THE SIXTH YUGOSLAV MATERIALS RESEARCH SOCIETY CONFERENCE

YUCOMAT 2004

Programme
and
The Book of Abstracts

HERCEG NOVI,
September 13-17, 2004

Organized by:
YUGOSLAV MATERIALS RESEARCH SOCITY
and
INSTITUTE OF TECHNICAL SCIENCES OF SASA

http://www.yu-mrs.org.yu

YU - CO MAT

THE SIXTH YUGOSLAV MATERIALS RESEARCH SOCIETY CONFERENCE

YUCOMAT 2004

Programme
and
The Book of Abstracts

HERCEG NOVI,
September 13-17, 2004

Organized by:

YUGOSLAV MATERIALS RESEARCH SOCIETY
and
INSTITUTE OF TECHNICAL SCIENCES OF SASA

http://www.yu-mrs.org.yu

YU - CO MAT

Title: THE SIXTH YUGOSLAV MATERIALS RESEARCH SOCIETY CONFERENCE
"YUCOMAT 2004"
Programme
and
The Book of Abstracts

Publisher: Institute of Technical Sciences of SASA
Knez Mihailova 35/IV; P.O. Box 315, 11000 Belgrade
Phone: +381 11 185-437; Fax: + 381 11 185-263

Editor: Prof. Dr. Dragan P. Uskoković

Technical editor: Aleksandra Stojičić

Cover page: Aleksandra Stojičić

Acknowledgment: The editor of the book of abstracts is grateful to the Ministry of Sciences and Environment Protection of Republic of Serbia for its financial support of this book and The Sixth Yugoslav Materials Research Society Conference "YUCOMAT 2004" held in Herceg Novi.

Printed in: Printing office "Čigoja"
Studentski trg 15, 11000 Belgrade
Phones: + 381 11 186-725; + 381 11 625-954
Circulation: 250 copies. The end of printing: July 2004.

Organized
by

Yugoslav Materials Research Society
and
Institute of Technical Sciences of SASA, Belgrade

Materials science and engineering incorporate acquiring of knowledge on synthesis and processing of materials, their composition and structure, properties and behaviour, functions and potentialities as well as application of that knowledge to various final products. Economic prosperity, life quality, and healthy environment are tightly connected with the improvements in the existing and the development of new materials and processing technologies. These improvements are development can contribute greatly to the national priorities: energy saving, environment and health protection, information and communication, infrastructure, transportation, etc.

The Yugoslav Materials Research Society (YU-MRS), a non-government and non-profit scientific association, was founded in 1997 to promote multidisciplinary goal-oriented research in materials science and engineering. Main task and objective of the Society is to encourage creativity in materials research and engineering to reach a harmonic coordination between achievements in this field in our country and analogous activities in the world with an aim to include our country into the global international projects.

CONTENTS

Programme

CONFERENCE PROGRAMME

SYMPOSIUM A Advanced Methods in Synthesis and Processing of Materials
SYMPOSIUM B Advanced Materials for High-Technology Application
SYMPOSIUM C Nanostructured Materials
SYMPOSIUM D Composites
SYMPOSIUM E Biomaterials

GENERAL INFORMATION

DATE AND VENUE: The conference will be held on September 13-17, 2004, at the PLAŽA Hotel, in Herceg Novi, Serbia and Montenegro.

Participants will be accommodated at the Plaža Hotel.

The conference will begin on Monday, September 13, at 09.00 and end on Friday, September 17, 2004 at 12.30.

REGISTRATION*:* Registration, registration fee payment, conference materials distribution, etc, will take place at the conference desk (Conference Secretariat) open on Sunday, September 12, from 16.00 to 19.00 and on Monday, September 13, from 07.30 to 09.00.

At registration, the participants are requested to submit proof on their advance registration fee payment.

INSTRUCTION FOR AUTHORS: The conference will feature plenary sessions and poster sessions.

Oral presentations of papers to be given in PLENARY SESSIONS are limited. Time available for delivery is 30 min for invited and 15 min for other papers including discussion (5-10 min). A graphoscope and video-beam are available. PowerPoint presentations, recorded on CD only, should be given at registration.

In POSTER SESSIONS, the authors are requested to display their papers two hours before the session and to be present beside their posters during the session.

PUBLICATION OF PAPERS: Abstracts will be included in a book of abstracts and distributed to each participant at registration.

The Proceedings will be published, as those from the previous conferences, by Trans Tech Publications Ltd., Switzerland, in Mat. Sci. Forum Edition. The papers will be refereed and those selected will be included in the Proceedings Volume.

CONFERENCE AWARDS: The Yugoslav Materials Research Society will award the authors (preferable young members under 35) of the best oral and poster presentation at the conference, and also the authors of highly rated PhD and MSc Theses defended between two conferences. The benefits include free registration, and YUCOMAT 2004 Conference Proceedings.

EXCURSIONS: Excursions can be organised on Wednesday afternoon, Friday after the close of the Conference and on Saturday. Possible destinations are Dubrovnik, Boka Kotorska, Cetinje and Ostrog, per choice.

GENERAL CONFERENCE PROGRAMME

Sunday, September 12, 2004

16^{00}-19^{00} Registration

Monday, September 13, 2004

07^{30}-09^{00} Registration

09^{00} **OPENING CEREMONY**
- Introduction and Welcome

09^{30}-13^{00} **First Plenary Session**
15^{00}-19^{00} **Symposium A**

SYMPOSIUM A: Advanced Methods in Synthesis and Processing of Materials
SYMPOSIUM B: Advanced Materials for High-Technology Application
SYMPOSIUM C: Nanostructured Materials
SYMPOSIUM D: Composites
SYMPOSIUM E: Biomaterials

Tuesday, September 14, 2004

09^{00}-13^{00} **Symposium B** (Session I)
15^{00}-18^{45} **Symposium B** (Session II)
20^{30}-22^{00} **Poster Session I** (Symposium A)

Wednesday, September 15, 2004

08^{30}-13^{00} **Symposium C**
14^{00}-19^{00} **Excursion**
20^{30}-22^{00} **Poster Session II** (Symposium B)

Thursday, September 16, 2004

09^{00}-12^{30} **Second Plenary Session**
15^{00}-17^{45} **Symposium D**
20^{30}-22^{00} **Poster Session III** (Symposiums C, D and E)

Friday, September 17, 2004

09^{00}-12^{00} **Symposium E** (Session I)

12^{00}-12^{30} **Awards and Closing**

CLOSE OF CONFERENCE

PLENARY SESSION

Monday, September 13, 2004

Session I: 09^{30}-13^{00}
Chairmen: S. Milonjić, R. Sinclair and V. Radmilović

09^{30}-10^{00} **IN SITU HREM STUDIES OF CRYSTALLIZATION IN MATERIALS**
R. Sinclair
Department of Materials Science and Engineering, Stanford University, Stanford, California, USA

10^{00}-10^{30} **PATTERNED ARRAYS OF FERROMAGNETIC NANODOTS OVER MACROSCOPIC AREAS: NANOFABRICATION AND PROPERTIES. TOWARDS THE Tbit/in^2 RECORDING DENSITY?**
X. Batlle[1, 2], Ch. Li[1], I.V. Roshchin[1] and I.K. Schuller[1]
[1]*Physics Department, U. California San Diego, La Jolla CA, USA*
[2]*Departament Física Fonamental, U. Barcelona, Barcelona, Catalonia, Spain*

10^{30}-11^{00} **ULTRA HIGH STRENGTH Al-Si THIN FILMS**
V. Radmilović
National Center for Electron Microscopy, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA 94720, USA

Break: 11^{00}-11^{30}

11^{30}-12^{00} **INTELLIGENT MATERIALS: FROM NANOBIOLOGY TO NANOTECHNOLOGY**
F.T. Hong
Dept of Physiology, Wayne State University, Detroit, Michigan, USA

12^{00}-12^{30} **SYNTHESIS AND CHARACTERIZATION OF III-V ROD SHAPE SEMICONDUCTOR NANOCRYSTALS**
J.M. Nedeljković, O.I. Mićić, S.Ph. Ahrenkiel, A.J. Nozik
National Renewable Energy Laboratory, Golden. Colorado, USA

12^{30}-13^{00} **Bi_2O_3-BASED GLASS-FREE CERAMICS FOR A NEW GENERATION OF LTCC MATERIALS**
D. Suvorov, M. Valant
Jožef Stefan Institute, Ljubljana, Slovenia

Break: 13^{00}-15^{00}

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

Monday, September 13, 2004

Session I: 15^{00}-19^{00}
Chairmen: V. Dondur, R.A. Andrievski and A. Auroux

15^{00}-15^{30} **PREPARATION BY ATOMIC LAYER DEPOSITION AND CHARACTERIZATION OF ACTIVE SITES OF HIGHLY DISPERSED VANADIA/ TITANIA/ SILICA CATALYSTS**
A. Auroux[1], J. Keranen[1], L. Niinisto[2]
[1]Institut de Recherches sur la Catalyse, CNRS, Villeurbanne cedex, France, [2]Laboratory of Inorganic and Analytical Chemistry, Helsinki University of Technology, Espoo, Finland

15^{30}-15^{45} **2-D COMPUTER SIMULATION OF RAPID SOLIDIFICATION**
Z.S. Nikolic[1], M. Yoshimura[2] and S. Araki[2]
[1]Faculty of Electronic Engineering, Department of Microelectronics, University of Nis, Nis, Serbia and Montenegro, [2]Materials and Structure Laboratory, Center for Materials Design, Tokyo Institute of Technology, Yokohama, Japan

15^{45}-16^{00} **THEORETICAL AND EXPERIMENTAL EXPLORATION OF THE ENERGY LANDSCAPE OF LiI**
Ž.P. Čančarević, J.Ch. Schön, D. Fischer, and M. Jansen
Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany

16^{00}-16^{15} **SOURCE-DRAIN DYNAMIC BALANCE OF NITROGEN AND OXYGEN IN PLASMA NITRIDING AND POST-OXIDATION PROCESS**
M. Zlatanović
Faculty of Electric Engineering, Belgrade, Serbia and Montenegro

16^{15}-16^{30} **CHARACTERISATION OF CARBON CRYOGEL SYNTHESIZED BY SOL-GEL POLYCONDENSATION AND FREEZE-DRYING**
B. Babić[1], B. Kaludjerović[1], Lj.Vračar[2], N. Krstajić[1,2]
[1]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro

Break: 16^{30}-17^{00}

17^{00}-17^{15} **EFFECTS OF MILLING CONDITIONS ON HYDROGEN SORPTION PROPERTIES OF MgH_2-Fe**
A. Montone[1], J. Grbović[1*], M. Vittori Antisari[1], A. Bassetti[2], E. Bonetti[2], L. Pasquini[2]
*[1]Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy, *P.a: INN Vinča, Department of Material Science, Belgrade, Serbia and Montenegro, [2]Department of Physics, University of Bologna and INFM*

17^{15}-17^{30} **ROLE OF ORGANIC ADDITIVES IN HYDRIDING PROPERTIES OF Mg-C NANOCOMPOSITES**
A. Montone[1], J. Grbović[1*], M. Vittori Antisari[1], L. Mirenghi[2], P. Rotolo[2], A. Bassetti[3], E. Bonetti[3], L. Pasquini[3]
*[1]Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy, [2]Materials and Technology Unit, ENEA C.R. Brindisi, Brindisi, Italy, *P. a: INN Vinča, Department of Material Science, Belgrade, Serbia and Montenegro, [3]Department of Physics, University of Bologna and INFM*

17^{30}-17^{45} **MODELING AND EXPERIMENTAL VERIFICATION OF OXIDATION PROTECTION OF C/C-Si-SiC COMPOSITES**
T. Damjanović, Chr. Argirusis, G. Borchardt
TU Clausthal, Institut für Metallurgie, Clausthal-Zellerfeld, Germany

17^{45}-18^{00} **SYNTHESIS AND ELECTROPHORETIC DEPOSITION OF YTTRIUMSILICATE COATING SYSTEM FOR OXIDATION PROTECTION OF C/C-Si-SiC COMPOSITES**
Chr. Argirusis[1], T. Damjanović[1], M. Stojanović[2], G. Borchardt[1]
[1]TU Clausthal, Institut für Metallurgie, Clausthal-Zellerfeld, Germany, [2]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro

18^{00}-18^{15} **FINE NANOPHASE ZnO:Ru AND ZnO:Pt POWDER SYNTHESIS THROUGH AEROSOLS**
L. Mančić[1], S. Grgurić-Šipka[2], V.M. Djinović[2], Z. Marinković[3], T. Sabo[2] and O. Milošević[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Faculty of Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro
[3]Center for Multidisciplinary Study, University of Belgrade, Serbia and Montenegro

18^{15}-18^{30} **SYNTHESIS OF METAL-SUBSTITUTED LITHIUM MANGANASE OXIDE SPINELS THROUGH ULTRASONIC SPRAY PYROLYSIS METHOD**
D. Jugović[1], N. Cvjetićanin[2], M. Mitrić[3], M. Miljković[4], S. Mentus[2] and D. Uskoković[1]

