NINTH YOUNG RESEARCHERS CONFERENCE
MATERIALS SCIENCES AND ENGINEERING

December 20-22, 2010, Belgrade, Serbia
Serbian Academy of Sciences and Arts, Knez Mihailova 35

Program and the Book of Abstracts

Materials Research Society of Serbia,
Institute of Technical Sciences of the
Serbian Academy of Sciences and Arts

December 2010, 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 the journals Tehnika – Novi Materijali and Chemical Industry. The best presented papers, suggested by Session Chairpersons and selected by Awards Committee, will be proclaimed at the Closing Ceremony.

Programme

Ninth Young Researchers Conference
Materials Science and Engineering

Monday, December 20, 2010

10.00 **Day of the Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Great Hall of SASA, 2nd floor**

Opening Ceremony of the Ninth Young Researchers Conference – Materials Science and Engineering: Prof. Dr. Nenad Ignjatović, President of the Organizing and Programming Committee

Cocktail in the Club SASA, mezzanine floor

13.00 **Registration, Hall 2, 1st floor SASA**

14.00 – 14.15 **Welcome speech by Prof. Dr. Nenad Ignjatović**

14.15 – 17.00 **1st Session – Nanotechnology and Advanced Materials**

Chairmen: Prof. Dr. Vladimir Srdić and Prof. Dr. Miroslav Dramićanin

14.15 – 14.30 Synthesis of strontium titanate core/ nickel ferrite shell nanoparticles
Bojana Mojić[1], Milan Nikolić[1], Jan Dusza[2], Vladimir Srdić[1]
[1]Department of Materials Engineering, Faculty of Technology, University of Novi Sad, Serbia, [2]Institute of Materials Research, Slovak Academy of Sciences, Košice, Slovak Republic

14.30 – 14.45 Comparison of titania nanoparticles synthesized by CVS and sol-gel methods
Stevan M. Ognjanović[1], Ivan Stijepović[1], Ružica Djenadić[2], Markus Winterer[2], Vladimir V. Srdić[1]
[1]Department of Materials Engineering, Faculty of Technology, University of Novi Sad, Serbia, [2]Nanoparticle Process Technology, Department of Engineering Science and Center for Nanointegration Duisburg-Essen (CeNIDE), University Duisburg-Essen, Duisburg, Germany

14.45 – 15.00 Microwave synthesis and characterization of Pt and PtRhSn electrocatalysts for ethanol oxidation
S. Stevanović[1], D. Tripković[2], D. Poleti[3], J. Rogan[3], D. Minić[4], A. Tripković[1], V.M. Jovanović[1]
[1]ICTM, Department of Electrochemistry,University of Belgrade, Belgrade, Serbia, [2]Materials Science Division, Argonne National Laboratory, Argonne, IL, USA, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [4]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

15.00 – 15.15 Nano-sized silane coatings as new materials in corrosion protection and adhesion promotion: the study of composition and electrochemical properties

Željka Jovanović[1], Jelena Bajat[1], Ingrid Milošev[2], Vesna Mišković-Stanković[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Jožef Stefan Institute, Department of Physical and Organic Chemistry, Ljubljana, Slovenia

15.15 – 15.30 Carbon -based materials for supercapacitors

Yulia G. Mateyshina, A. S. Ulihin, N.F. Uvarov
Institute of Solid State Chemistry and Mechanochemistry, Novosibirsk, Russia

15.30 – 15.45 Corrosion behavior of mild steel in CO_2 atmosphere

Aleksandra Debeljković[1], Ivana Jevremović[1], Vesna Mišković-Stanković[1], Srdjan Nešić[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Institute for Corrosion ad Multiphase Technology, Ohio University, Athens, OH, USA

15.45 – 16.00 Electrochemical behavior of nanostructured MnO_2/C(Vulcan) composite in aqueous electrolyte $LiNO_3$

Milica Vujković, Nikola Cvjetićanin, Nemanja Gavrilov, Ivana Stojković, Slavko Mentus
Faculty of Physical Chemistry, Belgrade, Serbia

16.00 – 16.15 Current – voltage characteristics of carbon nanotube FETs

Dušan B. Vasić[1], Petar M. Lukić[1], Vladan M. Lukić[2]
[1]University of Belgrade, Faculty of Mechanical Engineering, [2]Nokia Siemens Networks Srbija d.o.o. Belgrade, Serbia

16.15 – 16.30 Inquiring the local elastic properties of commonly used pharmaceutical excipients by nanoindentation techniques

Biljana Govedarica[1], Ilija Ilić[1], M. Škarabot[2], I. Muševič[2], Stane Srčič[1]
[1]Faculty of Pharmacy, Department of Pharmaceutical Technology, University Ljubljana, Slovenia, [2]Institute Jozef Stefan, Department of Condensed Matter Physics, Ljubljana, Slovenia

16.30 – 16.45 Age hardening potential of an Al-4.6 wt.% Mg alloy with Cu addition

Ana Alil[1], Miljana Popović[2], Tamara Radetić[2], Endre Romhanji[2], Bore Jegdić[1]
[1]Goša Institute, Belgrade, Serbia, [2]Dept. of Metall. Eng., Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

16.45 – 17.00 Properties of electrochemically deposited $Ni_xFe_yW_z$ alloy powder

Nataša Ćirović[1], Lenka Ribić-Zelenović[2], Nebojša Mitrović[3], Miroslav Spasojević[2], Aleksa Maričić[1]
[1]Valjaonica bakra Sevojno A.D, Sevojno, Serbia, [2]Faculty of Agronomy, University of Kragujevac, Čačak, Serbia, [3]Technical Faculty Čačak, University of Kragujevac, Čačak, Serbia

17.00 – 17.15 Break

17.15 – 19.15 2nd Session – Synthesis and Processing

Chairmen: Dr. Ralph Kraehnert, Prof. Dr. Nikola Cvjetićanin and Dr. Nebojša Nikolić

17.15 – 17.30 Synthesis and dielectric properties of calcium copper titanate (CCTO) based ceramics
Zoran Stojanović, Ljiljana Veselinović, Smilja Marković, Dragan Uskoković
Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia

17.30 – 17.45 Synthesis, stability ranges, structural characteristics and electrical conductivity of BI(CR,FE)VOX solid solutions.
Eugene V. Velichko[1], E.S. Buyanova[1], M.V. Morozova[1], S.A. Petrova[2]
[1]Ural State University, Yekaterinburg, Russia, [2]Institute of Metallurgy of the Ural Division of RAS, Yekaterinburg, Russia

17.45 – 18.00 Crystal growth of solvothermally obtained $LiFePO_4$ in dependence of synthesis conditions
Maja Kuzmanović[1], Dragana Jugović[1], Miodrag Mitrić[2], Nikola Cvjetićanin[3], Srečo Škapin[4], Dragan Uskoković[1]
[1]Institute of Technical Sciences of the SASA, Belgrade, Serbia, [2]The Vinča Institute, Condensed Matter Physics Laboratory, Belgrade, Serbia, [3]Faculty of Physical Chemistry, University of Belgrade, Serbia, [4]"Jožef Stefan" Institute, Ljubljana, Slovenia

18.00 – 18.15 The synthesis of tungsten trioxide gel by dissolution of tungsten in hydrogen peroxide and its transformations during the heat treatment in oxidation and reduction atmospheres
Radovan Georgijević, Slavko Mentus
University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia

18.15 – 18.30 Silica-silica and silica-titania combined coatings
Ádám Detrich, Dániel Balázs, Emőke Volentiru, Zoltán Hórvölgyi
Budapest University of Technology and Economics, Department of Physical Chemistry and Materials Science, Laboratory for Physical Chemistry, Budapest, Hungary

18.30 – 18.45 Control of pulse plasma transition state for enhanced processing efficiency
Ivan Popović, Miodrag Zlatanović, Djordje Klisić
School of Electrical Engineering, University of Belgrade, Belgrade, Serbia

18.45 – 19.00 Microstructure evolution and sintering kinetics of ZnO
Darko Kosanović[1], Suzana Filipović[1], Nina Obradović[1], Vladimir Pavlović[1], Momčilo M. Ristić[2]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Serbian Academy of Sciences and Arts, Belgrade, Serbia

19.00 – 19.15 Pulse plasma processing as a candidate technique for surface treatment of wind turbine components
Djordje Klisić, Miodrag Zlatanović, Ivan Popović
School of Electrical Engineering, University of Belgrade, Belgrade, Serbia

Tuesday, December 21, 2010

08.30 Registration, Hall 2, 1st floor SASA

09.00 – 11.15 3rd Session – Synthesis and Engineering of Biomaterials
Chairmen: Prof. Dr. Nenad Ignjatović, Prof. Dr. Djordje Janaćković and Dr. Vuk Uskoković

09.00 – 09.15 The influence of powder characteristics on two-step sintering behavior of hydroxyapatite
Miodrag Lukić[1], Zoran Stojanović[1], Ljiljana Veselinović[1], Srečo D. Škapin[2], Ines Bračko[2], Smilja Marković[1], Dragan Uskoković[1]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]Jožef Stefan Institute, Ljubljana, Slovenia

09.15 – 09.30 Green synthesis of PGA-capped silver nanoparticles and their characterization
Igor Savanović[1], Magdalena Stevanović[1], Srečo Škapin[2], M. Marković[3], Dragan Uskoković[1]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]Jožef Štefan Institute, Ljubljana, Slovenia, [3]Vinča Institute of Nuclear Sciences, Belgrade, Serbia

09.30 –09.45 Nucleation of biomimetic hydroxyapatite
Božana Čolović, Vukoman Jokanović
Institute of Nuclear Sciences "Vinča", Laboratory for radiation chemistry and physics, Belgrade, Serbia

09.45 – 10.00 Structural characterization of synthetic and biological carbonated hydroxyapatite
Ljiljana Veselinović[1], Miodrag Lukić[1], Ljiljana Karanović[2], Nenad Ignjatović[1], Smilja Marković[1], Dragan Uskoković[1]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]Laboratory for Crystallography, Faculty of Mining and Geology , University of Belgrade, Belgrade, Serbia

10.00 – 10.15 Evaluation of alginate hydrogels in a biomimetic bioreactor applying dynamic compression
Jovana Zvicer, Jasmina Stojkovska, Bojana Obradović
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

10.15 – 10.30 Evaluation of novel alginate nanocomposites for biomedical applications
Jasmina Stojkovska, Željka Jovanović, Danijela Kostić, Jovana Zvicer, Ivana Jevremović, Maja Vukašinović-Sekulić, Vesna Mišković-Stanković, Bojana Obradović
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

10.30 – 10.45 The influence of different polymerization mechanisms on thermal properties of poly(L-lactide)
Martina S. Basrak[1], Nataša D. Božić[1], Jaroslava K. Budinski-Simendić[1], Radmila Z. Radičević[1], Ljubiša B. Nikolić[2], Ivan S. Ristić[1]
[1]University of Novi Sad, Faculty of Technology, Novi Sad, Serbia, [2]University of Niš, Faculty of Technology, Leskovac, Serbia

10.45 – 11.00 Investigation of electrochemically synthesized Ag/PVP nanocomposites: Biomimetic approach
Ivana Jevremović, Željka Jovanović, Jasmina Stojkovska, Bojana Obradović, Maja Vukašinović-Sekulić, Aleksandra Perić-Grujić, Mirjana Ristić, Vesna Mišković-Stanković
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

