positioned 15 degrees with respect to the nickel vapour flux. The nickel thin film was characterized by Atomic Force Microscopy (AFM), Magneto–Optical Kerr effect Microscopy and Spectroscopic Ellipsometry. According to an AFM cross-section imaging, it was found that the nickel thin film has a columnar structure. The values of the coercivity, obtained from the magnetic hysteresis loops, were analyzed as a function of the sample rotation in the magnetic field. It was found that the direction of magnetization easy axis lies toward the structure growth. Optical properties of the nickel thin film were studied at the wavelength of 455 nm. From the shape of the refractive index and the extinction coefficient diagrams could be concluded that the nickel thin film has an optical anisotropy.

XII/3

The cataphoretic deposition of epoxy coating on Zn–Mn alloy substrate

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The cataphoretic deposition of epoxy coating was performed on steel modified by electroplated Zn–Mn alloy coatings containing 5, 8 or 16 at.% Mn. The adhesion measurements show that the epoxy coating is more strongly bonded to the Zn-Mn alloys, than to bare steel. However, the electrochemical impedance spectroscopy in NaCl electrolyte shows that the coating deposited on the Zn-Mn substrates with low Mn percent, is more conductive than the coating on steel and Zn-Mn with 16 at.% Mn. It is assumed that Mn inclusions in Zn-Mn substrate, prevent the dissolution of Zn during the cataphoretic deposition.

XII/4

Core-shell fibers for compsite materials with self-healing ability

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This study reports preparation and characterization of coaxial fibers containing components for self-healing. Fibers were obtained using coaxial electrospinning. The shell material for electrospinning was the solution of thermoplastic amorphous polymer, poly (methyl methacrylate) (PMMA) and 1st generation Grubbs' catalyst in dimethylformamide (DMF), while solution of healing agent, dicyclopentadiene (DCPD), in the same solvent, served as a core. Core-shell fibers' morphology and self-healing ability were investigated using SEM imaging. Size distribution of fibers was obtained after statistical analysis of SEM images. FTIR analysis was used for identification of starting components and products of self-healing reaction.

XII/5

Effect of diamond paste finishing on AFM surface texture parameters of dental nanofilled and nanohybrid composites polished by two different procedures

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The aim of this study was to determine the effect of diamond paste finishing on AFM surface texture parameters of dental nanofilled and nanohybrid composites polished by two different dental polishing protocols. The samples were polished by two dental polishing protocols using multi-step and one-step system. These protocols were than followed by diamond paste polishing. Samples were examined by Veeco di CP-II Atomic Force Microscope. Average roughness and maximum peak-to-valley distance were analyzed and compared between samples. Multi-step polishing protocol produced significantly smoother surface and lower roughness than one-step polishing protocol, even when it was followed by diamond paste polishing.

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XII/6

Dependence of high density polyethylene XPS spectrum on electron flood gun parameters

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As specimen charging appears the most significant obstacle in x-ray photoelectron spectroscopy (XPS) analysis of insulators, the application of low energy flood gun was investigated. Dependence of carbon and silicon peaks' properties, on flood gun parameters, was observed. The obtained results have shown that there is significant dependence of peaks' position, shape and width, on electron flood gun emission current and accelerating voltage.

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