[1]*Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro*
[2]*Faculty of Physical Chemistry,University of Belgrade, Belgrade, Serbia and Montenegro,* [3]*The Vinča Institute of Nuclear Sciences,Laboratory for Theoretical and Condensed Matter Physics, Belgrade, Serbia and Montenegro,* [4]*Faculty of Medicine, University of Niš, Niš, Serbia and Montenegro*

18^{30}-18^{45} **ADSORPTION OF TIRON ONTO ALUMINA**
J. Roćen, Lj. Čerović, S.K. Milonjić
The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

18^{45}-19^{00} **POROUS CERAMIC: PRODUCING AND CHARACTERIZATION**
D. Tripković[2] , R. Aleksić[1], V. Radojević[1], A. Tripković[2]
[1]*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro,* [2]*ICTM – Institut of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro*

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATION

Tuesday, September 14, 2004

Session I: 09^{00}-13^{00}
Chairmen: M. Davidović, H.Th. Langhammer and Z. Popović

09^{00}-09^{30} **BENDING ACTUATORS BASED ON MONOLITHIC BARIUM TITANATE-STANNATE CERAMICS AS FUNCTIONAL GRADIENT MATERIALS**
R. Steinhausen, H.Th. Langhammer, A. Kouvatov, C. Pientschke, H. Beige
Martin-Luther-Universität Halle-Wittenberg, FB Physik, Halle(Saale), Germany

09^{30}-09^{45} **CRYSTAL CHEMISTRY APPROACH IN Yb-DOPED LASER MATERIALS**
B. Viana
Laboratoire de Chimie Appliquée de l'Etat Solide UMR 7574 du CNRS, ENSCP, Paris Cedex 05, France

09^{45}-10^{00} **INFLUENCE OF PROCESSING PARAMETERS ON SINGLE PLANAR SOFC PERFORMANCE**
M.M. Vlajić, M.D. Vlajić and V.D. Krstić
Centre for Manufacturing of Advanced Ceramics and Nanomaterials, Queen's University, Kingston, ON, Canada

10^{00}-10^{15} **HIGH PRESSURE AND OPTICAL PROPERTIES OF 3d ELEMENTS**
B.R. Jovanić
Institute of Physics, CEP(LMR) , Zemun. Serbia and Montenegro

10^{15}-10^{30} **PHASE TRANSFORMATION OF HEXACELSIANS DOPED WITH Li, Na AND Ca**
V.T. Dondur[1], M. Kićanović[1], R. Dimitrijević[2], A. Kremenović[2], Lj. Damjanović[1]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Faculty of Mining and Geology, Department of Crystallography, University of Belgrade, Belgrade, Serbia and Montenegro

10^{30}-10^{45} **CHARACTERIZATION OF HZSM-5 ZEOLITE MODIFIDED WITH GOLD**
Lj. Damjanović[1], V. Dondur[1], V. Rakić[2], R. Dimitrijević[3], W. Lutz[4]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro, [2]Faculty of Agriculture, Belgrade, Serbia and Montenegro, [3]Faculty of Mining and Geology, Belgrade, Serbia and Montenegro, [4]Tricat Zeolites GmbH, Berlin, Germany

Break 10^{45}-11^{15}

11^{15}-11^{30} **THERMODYNAMIC ASSESSMENT OF THE TERNARY Cu-Pb-O SYSTEM**
M. Čančarević, M. Zinkevich, F. Aldinger

Max-Planck Institut für Metallforschung and Institut für Nichtmetallische Anorganische Materialien der Universität Stuttgart, Stuttgart, Germany

11^{30}-11^{45} **STRUCTURAL, DOPED, RADIATION DEFECTS AND PROPERTIES OF NON-STOICHIOMETRICAL SOLIDS**
N. Kulagin
Kharkiv National University for Radioelectronics, Kharkiv, Ukraine

11^{45}-12^{00} **CONDUCTIVITY OF GRAINS AND GRAIN BOUNDARIES IN POLYCRYSTALLINE HETEROPOLY ACID SALTS**
B. Škipina[1], T. Čajkovski[2], M. Davidović[2,3], D. Čajkovski[2], V. Likar-Smiljanić[3], U. B. Mioč[4]
[1]Faculty of Technology, University of Banjaluka, Banjaluka, Bosnia and Herzegovina (Republic of Srpska), [2]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montrenegro, [3]School of Electrical Engineering, University of Belgrade, Belgrade, Serbia and Montrenegro, [4]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montrenegro

12^{00}-12^{15} **FFT SIMILARITY ANALYSIS IN RAMAN SCATTERING STUDY OF RETiTaO$_6$ DIELECTRIC CERAMICS**
Z.M. Nikolić
Faculty of Physics, University of Belgrade, Belgrade, Serbia and Montenegro

12^{15}-12^{30} **LATTICE PARAMETERS OF Gd-DOPPED CERIA ELECTROLYTES**
B. Matović[1], S. Bošković[1], M.D. Vlajić[2] and V.D. Krstić[2]
[1]Institute of Nuclear Sciences Vinča, Laboratory for Material Science, Belgrade, Serbia and Montenegro, [2]Centre for Manufacturing of Advanced Ceramics and Nanomaterials, Queens University, Nicol Hall, Kingston, Canada

12^{30}-12^{45} **RAINBOW EFFECT IN CHANNELING OF HIGH ENERGY PROTONS THROUGH (10, 0) SINGLE-WALL CARBON NANOTUBES**
D. Borka, S. Petrović and N. Nešković
Laboratory of Physics (010), Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

12^{45}-13^{00} **ALKOXY DERIVATIVES OF FULLERENE C$_{60}$**
A. Djordjević[1], D. Orčić[1], V. Djordjević Milić[2], M. Vojinović-Miloradov[1], O. Nešković[3]
[1]University of Novi Sad, Faculty of Sciences, Novi Sad, Serbia and Montenegro,

[2]University of Novi Sad, Medical Faculty, Department of Pharmacy, Novi Sad, Serbia and Montenegro, [3]Institute of Nuclear Sciences, Vinča, Serbia and Montenegro

Break: 13^{00}-15^{00}

Session II: 15^{00}-18^{45}
Chairmen: D. Raković, D. Suvorov and M. Vlajić

15^{00}-15^{15} **LIGHT OUT OF SILICON. A DREAM OR REALITY?**
M.J. Konstantinović
Institute of Physics, Belgrade, Serbia and Montenegro

15^{15}-15^{30} **LOWEST ENERGY STRUCTURES AND ELECTRONIC PROPERTIES OF SMALL MOLYBDENUM CLUSTERS**
V. Koteski, B. Cekić, N. Novaković, J. Belošević-Čavor
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

15^{30}-15^{45} **NATURE OF MAGNETISM IN THE $HfCo_2$ LAVES PHASE**
J. Belošević-Čavor, N. Novaković, B. Cekić, V. Koteski
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

15^{45}-16^{00} **TEMPERATURE DEPENDENT SURFACE ELECTROCHEMISTRY ON SUPPORTED Pt Ru CATALYST: FORMIC ACID OXIDATION**
A.V. Tripković, K.Dj. Popović, J.D. Lović
ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro

16^{00}-16^{15} **SYNTHESIS, STRUCTURE AND PROPERTIES OF IRON-BASED BULK GLASS-FORMING METALLIC ALLOYS PREPARED BY DIFFERENT PROCESSING**
N. Mitrović[1], S. Roth[2], M. Stoica[2], J. Degmova[3] and J. Eckert[4]
[1]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia and Montenegro, [2]Leibniz Institute for Metallic Materials, IFW Dresden, Dresden, Germany, [3]Department of Nuclear Physics and Technology, Slovak University of Technology, Bratislava, Slovakia, [4]TU Darmstadt, FB11 Material- und Geowissenschaften, FG Physikalische Metallkunde, Darmstadt, Germany

16^{15}-16^{30} **THE ISOTHERMAL ANNEALING EFFECT ON THE CHANGE IN THE ELECTRONIC STATE DENSITY AT THE FERMI LEVEL OF THE $Fe_{89.8}Ni_{1.5}Si_{5.2}B_3C_{0.5}$ AMORPHOUS ALLOY**
A. Maričić[1], N. Mitrović[1], B. Jordović[1], M.M. Ristić[2]
[1]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro, [2]Serbian Academy of Science and Arts, Belgrade

16^{30}-16^{45} **SHORT RANGE STRUCTURE OF AMORPHOUS METALLIC ALLOYS Zr-Ti-Al-Cu-Ni**
P. Tomić[1], M. Davidović[2]
[1]Research and Development Department, Factory of Birač, Zvornik, Bosnia and Herzegovina (Republic of Srpska), [2]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montrenegro

16^{45}-17^{00} **EXPERIMENTAL EVIDENCE OF NONLINEAR PHOTOTHERMAL EFFECTS IN MATERIALS DETECTED BY SECOND HARMONIC PHOTOACOUSTIC SPECTROSCOPY (SHPAS) TECHNIQUE**
M.D. Dramićanin and A. Kapidžić
Institute of Nuclear Sciences "Vinča", Laboratory for Radiation Chemistry and Physics, Belgrade, Serbia and Montenegro

Break: 17^{00}-17^{30}

17^{30}-17^{45} **HYPERBOLIC PROPAGATION OF A THERMAL SIGNAL IN AN INHOMOGENEOUS MEDIUM**
S. Galović, D. Miličević, E. Suljovrujić
The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

17^{45}-18^{00} **DETERMINATION OF SURFACE CHARACTERISTICS OF GLYCIDYL METHACRYLATE BASED COPOLYMERS BY INVERSE GAS CHROMATOGRAPHY UNDER FINITE SURFACE COVERAGE**
A.B. Nastasović[1], A. E. Onjia[2], S.K. Milonjić[2], Z. Vuković[3], S.M. Jovanović[4]
[1]Institute for Chemistry, Technology and Metallurgy, Center for Chemistry, Belgrade, Serbia and Montenegro, [2]Vinča Institute of Nuclear Sciences, Chemical Dynamics Laboratory, Belgrade, Serbia and Montenegro, [3]Institute for Chemistry, Technology and Metallurgy, Center for Catalysis and Chemical Engeneering, Belgrade, Serbia and Montenegro, [4]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

18^{00}-18^{15} **EXAMINATIONS OF CROSS-LINKED POLYVINYLPYRIDINE IN OPEN REACTOR**
M. Milošević[1], N. Pejić[2], Ž. Čupić[3], S. Anić[1] and Lj. Kolar-Anić[1]
[1]Faculty of Physical Chemistry, University of Belgrade, Beograd, Serbia and Montenegro, [2]Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia and Montenegro, [3]Institute of Chemistry, Technology and Methalurgy, Departement of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

18^{15}-18^{30} **MICROSTRUCTURAL AND MECHANICAL PROPERTIES OF Ti_3Al-BASED INTERMETALLICS PRODUCED BY POWDER METALLURGY**

B. Dimčić, M. Vilotijević, D. Božić, M. T. Jovanović
Institute of Nuclear Sciences "Vinča", Material Science Laboratory, Belgrade, Serbia and Montenegro

18^{30}-18^{45} **THE AUSTEMPERING STUDY OF Cu-ALLOYED DUCTILE IRON**
O. Erić[1], D. Rajnović[2], L. Šidjanin[2], S.P. Zec[1]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro,
[2]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia and Montenegro

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

Wednesday, September 15, 2004

Session I: 08^{30}-13^{00}
Chairman: J. Nedeljković, M. Drofenik and M. Zlatanović

08^{30}-09^{00} **MAIN PROBLEMS OF NANOSTRUCTURED MATERIALS SCIENCE**
R.A. Andrievski
Institute of Problems of Chemical Physics, Russian Academy of Sciences, Chernogolovka, Moscow Region 142432, Russia

09^{00}-09^{30} **SYNTHESES AND CHARACTERIZATION OF MAGNETIC NANOPARTICLES**
M. Drofenik[1,2], D. Lisjak[1], D. Makovec[1]
[1]Jožef Stefan Institute, Ljubljana, Slovenia, [2]Faculty of Chemistry and Chemical Engineering, University of Maribor, Slovenia

09^{30}-09^{45} **SYNTHESIS OF SILICA-COATED PERMALLOY NANOPARTICLES USING WATER-IN-OIL MICROEMULSION**
I. Ban[1], M. Drofenik[1,2], D. Makovec[2]
[1]Faculty of Chemistry and Chemical Engineering, University of Maribor, Slovenia, [2]Jožef Stefan Institute, Ljubljana, Slovenia

09^{45}-10^{00} **SYNTHESIS OF LANTHANUM-STRONTIUM MANGANITES BY A HYDROXIDE-PRECURSOR CO-PRECIPITATION METHOD IN SOLUTION AND REVERSE MICELLAR MICROEMULSION**
V. Uskoković[1], M. Drofenik[1, 2]
[1]»Jožef Stefan « Institute, Ljubljana, Slovenia, [2]Faculty of Chemistry and Chemical Engineering, Maribor, Slovenia