11.00 – 11.15 Chitosan laminated collagen film properties
Nevena Krkić, Vera Lazić, Jasna Gvozdenović
Faculty of Technology, Novi Sad, Serbia

11.15 - 12.00 Break

12.00 – 14.30 4th Session – Application of Biomaterials

Chairpersons: Prof. Dr. Zorica Ajduković and Prof. Dr. Bojana Obradović

12.00 – 12.15 Antibacterial activity of hydroxyapatite/silver nanocomposite
Marija Vukomanović[1,2], U. Repnik[3], T. Zavašnik[3], Srečo D. Škapin[1], Dragan Uskoković[2], Danilo Suvorov[1]
[1]Department of Advanced Materials, Jožef Stefan Institute, Ljubljana, Slovenia, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia, [3]Department of Biochemistry and Molecular Biology, Jožef Stefan Institute, Ljubljana, Slovenia

12.15 – 12.30 Protective effects of oral applied fullerenol $C_{60}(OH)_{24}$ nano particles, in rats after a single dose of DOX
Ivana Ičević[1], Aleksandar Djordjević[1], Branka Srdjenović[2], Saša Vukmirović[2], Jan Sudji[2], Rade Injac[3]
[1]University of Novi Sad, Faculty of Science, Department of Chemistry, Biochemistry and Environmental Protection, Novi Sad, Serbia, [2]University of Novi Sad, Faculty of Medicine, Department of Pharmacy, Novi Sad, Serbia, [3]Faculty of Pharmacy, The Chair of Pharmaceutical Biology, University of Ljubljana, Ljubljana, Slovenia

12.30 – 12.45 Distribution of nanoparticles of fullerenol in human serum in presence of doxorubicin

Danica Radmanovac[1], Aleksandar Djordjević[1], Alenka Mertelj[2], Mariana Seke[3], Rade Injac[4], Ivana Ičević[1]
[1]University of Novi Sad, Faculty of Science, Department of Chemistry, Biochemistry and Environmental Protection, Novi Sad, Serbia, [2]Institut Jožef Stefan, Ljubljana, Slovenija, [3]University of Belgrade, Faculty of Biology, Beograd, Srbija, [4]Faculty of Pharmacy, The Chair of Pharmaceutical Biology, University of Ljubljana, Ljubljana, Slovenia

12.45 – 13.00 Alginate microbeads as cell supports in a biomimetic bioreactor for cartilage tissue engineerig

Danijela Kostić, Jasmina Stojkovska, Bojana Obradović
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

13.00 – 13.15 The characterization of HAP/Lig coatings containing different lignin concentrations and their influence on the cytotoxicity

Sanja Eraković[1], Djordje Veljović[1], Papa N. Diouf[2], Tatjana Stevanović[2], Miodrag Mitrić[3], Ivana Matić[4], Zorica Juranić[4], Vesna Mišković-Stanković[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2] Département des sciences du bois et de la forêt, Université Laval, Québec, Canada, [3]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [4]Institute for Oncology and Radiology of Serbia, Belgrade, Serbia

13.15 – 13.30 In vitro evaluation of antimicrobial activity of nano composite biomaterials based on hydroxyapatite

Zorica Ajduković[1], Jelena Milićević[1], Milica B. Petrović[1], Nadica Djordjević[2], S. Mladenović- Antić[3], B. Kocić[3], Nenad Ignjatović[4], Dragan Uskoković[4], Vojin Savić[5]
[1]Faculty of Medicine, Niš, Clinic of Stomatology, Department of Prosthodontics, Niš, Serbia, [2]Faculty of Medicine, University of Priština located in Kosovska Mitrovica, Clinic of Stomatology, Department of Prosthodontics, Niš, Serbia, [3]Institute of Public Health, Center for Microbiology, Niš, Serbia, [4]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [5]Faculty of Medicine, Niš, Institute of Biomedical Research, Niš, Serbia

13.30 – 13.45 Evaluation compensation of an osteoporotic rat bone with Ca/Co-HAp nanoparticles

Zorica Ajduković[1], Milica B. Petrović[1], Jelena Milićević[1], Nadica Djordjević[2], Nenad Ignjatović[3], Dragan Uskoković[3], Vojin Savić[4]
[1]Faculty of Medicine, Clinic of Stomatology, Department of Prosthodontics, Niš, Serbia, [2]Faculty of Medicine, University of Pristina located in Kosovska Mitrovica, Clinic of Stomatology, Department of Prosthodontics, Niš, Serbia, [3]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [4]Faculty of Medicine, Niš, Institute of Biomedical Research, Niš, Serbia

13.45 – 14.00 Determination of clindamycin in pig plasma after implantation of poly(D,L-lactide-co-glycolide)/hydroxyapatite/clindamycin core–shell nanosphere by liquid chromatography-tandem mass spectrometry

Gorica Vuković[1], Sanja Lazić[2], Dragana Šunjka[2], Vojislava Bursić[2], Ivan Šarčev[3], Marija Vukomanović[4], Nenad Ignjatović[4], Dragan Uskoković[4]
[1]Institute of Public Health of Belgrade, Belgrade, [2]Faculty of Agriculture, Novi Sad, [3]Medical Faculty, Novi Sad, [4]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia

14.00 – 14.15 Effect of caseinphosphopeptide-amorphous calcium phosphate and fluoride on enamel remineralisation

Tamara Perić[1], Dejan Marković[1], Radmila Jančić Heinemann[2], Vesna Radojević[2], Bojan Petrović[3]
[1]Faculty of Dentistry, University of Belgrade, Belgrade, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, [3]Dentistry Clinic of Vojvodina, University of Novi Sad, Novi Sad, Serbia

14.15 – 14.30 Mineral trioxide aggregate as an alternative material in endodontic treatment for teeth with incomplete root development

Bojan Petrović[1], Dejan Marković[2], Tamara Perić[2], Vukoman Jokanović[3]
[1]Department of Paediatric and Preventive Dentistry, Dentistry Clinic of Vojvodina, Faculty of Medicine, University of Novi Sad, Serbia, [2]Department of Paediatric and Preventive Dentistry, Faculty of Dentistry, University of Belgrade, Serbia, [3]Laboratory for radiation chemistry and physics, Institute of Nuclear Sciences Vinča, Belgrade, Serbia

14.30 – 15.30 Break

15.30 – 17.30 5th Session – Polymer Science

Chairpersons: Dr. Edin Suljovrujić and Prof. Dr. Gordana Ćirić-Marjanović

15.30 – 15.45 Redox-sensitive poly(amino acid) based gels

Benjámin S. Gyarmati, András Szilágyi
Department of Physical Chemistry and Materials Science, Budapest University of Technology and Economics, Laboratory of Soft Matters, Budapest, Hungary

15.45 – 16.00 Effects of composition and crosslinker content on swelling and mechanical properties of poly(2-hydroxyethyl acrylate/itaconic acid) hydrogels

Jovana S. Jovašević[1], Maja M. Mićić[2], Edin H. Suljovrujić[2], Simonida Lj. Tomić[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia,
[2]Vinča Institute of Nuclear Sciences, Belgrade, Serbia

16.00 – 16.15 Synthesis of nanostructured polyaniline in the presence of vanillic acid

Aleksandra M. Janošević[1], Gordana N. Ćirić-Marjanović[2]
[1]Faculty of Pharmacy, Belgrade, Serbia,
[2]Faculty of Physical Chemistry, Belgrade, Serbia

16.15 – 16.30 Microstructure and crystallinity of oriented polyolefins
Tihana Mudrinić[1], Dejan Miličević[2], A. Leskovac[2], Miodrag Mitrić[2], Edin Suljovrujić[2]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia
[2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

16.30 – 16.45 Poly(itaconic acid) /pectin blends as membrane materials
Aleksandra Nešić
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

16.45 – 17.00 Kinetics of pertechnetate removal by amino-functionalized glycidyl methacrylate copolymer
Danijela D. Maksin[1], Radmila V. Hercigonja[2], Magdalena Ž. Lazarević[1], Marija J. Žunić[3], Aleksandra B. Nastasović[4]
[1]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [2]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia, [3]ICTM-Center for Catalysis and Chemical Engineering, University of Belgrade, Belgrade, Serbia, [4]ICTM-Center for Chemistry, Polymer Department, University of Belgrade, Belgrade, Serbia

17.00 – 17.15 Surface characterization of polyurethane nanocomposites
Vesna Simendić, Ivan S. Ristić, Nevena Vukić
Faculty of Technology, University of Novi Sad, Novi Sad, Serbia

17.15 – 17.30 Electrical cable-like model of microtubules
Dalibor L. Sekulić, Miljko V. Satarić, Miloš B. Živanov
Faculty of Technical Sciences, University of Novi Sad, Serbia

Wednesday, December 22, 2010

09.00 – 12.30 6th Session – Theoretical Modelling of Materials

Chairpersons: Dr. Željka Nikitović, Dr. Nikola Novaković and Prof. Dr. Nebojša Mitrović

09.00 – 09.15 Stable configurations of graphene based structures
Nataša Lazić, E. Dobardžić, Milan Damnjanović
NanoLab, University of Belgrade, Faculty of Physics, Belgrade, Serbia

09.15 – 09.30 DFT study of hydrogen adsorption on Pt(100), Pt(110) AND Pt(111) surfaces
Dragana D. Vasić, Igor A. Pašti , Slavko V. Mentus
Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

09.30 – 09.45 AB initio calculation of the structure and partition functions of BC_2
Radojka Vujasin[1], Milan Senćanski[2]
[1]Laboratory of Material Sciences, Vinča Institute of Nuclear Sciences, Belgrade, Serbia, [2]Innovation center of the Faculty of Chemistry, Belgrade, Serbia

09.45 – 10.00 Energy spectrum of a circular graphene quantum dot in a perpendicular magnetic field
Marko Grujić, Milan Tadić
Faculty of Electrical Engineering, University of Belgrade, Belgrade, Serbia

10.00 – 10.15 Research of dynamic compaction in powder environments
A.O. Tovpinets, E.V. Zhukov, M.A. Dmitrieva, V.N. Leitsin
Russian State University "Immanuil Kant", Kaliningrad, Russia

10.15 – 10.30 Analysis of specific transmission maxima in rectangular semiconductor quantum well
Nemanja Niketić, Vitomir Milanović, Jelena Radovanović
School of Electrical Engineering, Belgrade, Serbia

10.30 - 11.00 Break

11.00 – 11.15 Influence of thermal memory on the thermoelastic bending component of photoacoustic response
Mioljub Nešić, Marica Popović, Slobodanka Galović
The "Vinča" Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

11.15 – 11.30 Application of the progressive failure criteria in determining delamination of multilayer composite materials with an interlayer crack
Dragan Čukanović[1], Aleksandar Radaković[2], Miroslav Živković[1]
[1]Faculty of Mechanical Engineering, Kragujevac, [2]State University in Novi Pazar, Serbia

11.30 – 11.45 Determining the laminate "safe" stress zone in different types of loading
Aleksandar Radaković[1], Dragan Čukanović[2], Dragan Milosavljević[2]
[1]State University in Novi Pazar, [2]Faculty of Mechanical Engineering, Kragujevac, Serbia