10^{00}-10^{15} **PHOTOLUMINESCENCE OF LASER-SYNTHESIZED ANATASE TITANIUM DIOXIDE NANOPOWDERS**
M. Šćepanović, Z.D. Dohčević-Mitrović, I. Hinić, M. Grujić-Brojčin, G. Stanišić, Z.V. Popović
Institute of Physics, Center for Solid State Physics and New Materials, Belgrade, Serbia and Montenegro

10^{15}-10^{30} **CHARACTERIZATION OF NANOPOROUS LANTHANIDES-DOPED GADOLINIUM GALLIUM GARNET POWDERS OBTAINED BY PROPELLANT SYNTHESIS**
R. Krsmanović, S. Polizzi, P. Canton
Dipartimento di Chimica Fisica, Laboratorio di Microscopia Elettronica, Università Ca' Foscari di Venezia, Venice, Italy

10^{30}-10^{45} **PREPARATION AND ELECTROCHEMICAL CAPACITANCE OF NANO-STRUCTURED NiO-Fe_2O_3 SUPPORTED ON CARBON CRYOGEL**
B. Babić[1], D. Djokić[1], T. Trišović[2], Lj. Gajić-Krstajić[2]
[1]The Vinča Institute of Nuclear Sciences, Belgrade, [2]Institute of Technical Science of SASA, Belgrade, Serbia and Montenegro

10^{45}-11^{00} **PARTICLE SIZE EFECT: METHANOL OXIDATION ON SUPPORTED PT CATALYST IN ALKALINE SOLUTION**
A.V. Tripković[1], K.Dj. Popović[1], J.D. Lović[1], A. Kowal[2]
[1]ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Krakow, Poland

Break: 11^{00}-11^{30}

11^{30}-11^{45} **RESONANT RAMAN SCATTERING IN STRAINED AND RELAXED InGaN/GaN MULTIPLE QUANTUM WELLS**
S. Lazić[1], M. Moreno[1], J.M. Calleja[1], F. Naranjo[2], E. Calleja[2]
[1]Departamento de Física de Materiales, Universidad Autónoma de Madrid, Madrid, Spain, [2]Departamento de Ingeniería Electrónica, Universidad Politécnica de Madrid, Madrid, Spain

11^{45}-12^{00} **GaN/AlGaN NANOCAVITIES WITH AlN/GaN BRAGG REFLECTORS GROWN IN AlGaN NANOCOLUMNS BY PLASMA-ASSISTED MBE**
J. Ristić[1], E. Calleja[1], S. Fernández-Garrido[1], A. Trampert[2], K.H. Ploog[2], M. Povoloskyi[3] and A. Di Carlo[3]
[1]ISOM-Dept. Ingeniería Electrónica, Universidad Politécnica, Ciudad Universitaria s\n, Madrid, Spain, [2]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany, [3]Dpt. di Ingegneria Elettronica, Universita di Roma "Tor Vergata", Roma, Italy

12^{00}-12^{15} **GaAs/AlGaAs QUANTUM CASCADE LASERS BASED ON DOUBLE RESONANT ELECTRON – LO PHONON TRANSITIONS**
A. Mirčetić[1,2], D. Indjin[1,3],V. Milanović[1], P. Harrison[3], Z. Ikonić[1,3], R. W. Kelsall[3], M. Giehler[4], R. Hey[4], H.T. Grahn[4]

[1]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro, [2]"Telekom Srbija" a.d., Zona održavanja Pančevo, Pančevo, Serbia and Montenegro, [3]Institute of Microwaves and Photonics, School of Electronic and Electrical Engineering, University of Leeds, Leeds, UK, [4]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany

12^{15}-12^{30} **CONTROL OF OPTICAL GAIN IN THE ACTIVE REGION OF QUANTUM CASCADE LASER BY STRONG PERPENDICULAR MAGNETIC FIELD**

J. Radovanović[1,2], V. Milanović[2], Z. Ikonić[2,3], D. Indjin[2,3]
[1]Institute of Physics, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro, [3]Institute of Microwaves and Photonics, School of Electronic and Electrical Engineering, University of Leeds, Leeds, UK

12^{30}-12^{45} **POTENTIAL FOR OPTIMAL DIPOL MATRIX TRANSITION ELEMENTS IN CdS-HgS QUANTUM DOTS**

G. Todorović[1], V. Milanović[2], R. Gospavić[1], V. Popov[3]
[1]Faculty of Civil Engineering, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro, [3]Wessex Institute of Technology, Southampton, UK

12^{45}-13^{00} **HEMT CARRIER MOBILITY ANALYTICAL MODEL**

P.M. Lukić[1], R.M. Ramović[2], R.M. Šašić[3]
[1]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, [3]Faculty of Tecnology and Metallurgy, Belgrade

PLENARY SESSION

Thursday, September 16, 2004

Session II: 09^{00}-12^{30}
Chairmen: Z. Petrović, S. Bošković and E. Antić-Fidančev

09^{00}-09^{30} **FRAMEWORK FOR RESEARCH AND TECHNOLOGY DEVELOPMENT POLICY IN SMALL COUNTRIES – THE CASE OF SLOVENIA**
M. Komac
Ministry of Education, Science and Sport, Ljubljana, Slovenia

09^{30}-10^{00} **SURFACE SENSITIVE SEMICONDUCTING NANOMATERIALS**
R.M. Leblanc and K.M. Gattás-Asfura
Department of Chemistry, University of Miami, Coral Gables, Florida, USA

10^{00}-10^{30} **EVIDENCE OF DOPANT MATRIX INTERACTION - DMI - IN OPTICAL SPECTRA OF RARE EARTH IONS**
E. Antić-Fidančev
Laboratoire de Chimie Appliquée de l'État Solide, CNRS, UMR-C7574, ENSCP, Paris Cédex 05, France

Break: 10^{30}-11^{00}

11^{00}-11^{30} **HYDROGEN STORAGE USING LIGHT METAL HYDRIDES CHOICE BETWEEN THERMODYNAMIC OR CHEMICAL WAYS**
S. Jacques, M.P. Berthet and B. Bonnetot
L. M. I., UMR 5615, UCB Lyon 1, Villeurbanne Cedex, France

11^{30}-12^{00} **INORGANIC FLUORIDES AND OXIDES BY THERMAL DECOMPOSITION OF HYDRAZINIUM(+1) AND HYDRAZINIUM(+2) FLUOROMETALLATES**
A. Rahten, M. Remškar, A. Jesih
Jožef Stefan Institute, Ljubljana, Slovenia

12^{00}-12^{30} **THE INFLUENCE OF SURFACE MODIFICATION ON RELATED FUNCTIONAL PROPERTIES OF WOOL AND HEMP**
P. Jovančić[1], D. Jocić[1], M. Radetić[1], T. Topalović[2], Z.Lj. Petrović[3]
[1]Textile Engineering Department, Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Textile Technology Group, Faculty of Science and Technology, University of Twente, Enschede, The Netherlands, [3]Institute of Physics, Zemun, Serbia and Montenegro

Break: 12^{30}-15^{00}

SYMPOSIUM D: COMPOSITES

Thursday, September 16, 2004

Session I: 15^{00}-17^{45}
Chairmen: M. Stevanović, D. Perreux and Lj. Čerović

15^{00}-15^{30} **INVESTIGATION ON THE STATIC AND FATIGUE FAILURE OF BI-DIRECTIONAL COMPOSITE PIPES**
D. Perreux[1], F. Thiébaud[1], L. Farines[1], P.S. Uskoković[1,2]
[1]Laboratoire de Mécanique Appliquée. R Chaléat, Besançon-France, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

15^{30}-15^{45} **NANOTRIBOLOGICAL PROPERTIES OF UHMWPE/QUARTZ COMPOSITES**
C.Y. Tang[1], P.S. Uskoković[1,2], C.P. Tsui[1], K.C. Chan[1], S. C.L. Lo[3]
[1]Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, P.R. China, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro, [3]Department of Applied Biology and Chemical Technology, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, P.R. China

15^{45}-16^{00} **GAMMA RADIATION EFFECTS ON SHORT TERM MECHANICAL PROPERTIES OF CARBON/EPOXY COMPOSITES**
M.M. Stevanović, D.R. Sekulić, I.M. Djordjević
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

Break: **16^{00}-16^{30}**

16^{30}-16^{45} **SiC/SiC COMPOSITES PREPARED WITH A BN INTERPHASE PROCESSED BY LP-CVD FROM MOLECULAR PRECURSOR**
S. Jacques, M.-P. Berthet and B. Bonnetot
Laboratoire des Multimatériaux et Interfaces, UMR 5615 University of Lyon 1 / CNRS, Villeurbanne Cedex, France

16^{45}-17^{00} **HOT PRESSING OF Y_2O_3 DOPPED Si_3N_4 CERAMICS**
D. Bučevac and S. Bošković
Institute of Nuclear Sciences Vinca, Materials Science Laboratory 170, Belgrade, Serbia and Montenegro

17^{00}-17^{15} **INFLUENCE OF ADDITIVE TYPE ON DENSFICATION AND PHASE TRANSFORMATION OF SEEDED Si_3N_4**
A. Vučković, B. Matović and S. Bošković
Materials Science Laboratory, Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

17[15]-17[30] **MORPHOLOGY AND CAPACITIVE PROPERTIES OF DIFFERENTLY PREPARED RuO_xH_y/C COMPOSITE MATERIALS**

V. Panić[1], A. Dekanski[1], S. Gojković[2], S.K. Milonjić[3], V. Mišković-Stanković[2], B. Nikolić[2]

[1]ICTM – Center of Electrochemistry, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [3]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

17[30]-17[45] **MECHANICAL BEHAVIOUR OF SPHEROIDAL GRAPHITE UNDER DIFFERENT LOAD TYPES**

S. Baloš, D. Rajnović, L. Šidjanin, P. Kovač

Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia and Montenegro

SYMPOSIUM E: BIOMATERIALS

Friday, September 17, 2004

Session I: 09^{00}-12^{00}
Chairmen: M.B. Plavšić, A.R. Boccaccini and J.P. Šetrajčić

09^{00}-09^{30} **BIODEGRADABLE AND BIOACTIVE COMPOSITE FOAMS FOR TISSUE ENGINEERING SCAFFOLDS**
A.R. Boccaccini
Department of Materials and Centre for Tissue Engineering and Regenerative Medicine, Imperial College, London, UK

09^{30}-09^{45} **SYNTHESIS, CHARACTERIZATION AND APPLICATION OF COMPOSITE BIOMATERIALS BIPHASIC CALCIUM PHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLIDE AS FILLER AND BLOCKS FOR REPARATION HARD BONE TISSUE**
N. Ignjatović[1], P. Ninkov[2], Z. Ajduković[3], V. Konstantinović[4], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [2]Faculty of Medicine, Clinic of Stomatology, University of Novi Sad, Novi Sad, [3]Faculty of Stomatology, University of Nis, Nis, [4]Clinic for Maxillofacial Surgery, Faculty of Stomatology, Belgrade, Serbia and Montenegro

09^{45}-10^{00} **RADIATION EFFECTS ON POLY-L-LACTIDE AND HYDROXYAPATITE/ POLY-L-LACTIDE COMPOSITE**
E. Suljovrujić[1], N. Ignjatović[2], M. Mitrić[1], M. Mitrović[3], D. Uskoković[2]
[1]Vinca Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [3]Faculty of Physics, Belgrade, Serbia and Montenegro

10^{00}-10^{15} **INFLUENCE OF γ RADIATION ON THE PROPERTIES OF CARBON CLOTH AS A BANDAGING MATERIAL**
B. Kaludjerović, B. Babić and Lj. Milovanović
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

10^{15}-10^{30} **MATHEMATICAL MODELING OF CELL DISTRIBUTION IN ALGINATE MICROBEADS**
B. Obradović[1], B. Bugarski[1], D. Bugarski[2], Z. Todosijević[1], G. Vunjak-Novaković[3]
[1]Chemical Engineering Department, Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro; [2]Institute for Medical Research, Belgrade, Serbia and Montenegro; [3]Division of Health Sciences and Technology, Massachusetts Institute of Technology, Cambridge, USA

Break: 10^{30}-11^{00}

11^{00}-11^{15} **SYNERGY OF MATTER, ENERGY AND INFORMATION IN BIOLOGICAL NANOSTRUCTURES**

Dj. Koruga
Molecular Machines Research Center, Faculty of Mechanical Engineering, University of Belgrade, Serbia and Montenegro

11^{15}-11^{30} **A KINK-SOLITON MODEL OF CHARGE TRANSPORT THROUGH MICROTUBULAR CYTOSKELETON**

G. Keković[1], D. Raković[2], M. Satarić[3], Dj. Koruga[4]
[1]Military Academy, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro, [3]Faculty of Technical Sciences, Novi Sad, Serbia and Montenegro, [4]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro

11^{30}-11^{45} **BIOPOLYMER CHAIN FOLDING AND BIOMOLECULAR RECOGNITION: A QUANTUM DECOHERENCE THEORY APPROACH**

D. Raković[1], M. Dugić[2], M.B. Plavšić[3]
[1]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro, [2]Department of Physics, Faculty of Science, Kragujevac, Serbia and Montenegro, [3]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

11^{45}-12^{00} **APPEARANCE OF A HARD LAYER ("α CASE") ON THE SURFACE OF TITANIUM-BASED CAST ALLOYS**

Z. Mišković, B. Dimčić, I. Bobić, S.P. Zec, M.T. Jovanović
Institute for Nuclear Sciences «Vinca», Belgrade, Serbia and Montenegro

POSTER SESSION I

Tuesday, September 14, 2004, 20^{30}-22^{00}

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

P.S.A.1. **FORMATION OF SOLID TiC FROM THERMAL PLASMA. THERMODYNAMIC CONSIDERATION**
J. Radić-Perić
Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro

P.S.A.2. **LOW PRESSURE RF PLASMA REACTOR FOR MODIFICATION OF POLYMERS AND TEXTILE MATERIALS**
N. Puač[1], Z.Lj. Petrović[1], M. Radetić[3] and A. Djordjević[2]
[1]Institute for Physics, Zemun, Serbia and Montenegro, [2]Faculty of Electrical Engineering, University of Belgrade, Belgrade, Serbia and Montenegro, [3]Department for Textil Engineering, Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro

P.S.A.3. **NEUTRALIZATION OF IONS BEAMS FOR REDUCTION OF CHARGING DAMAGE IN PLASMA ETCHING**
A. Stojković, M. Radmilović-Radjenović and Z. Lj. Petrović
Institute of Physics, Belgrade, Serbia and Montenegro

P.S.A.4. **WATER TREATMENT USING PULSED CORONA DISCHARGES**
N. Popović[1], N. Stančić[2], I. Vidović[2], J. Krstić-Simić[1], M. Simičić[1], M. Dimitrijević[3]
[1]Institute of Chemical Power Sources (IHIS), Zemun, Serbia and Montenegro, [2]NAISSUS, Niš, Serbia and Montenegro, [3]Astronomical Observatory, Belgrade, Serbia and Montenegro

P.S.A.5. **DYNAMIC VOLTAGE-CURRENT CHARACTERISTICS OF UNIPOILAR PULSE GLOW DISCHARGE**
I. Popović, V. Rajović and M. Zlatanović,
Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

P.S.A.6. **DRM-MD FORMULATION FOR LASER-MATERIAL INTERACTION**
R. Gospavić[1], G. Todorović[1], V. Popov[2], M. Srećković[3]
[1]Faculty of Civil Engineering, Belgrade, Serbia and Montenegro, [2]Wessex Institute of Technology, Southampton, UK, [3]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

P.S.A.7. **SURFACE STRUCTURES FORMED ON THE AISI 420 STAINLESS STEEL BY PULSED LASER IRRADIATION**
B. Gaković[1], M. Trtica[1], S. Petrović[1], P. Panjan[2], M. Čekada[2], Z. Samardžija[2]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro, [2]Jožef Stefan Institute, Ljubljana, Slovenia

P.S.A.8. **COMPARISON OF HYDROXYAPATITE SORPTION PROPERTIES TOWARDS Pb, Cd, Zn and Sr IONS**
I.D. Smičiklas, A. Onjia, J. Marković, S. Raičević
The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.A.9. **REDUCTION OF NiO-WO_3 OXIDE MIXTURES SYNTHESIZED BY GEL-COMBUSTION TECHNIQUE: A ROUTE TO NiW ALLOYS**
S. Mentus[1], D. Majstorović[2], B. Tomić[2], R. Dimitrijević[2]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Institute of General and Physical Chemistry, Belgrade, Serbia and Montenegro, [3]Faculty of Mining and Geology, Belgrade, Serbia and Montenegro

P.S.A.10. **THE INFLUENCE OF CHANGE OF SYNTHESYS PROCEDURE ON PHISICO-CHEMICAL PROPERTIES OF Ni-SILICATE PRECURSOR**
J. Krstić[1], N. Vukelić[2], Z.P. Nedić[2], A. Milutinović-Nikolić[1], A. Šućurović[1], D. Jovanović[1]
[1]Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, University of Belgrade, Serbia and Montenegro

P.S.A.11. **THE PROPERTIES OF BORON DOPPED GLASSY CARBON**
A. Udovičić[1], M. Baćić[2], M. Laušević[2] and Z. Laušević[1]
[1]The Institute of Nuclear Science VINCA, Laboratory of Physics 010, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade

P.S.A.12. **THE EFFECT OF THE ELECTROLYSIS PARAMETERS ON MORPHOLOGY STRUCTURE AND CHEMICAL COMPOSITION OF COBALT AND NICKEL POWDER**
M. Spasojević[1], L. Rafailović[1], L. Ribić-Zelenović[1], B. Jordović[2]
[1]Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro, [2]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro

P.S.A.13. **THE FLOWABILITY OF ELECTROLYTIC COPPER POWDER**

M.G. Pavlović[1], K.I. Popov[2], S.B. Krstić[2], Lj.J. Pavlović[1]
[1]ICTM-Department of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro

P.S.A.14. **INFLUENCE OF MECHANICAL ACTIVATION AND Ni^{2+} ION ON CHARACTERISTICS OF THE $BaTiO_3$ CAPACITORS**
V. Pejović[1], D. Djurović[2], S. Bošković[2]
[1]IRITEL, Belgrade, Serbia and Montenegro, [2]Institute for Nuclear Sciences "Vinča", Belgrade

P.S.A.15. **MECHANICAL ACTIVATION SYNTHESIS OF $CaTiO_3$ FROM MIXTURE OF CaO AND TiO_2**
V.M. Vukotić[1], N. Radojević, Lj. Živković[2], Z. Vuković[3], B.D. Stojanović[1]
[1]Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Faculty of Electronic Engineering, University of Niš, Niš, Serbia and Montenegro, [3]Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.A.16. **THE INFLUENCE OF MILLING PARAMETERS ON COMPRESSIBILITY OF MECHANICALLY ACTIVATED ZINC OXIDE POWDERS**
K. Vojisavljević[1], J. Filipović[2], T. Srećković[1], D. Minić[2], M. M. Ristić[3]
[1]Center for Multidisciplinary Studies of the Belgrade University, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry of the Belgrade University, Belgrade, Serbia and Montenegro, [3]Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

P.S.A.17. **COMPUTER SIMULATION OF GRAIN COARSENING DURING LIQUID PHASE SINTERING**
Z.S. Nikolić
Faculty of Electronic Engineering, Department of Microelectronics, University of Niš, Niš, Serbia and Montenegro

P.S.A.18. **SYNTHESIS OF ZINC STANNATE SPINEL BY REACTIVE SINTERING**
N. Nikolić[1], T. Ivetić[1], T.V. Srećković[2], M.M. Ristić[3]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [2]Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia and Montenegro, [3]Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

P.S.A.19. **DILATOMETER INVESTIGATIONS OF REACTIVE SINTERING OF ZINC TITANATES CERAMICS**
N. Obradović[1], N. Labus[1], T.V. Srećković[2], Lj. Živković[3], M.M. Ristić[4]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [2]Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia and

Montenegro, [3]Faculty of Electronic Engineering, University of Niš, Niš, Serbia and Montenegro, [4]Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

P.S.A.20. **APPLICATION OF THE MASTER SINTERING CURVE THEORY TO NON-ISOTHERMAL SINTERING OF $BaTiO_3$ CERAMICS**
M.V. Nikolić[1], V.P. Pavlović[2], V.B. Pavlović[3], N. Labus[4], B.D. Stojanović[1]
[1]Center for Multidisciplinary Studies of the University of Belgrade, Beograd, Serbia and Montenegro, [2]Faculty of Mechanical Engineering, Beograd, Serbia and Montenegro, [3]Faculty of Agriculture, Beograd, Serbia and Montenegro, [4]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Beograd, Serbia and Montenegro

P.S.A.21. **MICROSTRUCTURE EVOLUTION AND CHARACTERIZATION OF CdO AND ZnO**
V.P. Pavlović[1], Z.M. Nikolić[2], V.B. Pavlović[3], D.M. Popović[2]
[1]Faculty of Mechanical Engineering, Beograd, Serbia and Montenegro, [2]Faculty of Physics, Belgrade, Serbia and Montenegro, [3]Faculty of Agriculture, Zemun, Serbia and Montenegro

P.S.A.22. **SINTERING OF NATURAL ALUMOSILICATE**
D. Živanović
Institute for Mineral and Other Raw Materials, Belgrade, Serbia and Montenegro

P.S.A.23. **COMPARATIVE INVESTIGATION OF METHYL METHACRYLATE POLYMERIZATION UNDER THERMAL AND MICROWAVE ENERGY**
J. Jovanović[1] and B. Adnadjević[2]
[1]Institute of Technical Science of SASA, Beograd, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Beograd, Serbia and Montenegro

P.S.A.24. **MELTING BEHAVIOR OF ISOTACTIC POLYPROPYLENE HIGHLY CROSSLINKED BY GAMMA IRRADIATION IN THE ABSENCE OF OXYGEN**
Z. Kačarević-Popović, D. Babić, M. Marinović-Cincović
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

P.S.A.25. **THE COMPOSITION CHANGE OF ORGANIC COATINGS AND THEIR INFLUENCE ON PROPERTIES OF COATINGS**
M. Rajković[1], J. Djordjević[1], M.P. Antić[1], C. Lačnjevac[1], Lj. Rašković[2]
[1]Faculty of Agriculture, Belgrade, Serbia and Montenegro [2]Pomoravlje-Niš, Niš

P.S.A.26. **SYNTHESIS OF THE 4-VINILPYRIDINE COPOLYMER WITH METYLACRILAT AND ACRYLONITRILE AND THEIR APPLY FOR THE ADSORPTION OF GOLD FROM DILUTED SOLUTIONS**

P. Miletić[1], V. Bojanić[2], S. Jovanović[3], Ž. Topić[2], M. Dragić[4], Ž. Marjanović-Balaban[1]
[1]Faculty of Forestry, Banja Luka, Republic Srpska, Bosnia and Hercegovina, [2]Faculty of Agriculture, Banja Luka, [3]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [4]MUP RS, Dept. of Crimetechnics, Banja Luka

P.S.A.27. **SINTHESIS OF CYCLIC ACETALS**

Z. Sebastijan
Higher Technological School for non-metals, Aradjelovac, Srbia and Montenegro

POSTER SESSION II

Wednesday, September 15, 2004, 20^{30}-22^{00}

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATIONS

P.S.B.1. **THE INFLUENCE OF THE SMALL-POLARON INDUCED SHIFT OF PHONON FREQUENCIE ON IR SPECTRA OF HYDROGEN BONDED MOLECULAR CRYSTALS**
D. Čevizović, S. Zeković and Z. Ivić
The "Vinča" Institute of Nuclear Sciences, Laboratory of Theoretical and Condensed Matter Physics-020, Belgrade, Serbia and Montenegro

P.S.B.2. **HYPERVALENT MOLECULAR CLUSTER: $C_{28}H_4$**
M. Veljković[1], O. Nešković[1], A. Djerić[2], S. Veličković[1] and V. Šipka[1]
[1]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

P.S.B.3. **EVALUATION OF THE TWO-DIMENSIONAL ELECTRON DENSITY IN AlGaAs/GaAs MODFETS**
R.M. Šašić[1], D. Čevizović[2], and R.M. Ramović[3]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [2]The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [3]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

P.S.B.4. **MODEL FOR PHONONS IN MULTICOMPONENT $A_{1-x-y}B_xC_yD$ TYPE ALLOYS**
M. Romčević
Institute of Physics, Belgrade, Serbia and Montenegro

P.S.B.5. **SPIN INTERACTIONS IN $Cd_{1-x}Mn_xS$ BULK CRYSTALS**
D. Milivojević and B. Babić-Stojić
Vinča Institute of Nuclear Sciences, Belgrade, Sebia and Montenegro

P.S.B.6. **OPTICAL AND MAGNETIC PROPERTIES OF $Hg_{1-x}Mn_xSe$ ALLOYS**
Dj. Jovanović[1], D. Milivojević[2], M. Romčević[1], B. Babić-Stojić[2], N. Romčević[1]
[1]Institute of Physics, Belgrade, Serbia and Montenegro, [2]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.B.7. **PARALLEL ANALYSIS OF IC HOUSING THERMAL PROPERTIES**
B. Radojčić[1], R.M. Ramović[2], O. Aleksić[1]

[1]Institute of Security, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade

P.S.B.8. **PHOTOTHERMAL MODELING OF MULTILAYER SAMPLES BASED ON GENERALIZED TRANSMISSION-LINE THEORY OF HEAT CONDUCTION**
Z. Stojanović, S. Galović
The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.B.9. **HEATED AND SELF-HEATED THICK FILM NTC AIR FLOW VOLUME SENSOR**
O. Aleksić[1], M. Luković[1], D. Luković[2], S. Savić[2]
[1]Institute of Security, Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of SANU, Belgrade, Serbia and Montenegro

P.S.B.10. **FAR INFRARED REFLECTIVITY SPECTRA OF LEAD-TELLURIDE DOPED WITH SAMARIUM**
D. Luković[1], S. Savić[1], W. König[2], V. Blagojević[3], S. Vujatović[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [2]Max Planck Institut für Festkörperforschung, Stuttgart, Germany, [3]Faculty of Electrical Engineering of Belgrade University, Belgrade, Serbia and Montenegro

P.S.B.11. **EXTRACTION OF THE PARAMETERS FROM I-V DATA FOR NONIDEAL PHOTODETECTORS: A COMPARATIVE STUDY**
A. Vasić[1], P. Osmokrović[2], B. Lončar[3], S. Stanković[4]
[1]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, [3]Faculty of Tecnology and Metallurgy, Belgrade, [4]The Vinča Institute of Nuclear Sciences, Belgrade

P.S.B.12. **COMPARATIVE POTENCIODINAMIC STUDY OF Ni AND H UNDERPOTENTIAL DEPOSITION AT Pt ELECTRODE IN NEUTRAL SOLUTION**
M.D. Obradović[1], B.N. Grgur[2], Lj.M. Vračar[2],
[1]ICTM - Institute of Electrochemistry, Belgrade, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.B.13. **CARBON NANOTUBES AS ASSISTED MATRIX FOR FULLERENES**
V. Šipka, O. Nešković, M. Veljković and S. Veličković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.B.14. **DIELECTRIC, SPECTRAL AND RAMAN SCATTERING STUDIES OF Nd-DOPED $SrTiO_3$ SINGLE CRYSTAL**
D.M. Popović[1], N. Romčević[2], S.Spasović[1], J.Dojčilović[1]
[1]Faculty of Physics, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Institute of Physics, Belgrade, Serbia and Montenegro

P.S.B.15. **PREPARATION AND PROPERTIES OF $BaTi_{1-x}Sn_xO_3$ MULTILAYERED CERAMICS**
S. Marković[1], M. Mitrić[2], N. Cvjetićanin[3], V. Pejović[4], D. Uskoković[1]
[1]Institute of Technical Science of the Serbian Academy of Sciences and Arts, Belgrade, [2]The Vinča Institute of Nuclear Science, Belgrade, [3]Faculty of Physical Chemistry, Belgrade, [4]d.d. IRITEL, Belgrade, Serbia and Montenegro

P.S.B.16. **HIGH TEMPERATURE DEFORMATION AS METHOD INCREASING OF MECHANICAL PROPERTIES AND WAY OF FABRICATION SILICON NITRIDE BASED PRODUCTS**
Ya.A. Kryl, I.D. Gnylytsya
Ivano-Frankivsk National Technical University of Oil and Gas, Ivano-Frankivsk, Ukraine

P.S.B.17. **KINETIC PROPERTIES OF HYDRIDING PROCESS AT $LmNi_{3.55}Co_{0.75}Mn_{0.4}Al_{0.3}$ HYDROGEN STORAGE ALLOY**
N. Potkonjak[1], D. Sužnjević[1], B. Simonović[1], S. Mentus[2]
[1]Institute of General and Physical Chemistry, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro

P.S.B.18. **HYDROGEN ABSORPTION AND DESORPTION EFFECT ON THE COBALT POWDER ELECTRICAL RESISTIVITY**
L. Rafailović[1], D. Minić[2], M. Spasojević[1], A. Maričić[3]
[1]Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, University of Belgrade, Serbia and Montenegro, [3]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro

P.S.B.19. **STRUCTURAL CHANGES OF THE $Ni_{20}Co_{80}$ AMORPHOUS POWDER WITHIN THE 20°C TO 700°C TEMPERATURE INTERVAL**
R. Simeunović[1], M. Spasojević[2], L. Rafailović[2], M.M. Ristić[3]
[1]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro, [2]Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro, [3]Serbian Academy of Science and Arts, Belgrade

P.S.B.20. **THERMAL COEFFICIENT OF LINEAR EXPANSION OF NON-CRYSTALLINE CHALCOGENIDES IN THE Cu-As-Se SYSTEM**
V.B. Petrović[1], S.R. Lukić[1], F. Skuban[1], D.D. Petrović[2]
[1]Department of Physics, Faculty of Sciences, Novi Sad, Serbia and Montenegro, [2]Institute of Energy and Process Engineering, Novi Sad, Serbia and Montenegro

P.S.B.21. **A COMPARISON BETWEEN PHASE-FIELD AND MOVING MESH MODEL FOR SOLVING SOLID-SOLID PHASE TRANSFORMATIONS IN BINARY ALUMINIUM ALLOYS**
I. Kovačević, B. Šarler
Laboratory for Multiphase Processes, Nova Gorica Polytechnic, Nova Gorica, Slovenia

P.S.B.22. **THE EFFECT OF COPPER CONTENTS ON THE MICROSTRUCTURE AND PROPERTIES OF THE ALUMINIUM-COPPER-MAGNESIUM ALLOYS**
B. Zlatičanin[1], B. Radonjič[1], M. Filipović[2], A. Valčić[2], R. Aleksić[2], S. Nikolić[3]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [3]Institute for the Physics, Belgrade, Serbia and Montenegro

P.S.B.23. **CRACK GROWTH RESISTANCE OF OVERAGED Al-Zn-Mg-Cu ALLOYS**
M. Vratnica[1], Z. Cvijović[2], H.P. Degischer[3], G.C. Requena[3], G. Rumplmair[4], M. Rakin[2]
[1]Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [3]Institute of Materials Science and Testing, Vienna, Austria, [4]USTEM, Technical University of Vienna, Vienna, Austria

P.S.B.24. **EXAMINATION OF STRUCTURAL CHANGES IN THE CONSTRUCTIVE PARTS MADE OF MORE ALUMINIUM ALLOYS BY APPLYING THE MODERN OPTICAL METHOD**
R. Radovanović[1], A. Milosavljević[2], M. Srećković[3], A. Milovanović[1], M. Kutin[1]
[1]Institute Goša d.o.o, Belgrade, Serbia and Montenegro, [2]Faculty of Mechanical Engineering, Belgrade, [3]Faculty of Electrical Engineering, Belgrade

P.S.B.25. **THE INFLUENCE OF THE HEAT AND HEAT-MECHANICAL TREATMENTS REGIME ON MECHANICAL AND EXPLOITATION PROPERTIES OF ALLOY 8090**
S. Drecun Nešić[1], Z. Burzić[2], A. Milosavljević[3], R. Prokić-Cvetković[3]
[1]Jugoinspekt Beograd, Belgrade, Serbia and Montenegro, [2]Military Technical Institute, Belgrade, [3]Faculty of Mechanical Engineering, Belgrade

P.S.B.26. **STRUCTURAL DEGRADATION OF COMBUSTION CHAMBER LINER DURING LONG EXPOSURE MADE OF Ni-BASE SUPERALLOY HASTELLOY X**
E. Počuča[1], A. Milosavljević[2], M. Srećković, R. Prokić-Cvetković[3]

[1]Engine Maintenance Dept., Engineering&Maintenance Division, JAT Airways, Belgrade, Serbia and Montenegro, [2]Mechanical Faculty, Belgrade, Serbia and Montenegro, [3]Electrical Faculty, Belgrade, Serbia and Montenegro

P.S.B.27. **SCANNING ELECTRON MICROSCOPY OF SHAPE AND SIZE OF PARTICLES IN DIFFERENT AMALGAM ALLOY**

J. Gašić[1], G. Radićević[1], M. Miljković[2], M. Spasić[3]
[1]Faculty of Medicine, Niš, Clinic of Stomatology, Department of Dental Pathology, Serbia and Montenegro, [2]Faculty of Medicine, Niš, Institute of Biochemical Research, [3]Student of Stomatology

P.S.B.28. **THERMOGRAVIMETRIC ANALYSIS OF SUPERABSORBING POLYACRILIC HYDROGEL**

B. Janković[1], B. Adnadjević[1], J. Jovanović[2], D. Minić[1] and Lj. Kolar-Anić[1]
[1]Faculty of Physical Chemistry, University of Belgrade, Beograd, Serbia and Montenegro, [2]Institute of Technical Science of SASA, Beograd, Serbia and Montenegro

P.S.B.29. **ELECTROCHEMICAL POLYMERIZATION OF ANILINIUM 5-SULPHOSALICYLATE**

G. Ćirić-Marjanović[1], B. Marjanović[2]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro, [2]"Centrohem", Stara Pazova, Serbia and Montenegro

P.S.B.30. **STRUCTURAL CHARACTERIZATION OF POLY (o -TOLIDINE)**

G. Ćirić-Marjanović[1], B. Marjanović[2], M. Trchová[3] and P. Holler[3]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro, [2]"Centrohem", Stara Pazova, Serbia and Montenegro, [3]Institute of Macromolecular Chemistry, Prague, Czech Republic

P.S.B.31. **GEL PRODUCTION, OXIDATIVE DEGRADATION AND DIELECTRIC PROPERTIES OF GAMMA IRRADIATED UNIAXIALLY ORIENTED IPP**

D. Miličević, S. Galović, Z. Kačarević-Popović, Z. Stojanović, E. Suljovrujić
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.B.32. **SYNTHESIS AND THERMAL PROPERTIES OF POLY(ESTER-ETHER-SILOXANE) ELASTOMERS**

J. Petrović, M.V. Vučković[1], V.V. Antić[1], M.N. Govedarica[1], J. Djonlagić[2]
Polymer Department, [1]Centre of Chemistry, Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.B.33. **CHARACTERIZATION AND CATALYTIC ACTIVITY OF POLY(4-VINYLPYRIDINE-co-DIVINYLBENZENE)-Co^{2+} COMPLEX**

D. Lončarević, Ž. Čupić
Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

P.S.B.34. **CURING CHARACTERISTICS AND DYNAMIC MECHANICAL BEHAVIOR OF REINFORCED ACRYLONITRILE-BUTADIENE / CHLOROSULPHONATED POLYETHYLENE RUBBER BLENDS**
G. Marković[1], M. Marinović-Cincović[2], H. Valentova[3], M. Ilavsky[3], B. Radovanović[4], J. Budinski-Simendić[5]
[1]Tigar, Pirot, Serbia and Montenegro, [2] Institute of Nuclear Science VINČA, Belgrade, Serbia and Montenegro, [3]Sant Charles University, Macromolecular physics department, Prague, Czech Republic, [4]Faculty of Science, Niš, Serbia and Montenegro, [5]Faculty of Technology, Novi Sad, Serbia and Montenegro

P.S.B.35. **CALCIUM TITANATE**
V. Petrović
The Advanced School of Electrical Engineering, Belgrade, Serbia and Montenegro

P.S.B.36. **RED MUD AS A RAW MATERIAL BASE FOR THE BRICK PRODUCTION**
M.M. Krgović[1], N.Z. Blagojević[1], M.A. Vukčević[1], R. Zejak[2]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro, [2]University of Montenegro, Faculty of Civil Engineering, Podgorica

P.S.B.37. **KINETICS OF INTERACTION BETWEEN FULLEROLE $C_{60}(OH)_{24}$ AND POLYACRYLIC HYDROGELS**
L. Matija[1], J. Jovanović[1], B. Adnadjević[2], Dj. Koruga[3]
[1]Institute of Technical Sciences SASA, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, [3]Faculty of Mechanical Engineering, Belgrade

POSTER SESSION III

Thursday, September 16, 2004, 20^{30}-22^{00}

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

P.S.C.1. **AB INITIO CALCULATIONS OF THE ELECTRONIC STRUCTURE OF NANO-CRYSTALS**
N. Kulagin, S. Protasenja
Kharkiv National University for Radioelectronics, Kharkiv, Ukraine

P.S.C.2. **INTERSUBLEVEL ABSORPTION IN STACKED N-TYPE DOPED SELF-ASSEMBLED QUANTUM DOTS**
D. Veljković, M. Tadić, D. Raković
Faculty of Electrical Engineering, University of Belgrade, Serbia and Montenegro

P.S.C.3. **INTERBAND AND INTRABAND TUNELLING PROPERTIES OF BROKEN-GAP TYPE-II DOUBLE BARRIER QUANTUM WELL STRUCTURES**
D. Čerkez[1], M. Tadić[2]
[1]VF Holding, Zemun, Serbia and Montenegro, [2]Faculty of Electrical Engineering, University of Belgrade, Serbia and Montenegro

P.S.C.4. **ELECTRONIC STRUCTURE OF SEMICONDUCTOR QUANTUM DOT CALCULATED BY THE FINITE ELEMENT METHOD**
R. Gospavić[1], G. Todorović[1], V. Popov[2], M. Srećković[3]
[1]Faculty of Civil Engineering, Belgrade, Serbia and Montenegro, [2]Wessex Institute of Technology, Southampton, UK, [3]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