11.45 – 12.00 Electromechanical characterization of helically coiled carbon nanotubes
Zoran P. Popović, Ivanka Milošević, Milan Damnjanović
University of Belgrade, Faculty of Physics, Belgrade, Serbia

12.00 – 12.15 The critical parameters of ultra-thin molecular film for monochromatic absorption
Stevan Armaković[1], Ana J. Šetrajčić-Tomić[2], Dragana Rodić[1], Blanka Škipina[3], Svetlana Pelemiš[4], Jovan P. Šetrajčić[1]
[1]University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Vojvodina – Serbia, [2]University of Novi Sad, Medical Faculty, Department of Pharmacy, Novi Sad, Vojvodina – Serbia, [3]University of Banja Luka, Faculty of Technology, Banja Luka, Republic of Srpska – B&H, [4]University of East Sarajevo, Faculty of Technology, Zvornik, Republic of Srpska – B&H

12.15 – 12.30 Phonon contribution in the superconducting properties of ultra-thin film structure
Igor J. Šetrajčić, Dragana Rodić, Igor Mandić, Stevan Armaković, Nenad V. Delić, Jovan P. Šetrajčić
University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Vojvodina – Serbia

12.30 - 13.00 Break

13.00 – 15.30 7th Session – Composite Materials and Thin Films

Chairpersons: Dr. Jasmina Grbović Novaković, Dr. Nebojša Nikolić and Dr. Srečo Škapin

13.00 – 13.15 Shoe-based multifunctional composite component with power generation, storage and structural capabilities
Noaman Makki, Remon Pop-Iliev
University of Ontario Institute of Technology, Oshawa, Ontario, Canada

13.15 – 13.30 Exchange kinetics and diffusion of oxygen in $La_{0.8}Sr_{0.2}Fe_{0.7}Ni_{0.3}O_{3-\delta}$ – $Ce_{0.9}Gd_{0.1}O_{1.95}$ composites with different microstructures
Yu.S. Okhlupin[1], M.V. Ananyev[2], Yulia G. Mateyshina[1], N.F. Uvarov[1]
[1]Institute of Solid State Chemistry and Mechanochemistry SB RAS, Novosibirsk, Russia, [2]Institute of High Temperature Electrochemistry UB RAS, Yekaterinburg, Russia

13.30 – 13.45 The effect of low-frequency oscillations on the Al-Ti-Zr melts for synthesis of aluminide and carbide nucleating phases
Aleksey Dolmatov, Elvira Popova, Ludmila Bodrova, Eduard Pastukhov, Andrey Bykov
Institute of Metallurgy UD RAS, Ekaterinburg, Russia

13.45 – 14.00 Dielectrical properties of EVA-carbon black composites
Kosta Simonović[1], F. Marinković[1], V. Cubrović[1], J. Dojčilović[1], Duško Dudić[2], V. Doković[2]
[1]Faculty of Physics, Belgrade University, Belgrade, Serbia
[2]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia

14.00 – 14.15 Hydrogen desorption from MgH_2-VO_2 composite
Sanja Milošević, Željka Rašković, Sandra Kurko, Ljiljana Matović, Nikola Cvjetićanin, Jasmina Grbović Novaković
[1]Faculty of Physical Chemistry, Belgrade, Serbia
[2]Vinča Institute of Nuclear Sciences, Belgrade, Serbia

14.15 – 14.30 Hydrogen storage properties of MgH_2-CeO_2 composites
Željka Rašković, Sandra Kurko, Radojka Vujasin, Jelena Gulicovski, Sanja Milošević, Ljiljana Matović, Jasmina Grbović Novaković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

14.30 – 14.45 Structural and electrical properties of TiO_x ($x \leq 2$) thin films obtained by reactive d.c. sputtering
Dejan Pjević, Davor Peruško, Momir Milosavljević, Velimir Milinović
„Vinča“ Institute of Nuclear Sciencies, Belgrade, Serbia

14.45 – 15.00 Characterization of the plasma electrolytic oxidation of aluminium in electrolytes that produce barrier oxide films
Marija Petković[1], S. Stojadinović[1], R. Vasilić[2], I. Belca[1], B. Kasalica[1], Z. Nedić[3], Lj. Zeković[1]
[1]Faculty of Physics, University of Belgrade, Belgrade, Serbia, [2]Faculty of Environmental Governance and Corporate Responsibility, Educons University, Sremska Kamenica, Serbia, [3]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

15.00 – 15.15 Microstructure and electrical characteristics of modified alumo-silicate ceramics
Jelena M. Purenović[1], Vesna Paunović[1], Vojislav Mitić[1,2]
[1]Faculty of Electronic Engineering, University of Niš, Niš, Serbia, [2]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia

15.15 – 15.30 Properties of some low melting lead-free alloys for ecological solders production
Aleksandra Milosavljević[1], Dragana Živković[2], Ana Kostov[1], Radiša Todorović[1]
[1]Mining and Metallurgy Institute, Bor, Serbia
[2]University in Belgrade, Technical Faculty in Bor, Bor, Serbia

15.30 - 16.45 Break

16.45 – 18.15 8th Session – Various Problems of Materials Science

Chairpersons: Dr. Jasmina Grbović Novaković, Dr. Nebojša Nikolić and Prof. Dr. Kemal Delijić

16.45 – 17.00 Kinetics of metoprolol tartrate photocatalytic degradation
Sanja J. Kler, Daniela V. Šojić, Biljana F. Abramović
University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Novi Sad, Serbia

17.00 – 17.15 Isothermal kinetics of water exchange in silica hydrogel
Aleksandra Pavićević, Vojkan Radonjić
Faculty of Physical Chemistry, Belgrade, Serbia

17.15 – 17.30 Voltametric determination of linuron insecticide in methanol using a boron doped, glassy carbon and commercial glassy carbon electrode
Jelena Djordjević[1], Ana Kalijadis[1], Ksenija Kumrić[1], Zoran Jovanović[1], Zoran Laušević[1], Milovan Purenović[2], Tatjana Trtić-Petrović[1]
[1]Laboratory of Physics (010), Vinča Institute of Nuclear Sciences, Belgrade, Serbia, [2]Faculty of Sciences and Mathematics, Department of Chemistry, University of Niš, Niš, Serbia

17.30 – 17.45 Use of natural zeolite for removal of Cu(II) from aqueous solutions in a fluidized-bed reactor
Srdjan Vidović, Nevenka Rajić, Bojana Obradović
Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

17.45 – 18.00 XRD and SEM analysis of urinary stones
Miljana Miljević[1], Aleksandra Rosić[2]
[1]Alaska 28/5, Belgrade, Serbia, [2]Faculty of Mining and Geology, Belgrade, Serbia

18.00 – 18.15 Computation of pressure of the liquid carbon dioxide in tank during summer storage conditions
Mirjana Prvulović, Milan Prokolab,Stevan Budimir
Institute Goša, Belgrade, Serbia

18.30 Closing Ceremony

I/1

Synthesis of strontium titanate core/ nickel ferrite shell nanoparticles

Bojana Mojić[1], Milan Nikolić[1], Jan Dusza[2], Vladimir Srdić[1]

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[2]*Institute of Materials Research, Slovak academy of sciences, Košice, Slovak Republic*

Over the last decade, there have been immense effects to fabricate core-shell materials with tailored properties. This work presents a possible approach for coating strontium titanate nanoparticles with a shell consisting of nickel ferrite nanoparticles. Strontium titanate ($SrTiO_3$) nanoparticles were synthesized by sol-gel and hydrothermal method in two-step process, while shell of nickel ferrite ($NiFe_2O_4$) nanoparticles have been synthesized by co-precipitation route using stable ferric and nickel salts with sodium hydroxide as the precipitating agent. Influence of process parameters (pH, temperature, core/shell mass ratio) on structural characteristics of core-shell particles was examined. Obtained core particles, as well as core-shell structures were characterised with different techniques.

I/2

Comparison of titania nanoparticles synthesized by CVS and sol-gel methods

Stevan M. Ognjanović[1], Ivan Stijepović[1], Ružica Djenadić[2], Markus Winterer[2], Vladimir V. Srdić[1]

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[2]*Nanoparticle Process Technology, Department of Engineering Science and Center for Nanointegration Duisburg-Essen (CeNIDE), University Duisburg-Essen, Duisburg, Germany*

In this work titanium dioxide powders were synthesized by chemical vapour synthesis (CVS) and sol-gel method. Influence of process parameters (system pressure and hot-wall temperature for CVS and amount of acid and nature of the precursor for sol-gel method) on powder characteristics was examined. It was determined that by precisely controlling the parameters it is possible to fine-tune the powder characteristics. Characteristics of the powders synthesized by different methods were then compared to reveal any inherent advantages/disadvantages of the method. It was found that the powders had very similar characteristics (crystallinity, crystallite size, particle diameter, etc.) and that the only major difference was the degree of agglomeration which was several orders of magnitude larger for the sol-gel synthesized powders.

I/3

Microwave synthesis and characterization of Pt and PtRhSn electrocatalysts for ethanol oxidation

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[4]*Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia*

Carbon supported Pt and PtRhSn catalysts were synthesized by microwave-polyol method in ethylene glycol solution and investigated for the ethanol electro-oxidation reaction. The catalysts were characterized in terms of structure, morphology and composition by employing XRD, STM, EDX and TGA techniques. Unsupported Pt and PtRhSn nanoparticles were characterized by scanning tunnelling microscopy (STM). The mean particle size and distribution were acquired from a few randomly chosen areas in the STM images containing about 150 particles. STM analysis confirmed that both catalysts have rather uniform particles smaller then 2 nm for bout catalysts. The Pt/C and PtRhSn/C catalysts were characterized by X-ray powder diffraction analysis. While XRD analysis of the Pt/C catalyst revealed the main characteristic peaks of face centered cubic crystal structure (*fcc*) of platinum, XRD patterns of the PtRhSn/C catalyst are all broadened and cannot be clearly resolved.

Electrochatalytic activity of the catalysts ware investigated by potentiodynamic and chronoamperometric tests. PtRhSn/C catalyst is highly active for the ethanol oxidation with the onset potential shifted for ~ 150 mV to more negative values and with currents nearly 2 times higher in comparison to Pt/C catalyst. The stability of catalyst was studied in the chronoamperometric experiments. The PtRhSn/C catalyst is evidently less poisoned then Pt/C catalyst. The small particle sizes and homogeneous size distributions of both catalysts should be attributed to the advantages of microwave assisted modified polyol process in ethylene glycol solution.The increased activity of PtRhSn/C catalyst in comparison to Pt/C catalyst is most probably promoted by bi-functional mechanism and the electronic effect of alloyed metals.