P.S.C.5. **EXCITON DISPERZION LAW AND STATES OF BIMOLECULAR THIN FILMS**
J.P. Šetrajčić[1], S.M. Vučenović[2], D.Lj. Mirjanić[2], V.D. Sajfert[3], S.K. Jaćimovski[4]
[1]Department of Physics, Faculty of Sciences, University of Novi Sad, Serbia and Montenegro, [2]Faculty of Medicine, University of Banja Luka, Republic of Srpska – BiH, [3]Technical Faculty "M. Pupin" Zrenjanin, University of Novi Sad, Serbia and Montenegro, [4]High School "D. Obradović" of Novi Kneževac, Serbia and Montenegro

P.S.C.6. **PHOTOLUMINESCENCE CHARACTERISTICS OF EUROPIUM DOPED SILICA SOLS AND NANOPOWDERS**
Ž. Andrić[1], V. Jokanović[2], M.D. Dramićanin[1]

[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

P.S.C.7. **THE PREPARATION AND CHARACTERIZATION OF POLYSTYRENE/HYDROXYAPATITE NANOCOMPOSITES**
O. Veljković[1], L. Katsikas[1], M. Miljković[2], J. Jovanović[3], D. Uskoković[3], I. Popović[1]
[1]Faculty of Technology and Metallurgy, Belgrade University, Belgrade, Serbia and Montenegro, [2]Faculty of Medicine, University of Niš, Niš, Serbia and Montenegro, [3]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

P.S.C.8. **PHOTOCATALYTIC REDUCTION OF CADMIUM ON TiO_2 NANOPARTICLES MODIFIED WITH HISTIDINE**
I.A. Ruvarac, Z.V. Šaponjić
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.C.9. **MAGNETOTRANSPORT PROPERTIES OF IRON-BASED SOFT-MAGNETIC AMORPHOUS AND NANOCRYSTALLINE ALLOYS**
N. Mitrović, S. Djukić, A. Ranković, R. Simeunović, A. Maričić, A. Kalezić-Glišović and B. Jordović
Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia and Montenegro

P.S.C.10. **THE INFLUENCE OF THE LOW-TEMPERATURE STRUCTURAL RELAXATION ON THE MAGNETIC ALTERATION OF THE SYNTHETISED NANOCRYSTALLINE MAGNETITE POWDERS HEATED UNDER ISOTHERMAL CONDITIONS**
Lj. Vulićević, S. Vardić, A. Maričić, Lj. Novaković
Technical Faculty, Čačak, Serbia and Montenegro

P.S.C.11. **THE INFLUENCE OF THE TEMPERATURE ON THE ELECTRICAL AND MAGNETIC PROPERTIES OF THE SYNTHESIZED NANOSTRUCTURED MAGNETITE POWDER**
S. Vardić, Lj. Vulićević, A. Maričić
Technical Faculty, Čačak, Serbia and Montenegro

P.S.C.12. **THE INFLUENCE OF ACID TREATMENT ON NANOSTRUCTURE AND TEXTURAL PROPERTIES OF BENTONITE CLAYS**
Z. Vuković, A. Milutinović-Nikolić, J. Krstić, A. Abu-Rabi, T. Novaković, D. Jovanović
Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

SYMPOSIUM D: COMPOSITES

P.S.D.1. **SCALING OF NETWORK SEGMENT DIMENSIONS IN HYPERELASTIC COMPOSITES**
M.B. Plavšić[1], I. Pajić-Lijaković[1], N.L. Lazić[2]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [2]Institute of General and Physical Chemistry, Belgrade

P.S.D.2. **THE STRUCTURING OF NANOCOMPOSITES BASED ON POLYURETHANE NETWORK AND TITANIA**
T. Dikić, V.V. Srdić, R. Djenadić, J. Budinski-Simendić
Faculty of Technology, Novi Sad, Serbia and Montenegro

P.S.D.3. **STRUCTURAL ANALYSIS OF BORON DOPED GLASSY CARBONS**
A. Devečerski[1], N. Petranović[2]
[1]Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

P.S.D.4. **LOW ENERGY IMPACT DAMAGE DETECTION IN LAMINAR TERMOPLASTIC COMPOSITE MATERIALS BY MEANS OF EMBEDDED OPTICAL FIBERS**
A. Kojović[1], I. Živković[2], Lj. Brajović[3], D. Mitraković[1], R. Aleksić[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [2]Institute of Security, Belgrade, Serbia and Montenegro, [3]Civil Engineering Faculty, Belgrade, Serbia and Montenegro

P.S.D.5. **NON-HOOKEAN ELASTIC BEHAVIOR OF UNIDIRECTIONAL EPOXY MATRIX COMPOSITES WITH CARBON FIBRES OF DIFFERENT BREAKING STRAIN**
M.M. Stevanović, I.M. Djordjević, D.R. Sekulić
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

P.S.D.6. **SOME PERFORMANCE OF EXPANDED SINGLE-MODE FIBER**
S. Pantelić[1], M. Srećković[2]
[1]Institute of Security, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

P.S.D.7. **INFLUENCE OF COMPOSITION AND NUMBER OF LAYERS ON PHYSICAL-MECHANICAL PROPERTIES OF TEXTILE/PUR/PES (MEMBRANE) LAMINATE COMPOSITES**
R.S. Popović[1], R. Karkalić[1], M.B. Plavšić[2] and R.G. Popović[3]

[1]Technical Experimental Centre, Belgrade, Serbia and Monternegro, [2]Faculty of Technology and Metallurgy, Belgrade, [3]Military Technical Institute, Belgrade, Serbia and Monternegro

P.S.D.8. **COMPLEX PERFOMANCES OF THE CONTEMPORARY TEXTILE MATERIALS COVERED WITH ACTIVE CHARCOAL**

R. Karkalić[1], R.S. Popović[1], B. Derbogosijan[1], M.B. Plavšić[2], R.G. Popović[3]
[1]Technical Experimental Centre, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, [3]Military Technical Institute, Belgrade, Serbia and Monternegro

P.S.D.9. **PROCESSIBILITY, MECHANICAL AND THERMAL CHARACTERISTICS OF MVQ/PP ELASTOMER/PLASTIC COMPOSITES**

R.S. Popović[1], R. Karkalić[1], M.B. Plavšić[2], R.G. Popović[3], J. Budinski-Simendić[4]
[1]Technical Experimental Centre, Belgrade, Serbia and Monternegro, [2]Faculty of Technology and Metallurgy, Belgrade, [3]Military Technical Institute, Belgrade, [4]Faculty of Technology, Novi Sad, Serbia and Monternegro

P.S.D.10. **THE CURING CHARACTERISTICS, MECHANICAL PROPERTIES AND SWELLING BEHAVIOR OF STYRENE BUTADIENE RUBBER/ CHLOROSULPHONATED POLYETHYLENE RUBBER BLENDS**

G. Marković[1], B. Radovanović[2], M. Marinović-Cincović[3] and J. Budinski-Simendić[4]
[1]Tigar, Pirot, Serbia and Montenegro, [2]Faculty of Science, Niš, Serbia and Montenegro, [3]Institute of Nuclear Sciences VINČA, Belgrade, Serbia and Montenegro, [4]Faculty of Technology, Novi Sad, Serbia and Montenegro

P.S.D.11. **PROPERTIES OF DISPERSION STRENGTHENED COPPER MADE BY INTERNAL OXIDATION OF PREALLOYED COPPER POWDER CONTAINING 2.5wt.%Al**

V. Rajkovic[1], D. Božić[1], D. Vračarić[2], E. Romhanji[3]
[1]Institute for Nuclear Sciences "Vinča", Laboratory for Materials, Belgrade, Serbia and Montenegro, [2]Military Technical Institute, Belgrade, [3]Faculty of Technology and Metallurgy, Belgrade

P.S.D.12. **MECHANICAL AND FRACTURE BEHAVIOUR OF A SiC-PARTICLE-REINFORCED ALUMINIUM ALLOY AT HIGH TEMPERATURE**

D. Božić, B. Dimčić, V. Rajković, M. Vilotijević, Ž. Gnjidić
Institute of Nuclear Sciences "Vinča", Material Science Laboratory, Belgrade, Serbia and Montenegro

SYMPOSIUM E: BIOMATERIALS

P.S.E.1. **SCALING OF ENZYME CONFORMATIONAL DYNAMICS AND DEGRADATION OF BIOMATERIALS**
M.B. Plavšić[1], M.M. Plavšić[1], P. Putanov[2]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [2]Serbian Academy of Sciences and Arts, Belgrade

P.S.E.2. **IMMOBILIZED FISH CELL TISSUE AS A BIOSENSOR**
Lj. Mojović[1], B. Bugarski[1] and G. Jovanović[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Department of Chemical Engineering, Oregon State University, Corvallis, U.S.A.

P.S.E.3. **ALGINATE MICROBEADS AS POTENTIAL SUPPORT FOR CULTIVATION OF BONE MARROW STROMAL CELLS**
D. Bugarski[1], B. Obradović[2], M. Petakov[1], G. Jovčić[1], N. Stojanović[1], B. Bugarski[2]
[1]Institute for Medical Research, Belgrade, Serbia and Montenegro, [2]Chemical Engineering Department, Faculty of Technology and Metallurgy, Belgrade

P.S.E.4. **CHARACTERIZATION OF NOVEL BIOACTIVE COMPOUNDS OF 12-TUNGSTOPHOSPHORIC ACID WITH GLYCINE AND ALANINE**
S. Uskoković-Marković[1], M.R. Todorović[2], U.B. Mioč[3], I. Holclajtner-Antunović[3]
[1]Faculty of Pharmacy, Belgrade, Serbia and Montenegro, [2]Faculty of Chemistry, Belgrade, Serbia and Montenegro, [3]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

P.S.E.5. **SYNTHESIS AND CHARACTERIZATION OF AMMONIUM DECAVANADATE(V)**
M.R. Todorović[1], U.B. Mioč[2], I. Holclajtner-Antunović[2] and D. Šegan[1]
[1]Faculty of Chemistry, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

P.S.E.6. **SYNTHESIS AND CHARACTERIZATION OF Co(III) COMPLEX WITH (*E*)-2-[N'-(1-PYRIDIN-2-YL-ETHYLIDENE)HYDRAZINO] ACETATE**
K. Andjelković[1], A. Bacchi[2], G. Pelizzi[2], D. Jeremić[1], D. Mitić[3] and R. Marković[1]
[1]Faculty of Chemistry, University of Belgrade, Serbia and Montenegro, [2]Dipartimento di Chimica Generale ed Inorganica, Chimica Analitica, Chimica Fisica, University of Parma, Parma, Italy, [3]Faculty of Stomatology, University of Belgrade, Serbia and Montenegro

P.S.E.7. **THERMAL DEGRADATION OF Zn(II), Pt(II) AND Pd(II) COMPLEXES WITH (*E*)-2-OXO-2-[N'-(1-PYRIDIN-2-YL-ETHYLIDENE)HYDRAZINO] ACETAMIDE**

T. Todorović[1], K. Andjelković[1], D. Sladić[1], N. Obradović[3], D. Minić[2]
[1]Faculty of Chemistry, University of Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, University of Belgrade, Serbia and Montenegro, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

P.S.E.8. **CRYSTALLIZATION KINETICS OF LEUCITE PHASE IN ALUMINOSILICATE GLASS**

M.B. Tošić[1], V.D. Živanović[1], N.S. Blagojević[2], J.D. Nikolić[1]
[1]Institute for Technology of Nuclear and other Mineral Raw Materials, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade

P.S.E.9. **SYNTHESIS AND CHARACTERIZATION OF THE COMPOSITE MATERIAL BIPHASIC CALCIUM PHOSPHATE/POLY-(DL-LACTIDE-CO-GLYCOLIDE)**

M. Radić[1], N. Ignjatović[1], Z.P. Nedić[2], M. Mitrić[3], M. Miljković[4], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade; [2]Faculty of Physical Chemistry, Belgrade; [3]The Vinča Institute of Nuclear Sciences, Laboratory for Theoretical and Condensed Matter Physics, Belgrade; [4]Faculty of Medicine, Laboratory for Electron Microscopy, Nis

P.S.E.10. **THE STUDY OF 2-HYDROXYETHYL METHACRYLATE BASED HYDROGELS OBTAINED BY GAMMA IRRADIATION**

S.Lj. Tomić[1], M. Mićić[2], J. Filipović[1], E. Suljovrujić[2]
[1]Faculty of Technology and Metallurgy, Belgrade University, Belgrade, Serbia and Montenegro, [2]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.E.11. **RADIOPROTECTIVE EFFICIENCY OF FULLERENOL IN IRRADIATED MICE**

S. Trajković[1], S. Dobrić[1], A. Djordjević[2], V. Dragojević-Simić[1]
[1]Center for Poisoning Control, Military Medical Academy, Belgrade, Serbia and Montenegro, [2]Faculty of Science, Department of Chemistry, Unuversity of Novi Sad, Novi Sad

P.S.E.12. **EFFECT OF FULLERENOL $C_{60}(OH)_{22}$ ON CYTOTOXICITY INDUCED BY ANTITUMOR DRUGS ON HUMAN BREAST CARCINOMA CELL LINES**

V. Kojić[1], D. Jakimov[1], G. Bogdanović[1], A. Djordjević[2]
[1]Institute of Oncology Sremska Kamenica, Experimental Oncology Department, Sremska Kamenica, Serbia and Montenegro, [2]Department of Chemistry, Faculty of Science, University of Novi Sad, Novi Sad, Serbia and Montenegro

P.S.E.13. **BIOACTIVE GLASS COATINGS WITH HYDROXYAPATITE PARTICLES ON TITANIUM IMPLANTS**

D. Stojanović[1], Ž. Mladičević, B. Jokić[2], Dj.Veljović[2], R. Petrović[2], Dj. Janaćković[2]

[1]Medical Centar Vračar, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade

P.S.E.14. **COMPARATIVE ANALYSIS OF HYDROTHERMALY SYNTHESIZED HYDROXYAPATITE AND MATERIALS FOR ENDODONTIC OBTURATION-A CYTOTOXICITY TESTING**

D. Marković[1], V. Jokanović[2], V. Živojinović[1], O. Popović[3], V. Koković[4]
[1]Clinic of Preventive and Paediatric Dentistry, Faculty of Stomatology, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of SASA, Belgrade, [3]Institute for Immunology and Virusology-Torlak, Belgrade, [4]Clinic of Oral Surgery, Faculty of Stomatology, University of Belgrade

P.S.E.15. **VASCULARISATION OF SYNTHETIC CALCIUMHYDROXYAPATITE: EXPERIMENTAL STUDY**

V. Koković[1], V. Jokanović[2], V. Živojinović[3], D. Marković[3], A. Marković[1]
[1]Clinic for Oral Surgery, Faculty of Stomatology, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [3]Clinic for Children and Preventive Stomatology, Faculty of Stomatology, University of Belgrade

P.S.E.16. **SUBSTITUTION OF OSTEOPOROTIC ALVEOLAR BONE WITH SYNTHETIC BIOMATERIALS**

Z. Ajduković[1], D. Mihailović[2], V. Savić[3], S. Najman[4], Lj. Djordjević[4], D. Petrović[5], N. Ignjatović[6], D. Uskoković[6]
[1]Faculty of Medicine, Clinic of Stomatology, Department of Prosthodontics, Niš, Serbia and Montenegro, [2]Faculty of Medicine, Institute of Pathology, Niš, [3]Faculty of Medicine, Institute of Biochemical Research, Niš, [4]Faculty of Medicine, Institute of Biology, Niš, [5]Faculty of Medicine, Clinic of Stomatology, Department of Maxillofacial Surgery, Niš, [6]Institute of Technical Sciences of SASA, Belgrade

P.S.E.17. **SEM ANALYSIS OF CHANGES OF DIFFERENT HAp/PLLA BIOCOMPOSITES AFTER INTRAPERITONEAL IMPLANTATION**

Lj. Djordjević[1], S. Najman[2], M. Miljković[2], V. Savić[2], N. Ignjatović[3], M.B. Plavšić[4], D. Uskoković[3]
[1]Faculty of Science, Niš, Serbia and Montenegro, [2]Institute for Biomedical Research, Medical Faculty, Niš, Serbia and Montenegro, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [4]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.E.18. **APPLICABILITY OF HAp/PLLA COMPOSITE MATERIAL IN FEMUR REPAIR**

V. Savić[1], M. Mitković[2], S. Najman[1], M. Vukelić[1], Lj. Djordjević[3], Z. Ajduković[1], N. Ignjatović[4], M.B. Plavšić[5], D. Uskoković[4].
[1]Medical Faculty, Niš, Serbia and Montenegro, [2]Orthopaedic and Traumatology Clinic, Niš, Serbia and Montenegro, [3]Faculty of Science, Niš, Serbia and

Montenegro, [4]Institute of Technical Science of S.A.S.A. Belgrade, Serbia and Montenegro, [5]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.E.19. **INTERACTION OF HAp/PLLA BIOCOMPOSITES WITH BONE MATRIX AFTER ECTOPIC IMPLANTATION**

P. Vasiljević[1], S. Najman[2], Lj. Djordjević[1], V. Savić[2], N. Ignjatović[3], M.B. Plavšić[4], D. Uskoković[3]

[1]Faculty of Science and Mathematics, Niš, Serbia and Montenegro, [2]Institute for Biomedical Research, Medical Faculty, Niš, Serbia and Montenegro, [3]Institute of Technical Sciences of SASA Belgrade, Serbia and Montenegro, [4]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro.

Abstracts

Oral Presentation

PL.S.I.1.

IN SITU HREM STUDIES OF CRYSTALLIZATION IN MATERIALS

R. Sinclair
Department of Materials Science and Engineering, Stanford University,
Stanford, California, USA

One of the most important material transformations, especially in integrated circuit processing, concerns the crystallization of amorphous solids. We have studied the basic behavior using in situ high resolution electron microscopy. Examples will be shown of solid phase epitaxial regrowth and nucleation and growth of amorphous silicon, and metal-mediated crystallization of amorphous silicon, germanium and carbon, in real time at atomic resolution. This work had been extended to investigate crystallization of amorphous high-k dielectric oxides for future gate oxide applications, which requires higher temperature observations. And a novel use of focused ion beam technology will be described to test the electrical properties of individual crystals in such oxide thin films.

PL.S.I.2.

PATTERNED ARRAYS OF FERROMAGNETIC NANODOTS OVER MACROSCOPIC AREAS: NANOFABRICATION AND PROPERTIES. TOWARDS THE Tbit/in^2 RECORDING DENSITY?

X. Batlle[1, 2], Ch. Li[1], I.V. Roshchin[1] and I.K. Schuller[1]
[1]Physics Department, U. California San Diego, La Jolla CA, USA
[2]Departament Física Fonamental, U. Barcelona, Barcelona, Catalonia, Spain

Nanostructured materials have attracted much research over the recent years, as they provide the critical building blocks for the booming of nanoscience and nanotechnology. Nanostructures have novel properties due to the interplay between the size confinement of electrons in small structures and proximity effects. This is relevant for example in device miniaturization towards the Tbit/in^2 recording density and in the thermal stability of the recorded bits. Nanofabrication by self-organized templates, in particular nanoporous alumina membranes, is being explored intensively due to the fact that it might enable mass production over large areas. In this work, Al thin films of 1 to 10 microns in thickness were deposited onto Si substrates using electron-beam evaporation and sputtering. Highly ordered hexagonal arrays of alumina nanopores were obtained by anodic oxidation of the Al films. Pore size and periodicity were controlled by the electrolyte used in the anodization process and by optimizing the parameters of the two-step anodization procedure. Single layer Fe and SiO_2 nanodots and bilayer Fe/FeF_2 exchange biased nanodots were deposited by electron-beam evaporation using the alumina nanopores as a template. The hexagonal arrays of nanodots show high degree of ordering over areas of ~ 1cm^2, while domain sizes are of ~ 0.5-1.0 μm^2. The average dot size and periodicity may be tuned from 15 to 140 nm and from 25 to 200 nm, respectively. Scanning electron microscopy and atomic force microscopy images yield a close agreement for those ordering parameters, while the latter show the homogeneity in the height of the nanodots. Magnetization hysteresis loops for the Fe dots suggest the key role of shape anisotropy and the transition from a vortex state to a single domain state as the dot size decreases, the latter being confirmed by small angle neutron scattering and micromagnetic simulations. Exchange biased Fe/FeF_2 bilayer nanodots show an enhanced squareness in the magnetization loops with respect to the single layer Fe dots, thus suggesting that the exchange coupling with the antiferromagnet yields a magnetic stabilization in the ferromagnetic layer. Finally, a new approach to control the nanopore arrangement by pretexturing the initial Al surface is presented. Hexagonal arrays of SiO_2 nanodots are used as a mold to prepare periodic concave regions on the fresh Al film.

PL.S.I.3.

ULTRA HIGH STRENGTH Al-Si THIN FILMS

V. Radmilović
National Center for Electron Microscopy, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA, USA

The high rate electron-beam co-evaporation was used to synthesize Al-Si thin films displaying remarkable mechanical properties. The composition of these films was varied from 2 to 23at.%Si. These films were compared with pure Al films grown using identical deposition conditions to be studied as a baseline. With increasing Si content the nano-indentation hardness increased from 1 GPa for the pure Al film to 4 GPa for the film containing 23at.% Si. Analysis of the indents indicated that all samples exhibited plasticity during deformation. The film microstructure was analyzed using conventional, atomic resolution and analytical transmission electron microscopy. The microstructure of the alloy films was an order of magnitude finer than that of pure Al, with grain sizes in the range from tens to several hundreds of nanometers. The Si grains were multiply twinned, whereas the Al grains were twin-free. In addition, the Si concentration in the Al grains was consistently measured to be well above the equilibrium room temperature composition.

PL.S.I.4.

INTELLIGENT MATERIALS: FROM NANOBIOLOGY TO NANOTECHNOLOGY

F.T. Hong
Dept of Physiology, Wayne State University, Detroit, Michigan, USA

The concept of smart materials was originally proposed by the U.S. Army Research Office (ARO) in 1998. Initially, it was limited to embedding sensors and actuators in conventional structural materials. Japan's Science and Technology Agency (STA) extended the idea to encompass functional molecular materials that include sensors, processors and actuators at the nanometer scale, thus ushering in nanotechnology. The latter concept entails not just miniaturization. Whereas miniaturization at the micrometer scale offers enhanced speed of signal transmission and reduced energy consumption, miniaturization at the nanometer scale in molecular materials offers an additional advantage of design: the possibility of enhanced intelligence. We shall argue that the primary source of intelligence of living organisms is the mixed mode of analog and digital information processing. Such intelligence can seldom arise from physical interactions of materials alone. Chemistry and, especially, biochemistry of biomaterials offer a rich repertoire of interactions to be exploited in the design of intelligent materials. Actual examples will be used to illustrate how such interactions make possible performances that exceed the expectation of conventional materials. This paper will also discuss the role of reverse engineering, through the study of nanobiology, in the development of nanotechnology.

PL.S.I.5.

SYNTHESIS AND CHARACTERIZATION OF III-V ROD SHAPE SEMICONDUCTOR NANOCRYSTALS

J.M. Nedeljković, O.I. Mićić, S.Ph. Ahrenkiel, A.J. Nozik
National Renewable Energy Laboratory, Golden. Colorado, USA

One-dimensional, rod shape nanocrystals have potential advantages over spheres in improved electronic transport, linearly polarized emission and lasing effect. We developed approach to grow InP and InAs semiconductor nanorods that are catalyst free via the reactions of monodispersed colloidal indium droplets with $P(Si(CH_3)_3)_3$ or $As(Si(CH_3)_3)_3$, respectively. Usually for materials with zinc blende cubic lattice liquid metallic droplets has been widely used as the catalyst to initiate growth of wire like crystallites. To the best of our knowledge, there is no prior literature describing the formation of free standing zinc blende III-V semiconductor nanorods or nanowires with no residual metallic catalyst remaining in the final product.

PL.S.I.6.

Bi_2O_3-BASED GLASS-FREE CERAMICS FOR A NEW GENERATION OF LTCC MATERIALS

D. Suvorov, M. Valant
Jozef Stefan Institute, Ljubljana, Slovenia

In the past decade, passive integration has moved from an expensive option for a few applications to a necessity in consumer electronics. In order to follow this trend, almost every technology has developed materials and processes that are smaller, more efficient (i.e., with improved functionality) and cheaper.

It is the combination of size, performance and cost that determines the choice of the technology. While organic laminates like FR4 are cheap, they offer limited possibilities for passive integration. The other end of the spectrum is covered by semiconductor technology. Silicon-based passive devices exhibit excellent integration options but lack the low-cost advantages of other technologies.

Ceramic technology in general and advanced LTCC technology in particular, can close the gap and provide a technology that combines high performance with a low mass-production cost.

In the introduction of this paper the requirements of today's mobile communications applications will be discussed. The emphasis is placed on ceramic materials and the future trends that are necessary to position advanced LTCCs as the integration basis for all other technologies.

The second part of the paper will describe our own research achievements in the area of materials development. Recent research work at the IJS has revealed that materials based on Bi_2O_3 can very efficiently attain most of the future demands for glass-free LTCC technology. By varying the composition and the processing parameters different ceramics with low, medium and high permittivity have been developed. Eulytites are typically a phase with a low permittivity (k'=16); sillenites are medium-permittivity materials (k'=40); and δ-Bi_2O_3 solid solutions have a high permittivity (k'=90). They meet the main requirements for LTCCs with respect to their sintering behavior (T_s=850^o-900^{o}C), their mutual chemical compatibility, their compatibility with silver electrodes as well as their dielectric properties. In the paper a stoichiometric model for sillenites will be discussed and correlated with their dielectric microwave properties.