I/4

Nano-sized silane coatings as new materials in corrosion protection and adhesion promotion: the study of composition and electrochemical properties

Željka Jovanović[1], Jelena Bajat[1], Ingrid Milošev[2], Vesna Mišković-Stanković[1]

[1]*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia*
[2]*Jožef Stefan Institute, Department of Physical and Organic Chemistry, Ljubljana, Slovenia*

Silane films, having nanometer-sized thicknesses, have been studied as new metallic surface pretreatments: silanes became substitutes of choice for traditional chromate pretreatments, because of their environmental compatibility. Two types of silane films on aluminium were investigated: methacryloxypropyltrimethoxysilane (MAPT) and vinyltriethoxysilane (VTES). By comparison of the electrochemical characteristics, adhesion and morphology, VTES films are shown to be more efficient in corrosion protection. Therefore, VTES is further investigated, by AES and XPS, and used as a sublayer for epoxy coating on aluminium. It was shown that VTES film pretreatment of aluminium surface significantly improved barrier properties and adhesion of epoxy coating.

I/5

Carbon -based materials for supercapacitors

Yulia G. Mateyshina, A. S. Ulihin, N.F. Uvarov

Institute of Solid State Chemicstry and Mechanochemistry, Novosibirsk, Russia

Supercapacitors have tremendous potential as high-energy and high-power sources for use in low weight systems. In this work, we report results of the study of new composite electrode materials based on carbon nanofibers for application in asymmetric supercapacitors. The carbon materials were modified by treatment in acids (H_2SO_4, HNO_3). Then nanoparticles of transition metal oxides, MO_x ($M=Mn^{4+}$,Ni^{2+}, Ti^{4+}) were deposited on the carbon surfaces using methods of salts impregnation, mechanical treatment and CVD. The electrode composite materials were investigated in a symmetrical two-electrode cell using XRD, SEM, an impedance spectroscopy, voltammetry. The work is supported by grants GContract № 16.740.11.0209

I/6

Corrosion Behavior of mild steel in CO_2 atmosphere

Aleksandra Debeljković[1], Ivana Jevremović[1], Vesna Mišković-Stanković[1], Srdjan Nešić[2]

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In the aqueous phase, CO_2 forms carbonic acid which exhibits strong corrosive attack to mild steel. In this study, corrosion behavior of mild steel was investigated in 3 wt. % NaCl with corrosion inhibitors (ethylamine and diethylamine) added at different concentrations: 0.3mM, 0.8mM, 1.6mM, 3.3mM and 4.9mM. In order to determine the corrosion efficiency of investigated inhibitors and the optimal concentration of inhibitors to achieve the lowest corrosion of mild steel, the linear sweep voltametry, electrochemical impedance spectroscopy and open circuit potential measurements were used. The results have confirmed that these inhibitors can significantly improve corrosion stability of mild steel.

I/7

Electrochemical behavior of nanostructured MnO2/C(Vulcan) composite in aqueous electrolyte $LiNO_3$

Milica Vujković, Nikola Cvjetićanin, Nemanja Gavrilov, Ivana Stojković, Slavko Mentus

Faculty of Physical Chemistry, Belgrade, Serbia

The electrolytic solutions of contemporary Li-ion batteries are made exclusively with organic solvents, since anodic materials of these batteries have potentials much more negative than the potential of water reduction, and organic electrolytes may withstand the voltages 3-5 V characteristic for these batteries. Since the discovery that some materials may electrochemically intercalate and deintercalate Li-ions in aqueous solutions, the number of works aimed to the attempts to make aqueous Li-ion battery grows permanently.

Manganese oxide has been largely studied as electrode material in rechargeable lithium-ion batteries with organic electrolytes. In this work its electrochemical behavior as an anode material in aqueous electrolyte solutions were examined first time. MnO_2 as a component of nanodispersed MnO_2/C(Vulcan) composite was synthesized hydrothermally and investigated in aqueous saturated $LiNO_3$ solution by both cyclic voltammetry and galvanostatic charging/discharging ($LiMn_2O_4$ as cathode material) techniques. The obtained composite shows a relatively good initial discharge capacity of 96,5 mAh/g which after 50^{th} charging/discharging cycles drops to a value of 57mAh/g. Thanks to its good reversibility and cyclability MnO_2/C(Vulcan) composite could be a promising anodic material for aqueous Li-ion batteries.

Keywords: Aqueous lithium-ion batteries, Li-ion intercalation, Manganese oxide.

I/8

Current – voltage characteristics of carbon nanotube FETs

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In this paper, one of the most actual devices – carbon nanotube field effect transistor (CNT FET) is investigated. At the beginning, the nanotube properties are presented. The main contribution of this paper is the new analytical model of CNT FET current – voltage characteristics. Developed model describes behavior of CNT FET in very good manner and, at the same time, the model is relatively simple. Using the developed model, simulations were performed. The results obtained by using proposed model are in very good agreement with already known and published ones.

I/9

Inquiring the local elastic properties of commonly used pharmaceutical excipients by nanoindentation techniques

Biljana Govedarica[1], I. Ilić[1], M. Škarabot[2], I. Muševič[2], S. Srčič[1]

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Mechanical properties of pharmaceutical solids are fundamental for research and development as well as production of solid dosage forms, and excipients selection. The main goal of current research was the evaluation of the local elastic properties of commonly used pharmaceutical excipients with nanoindentation techniques such as atomic force microscopy and nanoindenter. More profound interest of such study would be the correlation of mechanical properties at the single particle level with the compaction behavior estimated at the bulk level. Such unique combination of high resolution imaging technique and compositional mapping in the nanometer scale should provide relevant data about mechanical properties and therefore could be used in prediction of appropriate formulation for direct compression.

I/10

Age hardening potential of an Al-4.6 wt.% Mg alloy with Cu addition

Ana Alil[1], Miljana Popović[2], Tamara Radetić[2], Endre Romhanji[2], Bore Jegdić[1]

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The ageing behavior of an Al-4.6Mg-0.54Cu (in wt.%) alloy was studied after: (i) solution treatment for 1h at 530°C, and (ii) annealing at 280°C for 3h. Both groups of the heat treated specimens underwent further thermo-mechanical processing: 5% pre-deformation in tension + artificial ageing at various temperatures: 140°, 160° and 180°C for 30 min. Effect of the thermo-mechanical processing on the microstructure and mechanical properties was investigated by tensile testing and electrical resistivity measurements.

Solutionizing at 530°C resulted in higher resistivity level indicating that the most of solute atoms are retained in the solid solution. This provides great potential for precipitation hardening in a wide range of ageing temperatures. On the other hand, it appears that most of the main alloying elements precipitated during the annealing at 280°C thus diminishing the ageing potential. After further thermo-mechanical processing, the specimens annealed at 280°C showed significantly lower strength level than once solutionized at 530°C.

Key words: Al-Mg-Cu alloy, ageing, precipitation hardening, mechanical properties.

I/11

Properties of electrochemically deposited $Ni_xFe_yW_z$ alloy powder

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Nanostructural powder NixFeyWz was electrochemically deposited from ammoniac citrate bath at room temperature by using different current densities higher than 500 mA/cm^2. X-ray diffraction analysis has shown that the obtained powder contain crystal phase with the Fm-3m symmetry of FCC solid solution of Ni, Fe and W. Particles in the shape of cauliflower with a large number of pores were observed by TEM. Depending on current densities and chemical composition of bath size of nanocrystals was in the range from 2 nm to 7 nm.

Temperature dependence of the magnetic susceptibility of powder was investigated by the modified Faraday method in the temperature region from room temperature up to 600 ^{O}C. It has been established that the Curie temperature of as-prepared powder is about 300 ^{O}C. After first heating up to 400 ^{O}C magnetic permeability increases for about 12 %. After second heating up to 600 ^{O}C magnetic permeability decreases for about 5 %, but Curie temperature increases to about 400 ^{O}C.

II/1

Synthesis and dielectric properties of calcium copper titanate (CCTO) based ceramics

Zoran Stojanović, Ljiljana Veselinović, Smilja Marković, Dragan Uskoković

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The perovskite $CaCu_3Ti_4O_{12}$ (CCTO) powders with various oxide phase impurities were synthesized via citric gel combustion method. Influence of citric acid amount used for gel preparation was examined in order to lower CCTO formation temperature to obtain powders with less impurities and better micro structural characteristics. Prepared powders were pressed into pellets and sintered at 1000 ^oC. Effects of oxide component impurities, such as CuO, rutile, anatase, $CaTiO_3$ were examined on sintering behavior and dielectric properties of ceramics. Phase composition of powders and sintered specimens were determined by XRD, microstructure powders and sintered bodies were observed by SEM, and dielectric constants of sintered ceramics were measured by Wayne-Kerr B224 universal bridge.

II/2

Synthesis, stability ranges, structural characteristics and electrical conductivity of BI(CR,FE)VOX solid solutions.

Eugene V. Velichko[1], E.S. Buyanova[1], M.V. Morozova[1], S.A. Petrova[2]

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[2]*Institute of Metallurgy of the Ural division of RAS, Yekaterinburg, Russia*

Samples of Cr^{III}, Fe^{III}-substituted bismuth vanadate, formulated as $Bi_4V_{2-x}Fe_{x/2}Cr_{x/2}O_{11-\delta}$, $0<x<0.70$, were synthesized by convenient solid-state and citrate-nitrate methods. The structure was investigated using X-ray powder diffraction, differential thermal analysis and high-temperature X-ray powder diffraction. The solid solutions with $0.2\leq x\leq 0.7$ crystallize in tetragonal space group *I*4/*mmm*. Electrical conductivity of BICRFEVOX was studied by means of impedance spectroscopy as a function of temperature and composition. Above 873 K the highest conductivity is characteristic for x=0.2 solid solution. Samples synthesized via liquid precursors display higher total conductivity than those obtained by solid-state technique.

II/3

Crystal growth of solvothermally obtained $LiFePO_4$ in dependence of synthesis conditions

Maja Kuzmanović[1], Dragana Jugović[1], Miodrag Mitrić[2], Nikola Cvjetićanin[3], Srečo Škapin[4], Dragan Uskoković[1]

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Olivine type $LiFePO_4$ is a promising cathode material for the use in lithium ion batteries, especially in the batteries for hybrid electric vehicles or pure electric vehicles. In this work, $LiFePO_4$ was synthesized by solvothermal method at 180°C, for 15 hours. The n-hexanol was used as a solvent with cyclohexane and Triton X-100 as co-solvent and surfactant, respectively. The powders were annealed at elevated temperatures with addition of oxalic acid as carbon source. The conditions of solvothermal synthesis and the presence of the oxalic acid played important role in the crystal growth mechanism. Powders were characterized by X-ray diffraction, scanning electron microscopy and galvanostatic charge-discharge cycling.

II/4

The synthesis of tungsten trioxide gel by dissolution of tungsten in hydrogen peroxide and its transformations during the heat treatment in oxidation and reduction atmospheres

Radovan Georgijević, Slavko Mentus

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Tungsten trioxide has a wide spectrum of applications in optical and electrochromic devices, gas sensors, solar energy conversion, etc, and may be reduced to metallic state by heating in hydrogen atmosphere, which offers a new field of application. A suitable precursor for nanodispersed oxide and oxide films of nanometer thickness may be obtained by dissolving metallic tungsten in hydrogen peroxide. In this work such a solution was obtained, and dried to a state of transparent gel, by heating in air at 60°C. The gel was evidenced to be amorphous by means of X-ray diffractometry. By thermogravimetry it was determined that the molar ratio of H_2O against WO_3 in the gel was 1.5 : 1, and that on heating it at a rate 15°C min^{-1} water removal occurs up to 400°C. The X-ray diffractometry evidenced that the obtained product presents monoclinic WO_3. Both of these oxide forms were heated in a TGA device in reduction hydrogen atmosphere, and it was observed that the reduction of both amorphous and crystalline sample proceeded at almost equal temperatures. The morphology and granulation of obtained metallic powders were studied by means of scanning electron microscope.

II/5

Silica-silica and silica-titania combined coatings

Ádám Detrich, Dániel Balázs, Emőke Volentiru, Zoltán Hórvölgyi

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Structural, morphological and mechanical investigations of thin silica and titania coatings will be reported in our talk. The complex (silica-silica and silica-titania) films were prepared by combining the Langmuir-Blodgett (LB) technique with sol-gel method (SG). Two types of coatings were developed: nanoparticulate LB layer coated by sol-gel layer and *vice-versa*.

Structural information was obtained by scanning electron microscopy, by UV-Vis spectroscopy and by scanning angle reflectometry methods, while morphology was studied by atomic force microscopy. We will show that the combination of LB and SG methods gives a new entry to the fabrication of advanced coatings.

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II/6

Control of pulse plasma transition state for enhanced processing efficiency

Ivan Popović, Miodrag Zlatanović, Djordje Klisić

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The dynamics of the discharge in pulse plasma systems has a significant influence on the homogeneity of coatings. As opposite to PACVD systems where transition of the negative glow can be improved with the addition of positive pulses, in reactive sputtering, high-voltage negative pulses in partially decayed plasma increase discharge current transition to the stationary state. This greatly increases power delivered to the plasma during the negative pulse. The analysis of voltage and current waveforms during the glow discharge ignition show possibility for controlled generation of cathode high-voltage pulses. Control is performed with careful tuning of process parameters, and as a result increased plasma processing efficiency can be obtained.

II/7

Microstructure evolution and sintering kinetics of ZnO

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The aim of this paper was to analyse the sintering kinetics and microstructure evolution of ZnO. Powder was isothermally sintered (15, 30, 60, 90 and 120 minutes) in the temperature range from 800 to 1200^{o}C. The values of Lenel parameter were used to analyze both densification and mass transport processes. Scanning electron microscopy was performed in order to determine the microstructure evolution and dependence of everige grain size on temperature and time of sintering. These results will enable development of new phenomenological equations that can be applied in analyses of sintering kinetics.

Keywords: ZnO, Sintering, Kinetics.

II/8

Pulse plasma processing as a candidate technique for surface treatment of wind turbine components

Djordje Klisić, Miodrag Zlatanović, Ivan Popović

Faculty of Electrical Engineering, Belgrade, Serbia

Modern wind turbines construction is characterized by constantly increasing electrical power. The mandatory request of constant frequency of produced electricity output is contradictory to the variable wind turbine rotation frequency. The matching of wind turbine and electrical generator rotation frequencies can be achieved by a relatively complicated transmission gear box system or by power electronic system which eliminates matching gear box. The gear components must be resistant to different types of wear and to dynamic and static load, as well as to be corrosion resistant especially in off shore wind parks and to have acceptable noise emission. Unipolar pulse plasma was demonstrated to be efficient in diffusion and deposition mode of operation which combination gives the opportunity to meet the requirements of materials for wind turbine gears manufacturing, as well as for large size component treatment.

III/1

The influence of powder characteristics on two-step sintering behavior of hydroxyapatite

Miodrag Lukić[1], Zoran Stojanović[1], Ljiljana Veselinović[1], Srečo D. Škapin[2], Ines Bračko[2], Smilja Marković[1], Dragan Uskoković[1]

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Fabrication of full dense ceramic materials on the basis of hydroxyapatite (HAp) and biphasic calcium phosphate (BCP) with controllable microstructural and compositional characteristics attracts considerable efforts. Various synthesis and sintering methods were applied in order to achieve desirable material properties. In this study different nanopowders were produced and processed via two-step sintering (TSS) approach. Characterization of synthesized nanopowders were done by XRD, BET, FE-SEM, TEM and thermal analysis methods, while microstructural and chemical characterizations of sintered samples were performed through FE-SEM and XRD analysis. A possibility for obtaining full dense ceramics with suppressed grain growth is discussed on the basis of inherent nanopowders characteristics. Certain attention would be paid on thermal behavior of Ca-deficient HAp systems.

III/2

Green synthesis of PGA-capped silver nanoparticles and their characterization

Igor Savanović[1], Magdalena Stevanović[1], Srečo Škapin[2], M. Marković[3], Dragan Uskoković[1]

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Owing to their persistent antibacterial properties, Ag nanoparticles are increasingly used in clinical practice and investigated in recent laboratory research. Although there are a number of methods for the synthesis of Ag nanoparticles, recent research trends comply with the requirements of Non-toxic Environmental Chemistry.

In this study, the synthesis of silver nanoparticles was based on the principles of green chemistry. In order to improve their antibacterial properties and biocompatibility, Ag nanoparticles can be coated with various biocompatible and biodegradable polymers that can ensure their better interaction with cells and more favourable size distribution. Poly(α, γ-glutamic acid) is one of the polymers that have the required properties; it also serves as particle stabilizer. The synthesis of Ag nanoparticles was performed by a modified chemical reduction method with glucose as the reducing agent. The samples were characterized by UV/ Vis spectroscopy, FESEM and Zeta potential measurements.

III/3

Nucleation of biomimetic hydroxyapatite

Božana Čolović, Vukoman Jokanović

Institute of Nuclear Sciences "Vinča", Laboratory for Radiation Chemistry and Physics, Belgrade, Serbia

Formation of biomimetic calcium hydroxyapatite on the surface of different substrates (various polymer thin films and silica thin films) was investigated in this study. Supersaturated SBF and SBF combined with EMEM or FCS were used as bioactive liquid environment. After aging in SBF for various periods of time, samples were investigated by FTIR-ATR and XRD to analyze obtained phases, while morphology of self assembled hydroxyapatite was investigated by SEM and AFM. Investigations of mass changes of the samples showed that the rate of CHA self nucleation depends on the type of substrate and medium as well as the ageing time.

III/4

Structural characterization of synthetic and biological carbonated hydroxyapatite

Ljiljana Veselinović[1], Miodrag Lukić[1], Ljiljana Karanović[2], Nenad Ignjatović[1], Smilja Marković[1], Dragan Uskoković[1]

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It is well known that inorganic part of bones and teeth are impure form of hydroxyapatite, (HAp) $Ca_{10}(PO_4)_6(OH)_2$. During the past few decades, great efforts have been invested to develop synthetic equivalent of natural apatite. The major difference of natural bioapatites from hydroxyapatites is in the presence of certain content of CO_3^{2-} ions in the structure. The presence of the CO_3^{2-} ions in the HAp structure influences the reactivity and stability. Therefore, the exact content of CO_3^{2-} ions as well as their arrangement in the structure is very important.

The aim of our work is comparative analysis of the biological carbonated hydroxyapatite extracted from human alveolar bone and synthesized carbonated hydroxyapatite (BCHAp). Structural and microstructural parameters were determined through Rietveld refinement of recorded XRPD data, and with transmission electron microscopy (TEM).

Microstructure analysis showed anisotropic X-ray line broadening due to the small crystallite size (about 10 nm) as well as anisotropic growth of crystallites. The Raman spectroscopy confirmed the apatite structure and crystallinity.

III/5

Evaluation of alginate hydrogels in a biomimetic bioreactor applying dynamic compression

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Alginate hydrogels in different forms (discs, microbeads), different concentrations (1.5, 1.9 and 2 % w/w) and different chemical compositions (mannuronic to guluronic (M/G) residue ratios of 0.49 and 1.6) were tested in a biomimetic bioreactor at 10 % strain under two regimes: at a loading rate of 337.5 µm/s and at sequential increments of 50 µm displacement every 30 min. Higher content of G residues and higher alginate concentrations yielded stronger gels while packed beds of smaller microbeads exhibited highest compression moduli due to interstitial water. Results of this study are relevant for *in vivo* biomedical applications, in which implants are submitted to significant biomechanical stresses.

III/6

Evaluation of novel alginate nanocomposites for biomedical applications

Jasmina Stojkovska, Željka Jovanović, Danijela Kostić, Jovana Zvicer, Ivana Jevremović, Maja Vukašinović-Sekulić, Vesna Mišković-Stanković, Bojana Obradović

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In this study, we have investigated biomechanical properties, antibacterial and cytotoxic effects of novel alginate nanocomposites for biomedical applications. A bioreactor with dynamic compression and medium perfusion was utilized to evaluate biomechanical properties of nanocomposites under *in vivo*-like conditions. Packed beds of alginate microbeads with Ag nanoparticles exhibited higher compression modulus (for ~35 %) than the control microbeads. In addition, the presence of Ag nanoparticles induced antibacterial activity against *Staphilococcus aureus*, as well as strong cytotoxic effects on bovine calf hondrocytes. Results of this study show potentials of novel alginate nanocomposites for biomedical applications as soft tissue implants and wound dressings.

III/7

The influence of different polymerization mechanisms on thermal properties of poly(L-lactide)

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The aim of this work was to develop optimal polymerization conditions of L-lactide using two methods which involved different polymerization mechanisms. Bulk polymerization was performed with the presence of $Sn(Oct)_2$, as initiator, by coordination-insertion mechanism. The cationic polymerization, performed in solution with trifluoromethanesulfonic acid, as initiator. The effect of used initiator, reaction temperature and time of polymerization of L-lactide was investigated. The number-average molecular weight (M_n) and polydispersity Q of the obtained PLLA samples were determined by GPC measurements. According to GPC results, polymer obtained in solution had the narrower molar mass distribution. Thermal properties of synthesized polymers were investigated using thermogravimetry and differential scanning calorimetry. The presence of -OH and -$C(O)OSO_2CF_3$ end-groups at obtained polymers by cationic mechanism, allows efficient end-to-end cyclization which explains its higher thermal stability compared with linear poly(L-lactide), obtained by insertation mechanism.

III/8

Investigation of electrochemically synthesized Ag/PVP nanocomposites: Biomimetic approach

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Silver/poly(*N*-vinyl-2-pyrrolidone) (Ag/PVP) nanocomposites were obtained by electrochemical reduction of Ag^+ ions in polymer matrix, crosslinked by γ-irradiation. Ag/PVP nanocomposites were characterized by UV-visible spectroscopy and tested in the bioreactor with mechanical stimulation for evaluation of biomechanical properties. Silver release was investigated by atomic absorption spectroscopy and agar diffusion method was applied for detection of antimicrobial activity. Results of silver release confirmed the presence of Ag nanoparticles even after 4 weeks. Tests performed in the bioreactor have shown that mechanical properties of material are improved by silver nanoparticles. The antibacterial activity of silver nanoparticles is confirmed for bacteria *S. aureus*.

III/9

Chitosan laminated collagen film properties

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The objective of this study was to determin physical, mechanical and barrier properties of chitosan laminated collagen film. Lamination of collagen with chitosan film increased collagen film thickness. Laminated film was more soluble in water then collagen film, but lamination did not affect swelling property of collagen film significantly. As to film color, lamination with chitosan reduced collagen film lightness (L) and yellowness (+b), but increased film redness (+a). Chitosan laminated collagen film did not show improved mechanical properties, but did show greatly improved oxigen barrier properties.

IV/1

Antibacterial activity of hydroxyapatite/silver nanocomposite

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Hydroxyapatite containing silver nanoparticles (HAp/Ag) was synthesized by homogeneous sonochemical metod. Morphology of obtained particles was formed of micrometer-sized rod-like HAp with nanosized silver sphere-like particles attached to their surface. So obtained material was tested for interaction with bacteria. For that purpose composites with three different contents of silver were prepared and their interactions with two different types of bacteria were studied. *Escherichia coli* was used as a representative of Gram negative while *Staphylococcus aureus* was applied as a representative of Gram positive bacteria. In the case of *E. coli* wider inhibition zone without presence of bacteria and with a layer of inactive bacteria near the surface of material was obtained. In this case obtained antibacterial effect was not concentration dependant. In the case of *S. aureus*, inhibition zone was narrower with the presence of modified bacteria in inhibition zone. Obtained antibacterial response pronounced dependence on concentration of silver within composite. According to results achieved with this investigation we concluded that HAp/Ag composite is effective against both, Gram positive and Gram negative bacteria and shows stronger activity against *E. coli*.

IV/2

Protective effects of oral applied Fullerenol $C_{60}(OH)_{24}$ nano particles, in rats after a single dose of DOX

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Polyhydroxylated, water soluble, fullerenol $C_{60}(OH)_{24}$ nano particles (FNP) *in vitro* and *in vivo* models, showed an expressive biological activity. The scope of this experiment was to investigate the potential protective effects of oral applied FNP (in dose of 10, 14.4 and 21.2 mg/kg) in rats after a single dose (8 mg/kg (i.p.) of doxorubicin (DOX). After the last drug administration, the rats were sacrificed and the blood and tissues were taken for analysis. Biochemical and pathological results confirmed that, at all examined doses, FNP exhibits a protective influence against toxicity induced by DOX.

IV/3

Distribution of nanoparticles of fullerenol in human serum in presence of doxorubicin

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The aim of this experiment was to measure the changes in size of particles in aqueous solution of fullerenol $C_{60}(OH)_{24}$ in presence of comertila citostatic doxorubicin in human serum. This work was performed by measuring dimensions of particles by: dynamic light scattering, zeta potentila, scanning electron microscope and transmission electron microscopy. Results show that changes in the concentration of fullerenol have no significant effect on the distribution of particles in the serum, which could mean that there is no interaction with serum proteins. Results also show the stability of fullerenol/doxorubicin-nanoparticle of diferent molar ratio. Fullerenol nano particles in certain molar ratio with doxorubicin form nano-aggregates in a length of 100-2000 nm.

IV/4

Alginate microbeads as cell supports in a biomimetic bioreactor for cartilage tissue engineerig

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In this study, we have investigated two types of alginate in the form of microbeads for immobilization and cultivation of bovine calf chondrocytes in a biomimetic bioreactor. Microbeads (1.5 % w/w alginate, 33×10^6 cells/ml) were cultivated under dynamic compression applied in physiological ranges (1 h on/1 h off, frequency 0.42 and 0.56 Hz, 10 % strain) for up to 28 days. During the cultivation, cells proliferated and synthesized extracellular matrix so that after 4 weeks, compression moduli of packed beds of microbeads exceeded the initial values and large groups of bonded microbeads were observed, which demonstrated potentials of the investigated system for cartilage tissue engineering.

IV/5

The characterization of HAP/Lig coatings containing different lignin concentrations and their influence on the cytotoxicity

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Synthetic hydroxyapatite (HAP, $Ca_{10}(PO_4)_6(OH)_2$) has ability to form strong interfacial bonds with bone tissue and to improve its growth. The development of electrodeposited HAP/polymer coatings is currently being explored. The purpose of this work was to investigate the effect of lignin (Lig) concentration on morphology, phase composition and thermal behavior of HAP/Lig coatings. Therefore, XRD, XPS and TGA were used. MTT test has been conducted in order to determine the cytotoxicity of coatings. It was observed that the increase in lignin concentration causes better protection of the HAP lattice during sintering. The optimal lignin concentration was found to be 1 wt. %.

IV/6

In vitro evaluation of antimicrobial activity of nano composite biomaterials based on hydroxyapatite

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Antimicrobial materials based on hydroxyapatite are potentially attractive in a wide variety of medical and stomatological applications. The objective of this paper is to examine antimicrobic activity of cobalt-substituted calcium hydroxyapatite nanopowders and biphased calcium-phosphate/ poli-lactide-co-glicolide. The antimicrobial effects of these substances (powders) against two pathogen bacterial strains- *Escherichia coli* (ATCC 25922) and *Staphylococcus aureus (ATCC 25923)* were tested by disc diffusion method and quantitative antimicrobial test in liquid medium. It was noted that the inhibition zone of the bacterial cells *S. aureus* around the sample of the Ca/Co-HAp, was a lot bigger compared to the inhibition zone of bacterial cells *E. coli* around the sample of the mentioned biomaterial, which means that this material has bigger antimicrobic activity on *S. aureus*, in relation to *E. coli*. Quantitative antimicrobial test in liquid medium demonstrate that cobalt-substituted calcium hydroxyapatite samples show viable cells reduction of both tested microorganisms. It may be concluded that nanoparticles of cobalt-substituted calcium hydoxyapatite nano-powders has a satisfactory antimicrobic activity according to the tested bacteria strain.

IV/7

Evaluation compensation of an osteoporotic rat bone with Ca/Co-HAp nanoparticles

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This study examined the role of Ca / Co-HAp nanoparticles on time distance in regeneration of osteoporotic alveolar bone in rats by biochemical blood markers analysis (ALP, Ca, Mg, P) and through histochemical analysis. The research was carried out on female Westar rats, aged 6-8 weeks. The obtained results for the biochemical blood markers showed statistically significant rise. Histological analysis revealed high level reparatory skills of the biocomposite implanted in the bone defect as early as in the mineralized tissues. It can be concluded that Ca/Co-HAp stimulates the regeneration of osteoporotic alveolar bone in tested animals as confirmed by the increased levels of biochemical blood markers and through histochemical analysis. Therefore, it can be concluded that Ca/Co-HAp nanocomposite should be choise material in the osteoconstructive processes in the future.

IV/8

Determination of clindamycin in pig plasma after implantation of poly(D,L-lactide-co-glycolide)/hydroxyapatite/clindamycin core–shell nanosphere by liquid chromatography-tandem mass spectrometry

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Clindamycin was determined in pig plasma by liquid chromatography/tandem mass spectrometry (LC-MS/MS). The multiple reaction monitoring (MRM) mode of precursor-product ion transitions for clindamycin (m/z=421.1/126.1) and the internal standard, coffeine (m/z=192/125) was used. The samples were prepared by two methods: 0.1% formic acid in methanol and 1.5% trichloacetic acid. The recovery for the two preparation methods at 0.05μg/ml (n=6) was found to be for the first 104.3% and for the second method 106.5%, with repeatability RSD 1.1% and RSD 4.34%, respectively. The results of the comparison of the two different preparation methods of samples demonstrated that bought methods were satisfactory.

IV/9

Effect of caseinphosphopeptide-amorphous calcium phosphate and fluoride on enamel remineralisation

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The aim was to evaluate surface characteristic of incipient enamel carious lesion after treatment with caseinphosphopeptide-amorphous calcium phosphate and fluoride. Forty enamel slabs were used. Following formation of the artificial carious lesion, they were divided into four groups (caseinphosphopeptide-amorphous calcium phosphate, caseinphosphopeptide-amorphous calcium fluoride phosphate, sodium fluoride, and control) and submitted to a chemical caries model. Scanning electron microphotographs were taken and subsequently analysed with image analysis software to determine enamel surface characteristics. Although treatments with caseinphosphopeptide-amorphous calcium phosphate and fluoride result in different topography of enamel, all solutions exhibit remineralisation potential.

IV/10

Mineral trioxide aggregate as an alternative material in endodontic treatment for teeth with incomplete root development

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Aim of this research was to describe the management of apical periodontitis in immature permanent teeth using one-visit endodontic treatment with mineral trioxide aggregate (MTA).

In 10 immature teeth with persistent apical periodontitis conventional endodontic protocol with calcium-hydroxide was changed, and the apical portion was filled with MTA and the rest of the canal was filled with a canal sealer and gutta-percha. Control examinations were performed six months after treatment completion and afterward yearly. For follow-up, 8 teeth showed resolution of periapical radiolucencies, whereas clinical symptoms were absent in all patients.

MTA could be recommended for immature teeth in complex endodontic cases.

V/1

Redox-sensitive poly(amino acid) based gels

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Smart polymer gels are designed to change their properties to externally applied triggers and they have promising biomedical applications (eg. drug delivery) if they fulfil the requirements of biodegradability and/or biocompatibility.

We have prepared poly(amino acid) based gels which have well-defined pH and redox-sensitivity. Two different systems were investigated: first one shows reversible sol-gel transition to the changes in redox environment which was proven by gelation time and rheological measurements. The other one's swelling degree and elastic modulus can be controlled by redox potential of environment.

Both polymers and gels were characterized by different analytical methods as well.

V/2

Effects of composition and crosslinker content on swelling and mechanical properties of poly(2-hydroxyethyl acrylate/itaconic acid) hydrogels

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In this work, novel hydrogels based on 2-hydroxyethyl acrylate and itaconic acid (P(HEA/IA)) were prepared by free radical crosslinking copolymerization, varying itaconic acid and crosslinker (ethylene glycol dimethacrylate (EGDMA)) content. Effects of itaconic acid and crosslinker content on mechanical and swelling properties of P(HEA/IA) copolymeric hydrogels were investigated. Swelling studies were conducted for three series of P(HEA/IA) copolymeric hydrogels in a buffer solution of pH 7.40, at 37 ^{o}C. Mechanical properties were determined by dynamic-mechanical analysis (DMA). Results indicate that P(HEA/IA) hydrogels' properties are dependent on IA and EGDMA content. Equilibrium degree of swelling (q_e) of hydrogel samples increases as IA content increases. Higher EGDMA content contributes to decreased q_e of hydrogel networks. Analyzing mechanical properties expressed as shear modulus, it was noticed that EGDMA higher content causes increase of shear modulus value. Hydrogels containing higher IA content showed weaker mechanical performances.

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V/3

Synthesis of nanostructured polyaniline in the presence of vanillic acid

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Self-assembled polyaniline nanorods were synthesized by the oxidation of aniline with ammonium peroxydisulfate in an aqueous solution of vanillic acid, using the template-free falling-pH method. The effects of the initial mole ratio of vanillic acid to aniline (starting pH) and the reaction time on the yield of polymerization, morphology, molecular structure and conductivity of synthesized polymer were studied. The morphological change of polymerization products due to the change of reaction conditions, from the nanorods (possibly the nanotubes), with a diameter of 70 – 380 nm and a length of 0.3–1.0 μm, to the nanorods co-existing with the submicrospheres, was revealed by scanning electron microscopy. Molecular structure of synthesized polyaniline was investigated by FTIR and Raman spectroscopies.

V/4

Microstructure and crystallinity of oriented polyolefins

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The influence of orientation on polyolefins was studied in accordance with Peterlin's molecular model of drawing. Isotactic polypropylene and low density, linear low density and high density polyethylenes were oriented via solid-state stretching at an elevated temperature. Orientation-induced changes in the morphology were analyzed by optical and scanning electron microscopy. Differential scanning calorimetry and wide-angle X-ray diffraction were used to determine changes in the crystallinity where a two-stage evolution was revealed. The first stage is characterized by a significant increase in crystallinity while the following saturation occurs with a further draw ratio increase at the second one. The value of the critical draw ratio, which separates these two stages and corresponds to the transformation from the initial to the fully developed fibrillar structure, was influenced by the structural peculiarities of each polyolefin.

V/5

Poly(itaconic acid) /pectin blends as membrane materials

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The aim of this study is the application of poly(itaconic acid) (PIA) and pectin complexes that can be used for Direct Methanol Fuel Cell membranes (DMFC). DMFC have received considerable attention both as a portable power source and as a replacement for batteries. In this paper blends of PIA and pectin in ratios from 10 % to 90 % PIA were prepared by casting into films. These films were characterized by FTIR, and DSC. It was shown that the best properties for DMFC has PIA/pectin complex with ratio 50/50.

V/6

Kinetics of pertechnetate removal by amino-functionalized glycidyl methacrylate copolymer

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Technetium-99 comprises a significant health risk, since edible plants can bioaccumulate its most abundant environmental form, a highly mobile pertechnetate anion, and convert it to more lipophilic species that cannot be excreted through urine. Kinetics of pertechnetate removal from aqueous solutions by macroporous crosslinked poly(glycidyl methacrylate-*co*-ethylene glycol dimethacrylate), functionalized with diethylene triamine, PGME-deta, was investigated. PGME-deta was characterized by elemental analysis, mercury porosimetry and scanning electron microscopy. Pertechnetate with Tc-99m isotope was quantitated by gamma scintillation counting techniques. Three kinetic models (the pseudo-first, the pseudo-second order and intraparticle diffusion) were used to determine the best-fit equation for pertechnetate sorption.

V/7

Surface characterization of polyurethane nanocomposites

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This research focuses on surface characterization of polyurethanes, synthesized from castor oil and toluene diisocyanate. Different contents of titanium(IV)oxide nano particles were added to polymer matrix (0.5; 1; and 2 wt%) for composites preparation. Surface characterization of obtained materials was performed by scanning electron microscopy (SEM), tapping mode and atomic force microscopy (TM-AFM). From SEM images good dispersion of nano filler in polymer matrix was noticed. TM-AFM method clearly showed topology of nano fillers in polymer matrix and confirmed its good homogenization.

V/8

Electrical Cable-like Model of Microtubules

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Microtubules (MTs) are important cytoskeletal structures engaged in a number of specific cellular activities, including vesicular traffic, cell cyto-architecture and motility, cell division, and information processing within neuronal processes. MTs have also been implicated in higher neuronal functions, including memory and the emergence of ‘‘consciousness’’. How MTs handle and process electrical information, however, is heretofore unknown. Here we established a new model for ionic waves along MTs based on polyelectrolyte features of cylindrical biopolymers. Each tubulin dimmer protein is an electric element with a capacitive, resistive and negative incrementally resistive property. The particular attention was paid to the role of nano-pores (NPs) existing between neighbouring dimmers within a MT wall which exhibit properties like ionic channels. The localized ionic wave could be used to explain the behavior of microtubules as biomolecular transistors capable of amplifying electrical information in neurons.

VI/1

Stable configurations of graphene based structures

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We performed DFT calculations of the relaxed configurations of graphene and graphene nanoribbons. Within SIESTA package, the valence electrons are described by localized numerical orbitals, since the effects of core electrons are replaced by psudopotential approximation. Systems were relaxed using Coordinate Gradient algorithm. We obtained lattice constants and electronic structures in local (spin) density approximation and showed peculiarities for zig-zag nanoribbons when calculations were performed with and without spin degrees of freedom.

VI/2

DFT study of hydrogen adsorption on Pt(100), Pt(110) AND Pt(111) surfaces

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Hydrogen adsorption on surfaces Pt(100), Pt(110) and Pt(111) was studied using density functional theory. Adsorption parameters - binding energies, preferred adsorption sites, surface relaxation and Pt–H distances were determined in coverage range 0.25-1 ML. At Pt(111) fcc site was identified as preferred adsorption site, while at Pt(100) and Pt(110) 2-fold bridge type sites were obtained. Based on calculated energies, adsorbate mobility was discussed and diffusion barriers were estimated. Finally, adsorption parameters at preferred adsorption sites were discussed as a function of coverage and adsorbate structure. Obtained results were compared to available theoretical and experimental literature data.

VI/3

AB initio calculation of the structure and partition functions of BC_2

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The radical BC_2 is believed to be an important intermediate in producing boron carbide B_4C, a material of great practical importance. In order to study the possibility of transformation of the former species into the latter one, the partition functions for BC_2 are needed. Since the experimental information on BC_2 is very scarce, we carried out extensive ab initio calculations in order to estimate the structure thereof and to compute the corresponding partition functions.

VI/4

Energy spectrum of a circular graphene quantum dot in a perpendicular magnetic field

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Within the theoretical framework od Dirac-Weyl formalism we derive the analytical expressions for the wave functions for the Dirac fermions in a circularly shaped graphene quantum dot, formed under the influence of a perpendicular magnetic field. Further, we calculate the energy spectrum for non-negative energies for two different boundary conditions, stemming from the same equation derived by Berry and Mondragon. We go on to calculate angular current density and absorption strength.

VI/5

Research of dynamic compaction in powder environments

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Work is devoted numerical modeling of physical and chemical processes at compaction of reacting powder materials of type Zr-B.

For carrying out of computing experiments the multilevel model of a reacting powder mix describing physical and chemical processes of shock synthesis on micro and macro levels is used.

Influence of change of the mechanism of an internal friction of the powder environment on features of course of synthesis is investigated.

Repacking of firm particles for the account melting one or both components of a mix is one of defining factors of shock start of chemical transformations along with parameters of structure and intensity of mechanical influence.

VI/6

Analysis of specific transmission maxima in rectangular semiconductor quantum well

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The transmission maxima with values less than one are analyzed in rectangular semiconductor quantum well (QW) with uniform effective mass distribution. It is shown that there exists an infinite number of intervals of the strength of the quantum well in which these maxima occur, and that the sizes of the intervals have finite asymptotic values for very high QW strengths. Furthermore, the dependence of transmission on electron energy in case when the QW strength is approximately equal to integer multiple of pi, is analyzed in detail. Finally, it is shown that these effects are absent in rectangular quantum barrier.

VI/7

Influence of thermal memory on the thermoelastic bending component of photoacoustic response

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In this work, thermoelastic component of the photoacoustic response is derived, including thermal memory of the material. The comparison is made between this model and the classic one, which does not account for the influence of thermal memory. It has been noticed that the two models tend to overlap at very high and very low frequencies of the light modulation spectrum, while in the middle range some deviations become more apparent, which proves that thermal memory must be taken into account. It has also been shown that the limits of this range are the function of heat propagation speed and thickness of the sample. Based upon the processing of obtained data, it has been concluded that the characteristics of the output signal, in the range of the interest, are highly influenced by thermal dynamic qualities, like heat diffusivity and thermal relaxation time, as well as the sample thickness.

VI/8

Application of the progressive failure criteria in determining delamination of multilayer composite materials with an interlayer crack

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This paper examines multilayer composite materials – laminates having an interlayer crack. The laminate is under a dynamic loading. According to the theoretical thesis, we have incorporated the progressive failure criteria based on the direct-mode fiber failure and matrix failure, into the PAK structure analysis software package. The explicit central differences method and the implicit Newmark dynamic structure analysis have been used. The laminate is modeled by the finite element of orthotropic multilayer shell.

VI/9

Determining the laminate "safe" stress zone in different types of loading

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The paper examines the laminate "safe" stress zone i.e. the zone within which the stress values do not exceed the limit which would cause failure of the material. In the software package MatLab we have created the software for comparative analysis of interactive failure criteria. Using graphic visualization and comparison of maximal values of stress we have reached the conclusions on the stability of the material under different types of static loading. The software is created in the way that it is not obligatory to define the laminate type (symmetric, asymmetric, etc.), because the software determines it according to the inserted engineering constants of monolayers.

VI/10

Electromechanical characterization of helically coiled carbon nanotubes

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Helically coiled carbon nanotubes are frequently observed experimentally and several methods of their synthesis were reported. Their structure inspires study of potentially interesting elastic and electronic characteristics. We present results obtained numerically, using original POLSym code. Simplified symmetry based model is used, assuming straight carbon nanotube is pulled on helix, which causes homogeneous deformation of the tube without pentagon- heptagon pairs (i.e. the additional curvature is due to deformation of hexagons only). Variations of band- gap and electron density of states have been monitored, and their dependence on various deformation modes is analyzed. Possible application to electromechanical devices is considered.

VI/11

The critical parameters of ultra-thin molecular film for monochromatic absorption

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Based on the performed theoretical studies of changes of optical properties due to the presence of boundaries and boundary changes of nanofilm parameters in molecular crystals compared to bulk-structure (combining quantum, analytical and numerical and graphical methods), this paper presents the results of the phase diagram of localized states. Comparing these findings and results of discrete and selective optical absorption with several resonant peaks, a selection was made of those (critical) values of perturbation boundary parameters of exciton films for which occurs only the monoenergetic absorption.

VI/12

Phonon contribution in the superconducting properties of ultrathin film-structure

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Redefinition of application of Green's function method on to the research of the fundamental mechanic properties of ultra-thin film structures, by combined analytical and automated numerical calculation and graphical representation, enabled the analysis of the impact of boundary parameters of the film on to the changes of phonon states in these nano-structures. All possible states of phonons are examined, energy gaps are recorded and certain conditions for the emergence of the highest activation energy are determined. In this paper the analysis of phonon contribution in the superconducting properties of these nano-patterns was performed.

VII/1

Shoe-based multifunctional composite component with power generation, storage and structural capabilities

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This paper focuses on the design and development of a multifunctional composite component integrated into a shoe hill that is capable of generating power through piezoceramic (PZT) stacks and storing this energy in a capacitor integrated into the composite. The PZT elements are stacked in a cantilever manner with space in-between and around elements filled with foam, which provides structural support as well as walking comfort. Use of bendable PZT elements (d_{33} =110) instead of commonly used PVDF sheets (d_{33} = 20) increases the power generation potential over five folds, which is further compounded by stacking of PZT elements.

VII/2

Exchange kinetics and diffusion of oxygen in $La_{0.8}Sr_{0.2}Fe_{0.7}Ni_{0.3}O_{3-\delta}$ – $Ce_{0.9}Gd_{0.1}O_{1.95}$ composites with different microstructures

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Composite materials $La_{0.8}Sr_{0.2}Fe_{0.7}Ni_{0.3}O_{3-\delta} - Ce_{0.9}Gd_{0.1}O_{1.95}$ are of the great interest for applications as SOFC cathodes, materials for oxygen separation etc. Microstructures of the composites with different oxide ratios have been studied using SEM-image analysis. A correlation between the interphase boundary length and oxygen transport of the materials investigated by electrical conductivity relaxation technique was found. Oxygen exchange constant k_{chem} for the composites was higher than for the individual oxides with maximum at ~70 vol.% of $Ce_{0.9}Gd_{0.1}O_{1.95}$ ($\log\{k_{chem}/[cm\cdot s^{-1}]\}$=-3.2 at 700°C, P_{O2}=0.05atm). Interphase boundary is believed to affect oxygen exchange significantly. The work is supported by Integration Project #57 of SB RAS.

VII/3

The effect of low-frequency oscillations on the Al-Ti-Zr melts for synthesis of aluminide and carbide nucleating phases

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Synthesis of new grain-refiner alloys containing fine aluminide and carbide phases by means of the physical treatment of the melt.

Al-Ti and Al-Zr melts of different compositions were processed by low-frequency oscillations at 1100, 1200°C for 3 minutes. The oscillations were applied to using graphite piston-oscillator. Microstructure of the alloys were studied by X-ray diffraction, metallographic and electron microscopy.

The experimental grain-refiner alloys with different content of the metastable Al_3Ti and Al_3Zr phases were obtained. For example, the Al-3.1Ti-0.14Zr alloy contained solid solution of zirconium in Al, $Al_{0.98}Zr_{0.02}$, with lattice parameter 0.4054(1)nm. The Al-0.9Ti-0.9Zr alloy contained Al_3Zr and $Al_{1+x}Ti_{1-x}$ aluminides solid solutions. It was determined that the TiC phase formation happened when Zr content bellow its solubility. Increase of Zr content in Al melts restrained the titan carbide synthesis.

VII/4

Dielectrical properties of EVA-carbon black composites

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Electrical AC conductivities of ethylene-co-vinyl acetate (EVA)-carbon black (CB) composites were studied using Hameg 8118 LCR meter in the frequency range between 20 Hz and 200 kHz and temperature range from 173 to 330 K. Composites with different weight percent of CB content were obtained by melt mixing at 32 rpm in Brabender rheometer. The samples were melting pressed at 150 ºC into 1 mm thick sheets by using an AMS 10 ton (104 N) hot melt press. Electrical measurements were carried out during heating (2.5 K/min). The level of conductivities of the EVACB composites can be varied by over 10 orders of magnitude. The results showed that there is instability of electrical resistivity of the composite during prolonged treatment at constant elevated temperature (330 K).

VII/5

Hydrogen desorption from MgH_2-VO_2 composite

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Hydrogen storage is a key enabling technology for the development of hydrogen and fuel cell power technologies in transportation, stationary, and portable applications. On-board hydrogen storage is considered to be the most challenging aspect for the successful transition to a hydrogen economy. Modified nanostructure materials offer promise for superior hydrogen storage due to short diffusion distances, new phases with better capacity, reduced heats of adsorption/desorption, faster kinetics. We have investigated the possible use MgH_2-VO_2 system as a material for hydrogen storage by means of DTA, XRD and SEM analysis. It has been shown that use of nanostructurated VO_2 dramatically decrease the MgH_2 desorption temperature.

VII/6

Hydrogen storage properties of MgH_2-CeO_2 composites

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MgH_2 is promising material for hydrogen storage since it is light and contains 7,6% of hydrogen. Anyhow, its formation is extremely slow and it is very stable. Microstructural refinement and catalyst addition have been used to obtain nanostructured composite with improved storage properties. Among catalysts, transition metal oxides show high catalytic effect. The idea of this work was to use CeO_2 as a possible destabilization agent in MgH_2-CeO_2 composites. The morphological and microstructure characterization of obtained composites were done by XRD, SEM, particle size analysis, while the desorption properties where characterized by TPD. The high-temperature peak has been observed at 620K while low-temperature peak was observed at 400K.

VII/7

Structural and electrical properties of TiO_x ($x \leq 2$) thin films obtained by reactive d.c. sputtering

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A study on the influence of partial pressure of oxygen on electrical and structural properties of TiO_x ($x \leq 2$) is presented. Thin films of Ti-O were grown on (100) Si-wafers to a thickness of 120-150 nm by reactive d.c. sputtering of Ti target in the presence of oxygen. Partial pressure of oxygen was varied from 0 Pa to 5.2×10^{-2} Pa. It was found that titanium monoxide is dominant phase formed up to partial pressure of oxygen of 2.6×10^{-2} Pa, while above that pressure titanium dioxide prevails which was revealed by XRD measurements. Electrical resistance measurements show metal conductivity for $p(O_2)$ below 5.2×10^{-2} Pa and dielectric characteristics for pressure of 5.2×10^{-2} Pa.

VII/8

Characterization of the plasma electrolytic oxidation of aluminium in electrolytes that produce barrier oxide films

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We investigated morphology and composition of oxide coatings formed on aluminium during DC plasma electrolytic oxidation (PEO) in: sodium tungstate, ammonium tartrate and solution of borax and boric acid. Oxide coatings were characterized by optical emission spectroscopy, AFM, SEM-EDS and XRD. The morphology of coatings highly depends on process duration. Microhardness decreases with extended PEO time. Besides that,microdischarges characteristics were studied and it reveals that size of microdischarges extends, while the surface density of microdischarge sites diminishes, with increasing PEO time. Optical emission spectra are same for both organic and inorganic electrolytes and have several intensive band peaks caused by electronic transition in Al, W, Na, O, H atoms.

VII/9

Microstructure and electrical characteristics of modified alumo-silicate ceramics

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Microstructural and electrical characteristics of solid porous ceramics based on kaolinite and bentonite clay, modified with $Mg(NO_3)_2$ and some active additives, composed of Fe, Al and Mn salts were investigated in this work. During the interaction of magnesium-enriched alumo-silicate ceramics with aqueous solution of arsenic salt, the reduction of Mg, Al, Na and K concentrations was observed on the account of incorporation of arsenic in ceramics. Removal of arsenic from its water solution was estimated by using EDS and semi-quantitative analysis. This functional ceramics can be used in water filtration systems, for removal of arsenic or other heavy metal ions from water solutions via reduction processes, by incorporating metal ions in the structure.

VII/10

Properties of some low melting lead-free alloys for ecological solders production

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The aim of this paper is to analyze various properties of lead-free solder alloys, which should be suitable for application in electronics. These alloys must have low enough melting temperature to avoid thermal damage of the electronic devices. In this study, several tin based alloys with addition of silver, indium and copper will be considering, with respect to SAC alloys which are currently the most commercial lead-free solders.

In order to determine properties of investigated alloys, DSC, SEM-EDX, LOM and electroconductivity measurements are used.

Key words: lead-free solder alloys, DSC, SEM-EDX

VIII/1

Kinetics of metoprolol tartrate photocatalytic degradation

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Metoprolol (di[(*RS*)-3-[4-(2-methoxyethyl)phenoxy]-1-(isopropylamino)propan-2-ol]tartrate (2 : 1), $(C_{15}H_{25}NO_3)_2\ C_4H_6O_6$) is a selective β_1-blocker of the cardiac adrenergic receptors. Due to the frequent use, metoprolol tartrate is present in sewage waters. The aim of this work was to investigate photocatalytic activity of TiO_2 Wackherr in the degradation of metoprolol tartrate and to compare it with that of TiO_2 Degussa P25 applying the same source of UV radiation. Degradation was monitored by HPLC-DAD technique. It has been observed that the degradation rate is strongly related to the nature of the applied catalyst. Mineralization was studied by IC, TOC and spectrophotometry techniques. The obtained results show that TiO_2 Wackherr is more efficient catalyst for degradation of the original compound, but not for its intermediates.

VIII/2

Isothermal kinetics of water exchange in silica hydrogel

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The isothermal kinetic curves of water exchange with ethanol in silica hydrogel were recorded at temperature range from 297 to 316 K. By model fitting method. It was found that kinetics of water exchange is described by model of first order chemical reaction. The values of isothermal rate constants were calculated. They increase exponentially with temperature. The activation energy is 28 kJ/mol and pre-exponential factor ln (A/min^{-1}) is 7,9. Using differential isoconversional method it was shown that the exchange of water with ethanol in silica hydrogel is kinetically complex process. The change of kinetics paramters with degree of water exchange and existance of compensation effect were established.

VIII/3

Voltametric determination of linuron insecticide in methanol using a boron doped, glassy carbon and commercial glassy carbon electrode

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This paper presents voltametric studies of the linuron insecticide (3-(3,4-dichlorophenyl)-1-methoxy-1-methylureum) on a boron doped glassy carbon (GCB), glassy carbon (GC) prepared in our laboratory and commercial glassy carbon electrode. The method, operated in the differential pulse voltammetric mode, works in the concetracion range from 0.62 to 26.09 mg L^{-1}. We determined a peak potential, E_p, (1.25V), linear range and LOD for linuron in the sulfuric acid as a supporting electrolyte (pH=0.7) for all applied electrodes. GCB shows the broadest linear range and sensitivity. This appears to be the first aplication of a boron doped glassy carbon electrode to the voltammetric determination of linuron insecticide.

***Keyword**:* Linuron; glassy carbon electrode; boron glassy carbon electrode; differintial pulse voltammetry

VIII/4

Use of natural zeolite for removal of Cu(II) from aqueous solutions in a fluidized-bed reactor

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In this study, we have investigated possibilities for fluidization of natural zeolite, clinoptilolite (Zlatokop, Vranjska Banja) and the use of a fluidized bed reactor for removal of copper ions from aqueous solutions. Two zeolite fractions were isolated and used for hydrodynamic characterization of the fluidized bed reactor and then the particle fraction of ~90 □m in size was applied for Cu(II) ion sorption under continuous flowrate (33.8 ml/min) of aqueous $CuSO_4$ solution (300 mg dm^3). The zeolite (10 g) was saturated after about 50 min of reactor operation and the results of sorption kinetics were successfully modeled using pseudo-second order kinetics and plug flow.

VIII/5

XRD and SEM analysis of urinary stones

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Morphological and microstructural characteristics of urinary stones from patients of both sexes from different parts of Serbia has been presented in this paper. X-ray diffraction analysis of the samples indicate the presence of the following phases: Whewelite ($CaC_2O_4 \cdot H_2O$) and Weddelite ($CaC_2O_4 \cdot 2H_2O$) from oxalate, Apatite ($Ca_5(PO_4)_3X$), Brushite ($Ca(HPO_4) \cdot 2H_2O$) and Struvite ($MgNH_4PO_4 \cdot 6H_2O$) from phosphate, as well as Uricite ($C_5H_4N_4O_3$) and L – cystine ($C_6H_{12}N_2O_4S_2$). The SEM analysis confirmed the obtained structure.

VIII/6

Computation of pressure of the liquid carbon dioxide in tank during summer storage conditions

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In this research, pressure increase of the liquid carbon dioxide in tank during summer storage conditions, typical for geographic area of about 45° latitude, have been considered.

A mathematical model and computer software procedure in calculation of the pressure in a tank have been developed, depending on storage time. The verification program was based on the exploitation data. Based on the results of numerical experiments, it is possible to predict the pressure increase in a tank in a given period, or set a time for reaching the opening pressure of safety valve on the tank.

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