PL.S.A.1.

PREPARATION BY ATOMIC LAYER DEPOSITION AND CHARACTERIZATION OF ACTIVE SITES OF HIGHLY DISPERSED VANADIA/ TITANIA/ SILICA CATALYSTS

A. Auroux[1], J. Keranen[1], L. Niinisto[2]
[1]Institut de Recherches sur la Catalyse, CNRS, Villeurbanne cedex, France
[2]Laboratory of Inorganic and Analytical Chemistry, Helsinki University of Technology, Espoo, Finland

The Atomic Layer Deposition (ALD) method based on surface-saturating gas-solid reactions was applied to grow vanadia species on highly dispersed titania/ silica supports with from submono- to above monolayer levels of titania. The physicochemical properties of the V_2O_5/ TiO_2/ SiO_2 catalysts were examined by BET, XRD, XPS and Raman spectroscopy techniques. Besides a series of liquid-phase impregnated samples were characterized for comparison. The better dispersion of the active species in the ALD catalysts was confirmed by XPS of NH_3 adsorption. The number and strength of acid-base sites on the surface of the catalysts were directly related to the V-O-Ti and V-O-Si concentrations as well as to the titania and vanadia dispersion in the samples, in favour of the ALD catalysts.

O.S.A.1.

2-D COMPUTER SIMULATION OF RAPID SOLIDIFICATION

Z.S. Nikolić[1], M. Yoshimura[2] and S. Araki[2]
[1]Faculty of Electronic Engineering, Department of Microelectronics, University of Nis, Serbia and Montenegro, [2]Materials and Structure Laboratory, Center for Materials Design, Tokyo Institute of Technology, Yokohama, Japan

Two-dimensional numerical model is adopted to analyze heat transfer process during solidification of sample melted in Arc-image furnace. Numerical solution of this complex problem enabled us to calculate the temperature distribution in both sample and substrate, including the phase change phenomena. Also, the effects of process parameters on solidification of sample melted on substrate that is cooled by water can be investigated numerically. The parameters include sample size, size of contact area between the sample and substrate and degree of undercooling associated with rapid phase change and moving interface. The results obtained reveal that these parameters have strong effect on temperature distribution during solidification.

O.S.A.2.

THEORETICAL AND EXPERIMENTAL EXPLORATION OF THE ENERGY LANDSCAPE OF LiI

Ž.P. Čančarević[1], J.Ch. Schön[1], D. Fischer[1], and M. Jansen[1]
[1]Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany

The prediction of the existence and stability of (meta)stable phases in a chemical system is realized via a two-step process [1]: identification of structure candidates through global exploration of the classical empirical energy landscape, followed by a local optimization of the candidates on *ab-initio* level employing a heuristic algorithm[2]. From the computed E(V)-curves, one can then calculate the thermodynamically stable phase at a given pressure and the transition pressures among the phases. In order to gain insight into the kinetic stability of the structure candidates, one computes estimates of the energy and enthalpy barriers around the structures with the so-called threshold algorithm [3], yielding a tree graph representation of the chemical system.

In this work we perform a theoretical and experimental study of the LiI energy landscape. We determine the structure candidates, construct the tree graph representation and compute the ab-initio E(V)–curves for the hypothetical structures. We find that the thermodynamically preferred modifications at standard pressure should exhibit the rock salt and the wurtzite structure, respectively.

In order to validate our predictions by experiments, we have employed the newly developed ´Low-Temperature - Atomic Beam Deposition` (LT-ABD) technique [4], which allows to disperse the components of the desired product at an atomic level and in an appropriate ratio. After depositing LiI at $T \approx 77K$, the first crystallization occurs at $T \approx 170K$ in the wurtzite-type structure followed by a transition to the more stable rock salt–type structure at $T \approx 270K$. At room temperature only the cubic phase remains.

O.S.A.3.

SOURCE-DRAIN DYNAMIC BALANCE OF NITROGEN AND OXYGEN IN PLASMA NITRIDING AND POST-OXIDATION PROCESS

M. Zlatanović
Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

The relation between process parameters, surface layer architecture and tribological and corrosion properties of protective surface structures is of crutial importance for applied plasma surface treatment. Plasma nitrocarburazing followed by post oxidation process provide an excellent combination of tribological properties and corrosion resistance of steel made functoinal components. In general, the surface structure-functional properties relation is basically known, while a large number of experiments is required to find process parameters-surface structure dependence. In the case of diffusion dominated phase transformation a simple source-drain model is proposed in order to predict the surface layer structure and composition for various substrate materials.

O.S.A.4.

CHARACTERISATION OF CARBON CRYOGEL SYNTHESIZED BY SOL-GEL POLYCONDENSATION AND FREEZE-DRYING

B. Babić[1], B. Kaludjerović[1], Lj. Vračar[2], N. Krstajić[2]
[1]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro,
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

Resorcinol-formaldehyde (RF) cryogels were synthesized by sol-gel polycondensation of resorcinol with formaldehyde and freeze-drying was carried out with t-butanol. Carbon cryogels were obtained by pyrolyzing RF cryogels in an inert atmosphere. Characterization by nitrogen adsorption showed that carbon cryogels were micro and mesoporous materials with high surface areas (500 $m^2/g < S_{BET} < 750$ m^2/g). Cyclic voltammetry experiments at various scan rates (2 to 200 mV s^{-1}) have been performed to study the electrical double-layer charging of carbon cryogel electrodes in 0.5 mol dm^{-3} $HClO_4$ solution. It has been demonstrated that it is possible to divide further total specific capacitance into mesoporous and microporous specific capacitance by analyzing the linear dependence of the specific capacitance (C) on the reciprocal of the square root of the potential scan rate ($\nu^{-1/2}$), and linear dependence of the reciprocal specific charge (1/C) on the square root of the potential scan rate ($\nu^{1/2}$).

O.S.A.5.

EFFECTS OF MILLING CONDITIONS ON HYDROGEN SORPTION PROPERTIES OF MgH_2-Fe

A. Montone[1], J. Grbović[1*], M. Vittori Antisari[1], A. Bassetti[2], E. Bonetti[2], L. Pasquini[2]
[1]Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy, *P.a: INN Vinca Department of Material Science, Belgrade, Serbia and Montenegro, [2]Department of Physics, University of Bologna and INFM

Due to its high hydrogen storage capacity, light weight, low cost and abundance in the earth's crust, magnesium is one of the most promising candidates for a hydrogen storage material. However, the hydriding/dehydriding reaction takes place at high temperature and the kinetic is relatively slow. One of the ways to improve the kinetics of magnesium based hydrogen storage materials is the addition of catalytic metals. A large group of heterogeneous systems have been studied in the last 20 years. These include the Mg-Fe system, Mg-Ni, Mg-$LaNi_5$ and many other systems.

The aim of this study was to show the effect of mechanical alloying conditions, such as ball to powder ratio and of the amount of Fe on the microstructural and on the hydrogen storage properties of MgH_2-Fe systems. In particular crystallite size, powder morphology, degree of catalyst dispersion, presence of surface oxide and hydrogen desorption behaviour were investigated through X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Differential Scanning Calorimetry (DSC).

O.S.A.6.

ROLE OF ORGANIC ADDITIVES IN HYDRIDING PROPERTIES OF Mg-C NANOCOMPOSITES

A. Montone[1], J. Grbović[1*], M. Vittori Antisari[1], L. Mirenghi[2], P. Rotolo[2], A. Bassetti[3], E. Bonetti[3], L. Pasquini[3]
[1]Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy, [2]Materials and Technology Unit, ENEA C.R. Brindisi, Brindisi, Italy, *P. a:INN Vinca Department of Material Science, Belgrade, Serbia and Montenegro, [3]Department of Physics, University of Bologna and INFM

Magnesium based alloys are potentially the best materials for gaseous hydrogen storage due to their high capacity per weight. Their practical use is limited, among other factors, by poor hydrogen absorption and desorption kinetics. Mechanically milling of Mg and Mg alloys with some proper catalyst such as C, Si and transition metal and their oxides, has been proved to impart faster kinetics. Moreover, composites prepared by mechanical milling of Mg and graphite in presence of organic additives can be also effective in improving these properties. In the present work ball milling of magnesium, carbon and benzene was performed under argon using stainless steel vial and balls in a Spex 8000 mixer/mill with different weight ratios among the blend components. The powders were characterized by XRD to asses the details of the phase structure by Rietveld analysis, while microstructural studies were performed by SEM. Thermal stability and hydrogen desorption properties were investigated by DSC. To understand the influence of organic additives on surface characteristics, XPS measurements both at the free surface and after sputter erosion, have been performed. XPS results show that surface carbonate complexes can play an important role. A detailed study of C1s peaks points out the presence of a C-O component, besides the main C-C (graphite) peak, with spectral features which can be changed by the material processing route.

O.S.A.7.

MODELING AND EXPERIMENTAL VERIFICATION OF OXIDATION PROTECTION OF C/C-Si-SiC COMPOSITES

T. Damjanović, Chr. Argirusis, G. Borchardt
TU Clausthal, Institut für Metallurgie, Clausthal-Zellerfeld, Germany

The protectiveness of the electrophoretically deposited mullite layers against isothermal oxidation in air in the temperature range from 1200 °C to 1550 °C was investigated by means of thermogravimetry (TG). The experimental results were interpreted with the help of a phenomenological model. At lower temperatures the overall oxidation kinetics are determined by the transport processes in the EPD mullite layer, which leads to a linear growth law. At higher temperatures or longer times of oxidation the oxidation rate is controlled by solid state diffusion processes in the growing silica layer, which leads to a parabolic growth law. Comparison of experimental parabolic and linear rate constants with calculated ones leads, in the framework of the model, to the conclusion that carbon monoxide (CO) diffusion in the oxide layers is the rate determining step.

O.S.A.8.

SYNTHESIS AND ELECTROPHORETIC DEPOSITION OF YTTRIUMSILICATE COATING SYSTEM FOR OXIDATION PROTECTION OF C/C-Si-SiC COMPOSITES

Chr. Argirusis[1], T. Damjanović[1], M. Stojanović[2], G. Borchardt[1]
[1]TU Clausthal, Institut für Metallurgie, Clausthal-Zellerfeld, Germany
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

Yttriumsilicate coatings owing to the pronounced chemical and mechanical properties of this material (low Young`s modulus, low thermal expansion coefficient, low evaporation rate and oxygen permeability, good erosion resistance) are promising complement to SiC coatings for protecting C/C-Si-SiC composites. Especially the combination of yttriummono- and yttriumdisilicate is essential to ensure the mechanical stability of the coating. Two different chemical routes (sol-gel and Pechini method) for the preparation of stable sols and stable dispersions of the corresponding silicates were used. As a coating method, electrophoretic deposition was chosen. Under control of deposition voltage and duration of deposition, coating of various thickness were deposited. The protectiveness of these coatings was tested by means of isothermal thermogravimetry.

O.S.A.9.

FINE NANOPHASE ZnO:Ru and ZnO:Pt POWDER SYNTHESIS THROUGH AEROSOLS

L. Mančić[1], S. Grgurić-Šipka[2], V.M. Djinović[2], Z. Marinković[3], T. Sabo[2] and O. Milošević[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Faculty of Chemistry, Belgrade, Serbia and Montenegro
[3]Center for Multidisciplinary Study, University of Belgrade, Serbia and Montenegro

Zinc oxide, as n-type semiconducting nonstoichiometric metal oxide, with band gap of 3.2 eV, has wide application in optical and electronic devices especially when composed of ultrafine crystallites with dimension ranging from several to tens of nanometers. In addition, it was shown that particle sphericity and narrow size distribution significantly influence its functional properties, including photocatalytic activities. The opportunities for the synthesis of ZnO based material in nanocrystalline form, having well-defined morphological and structural properties and precise control of low-level dopants is in great demand. Aerosol processing route makes available fine particle formation and design through the mechanisms of nucleation, growth, collision and coalescence in dispersed phase. The object of the present work is to establish such a process for the nanophase ZnO:Ru and ZnO:Pt particle synthesis from the source solutions containing either Ru- or Pt-based organic complexes ($K[Ru(eddp)Cl_2]x3H_2O$ and $C_7H_{12}N_2O_4Br_2Pt$). The particle morphology, phase and chemical structure are revealed in accordance to various analysis methods (XRD, DSC, SEM/EDS, TEM) and discussed in terms of precursor chemistry and process parameters. Among the many parameters, attaining of the particle size and shape uniformity and homogeneous distribution of the corresponding metal cations in as-prepared particles are regarded as the most important factors for dominating microstructure evolution.

O.S.A.10.

SYNTHESIS OF METAL-SUBSTITUTED LITHIUM MANGANASE OXIDE SPINELS THROUGH ULTRASONIC SPRAY PYROLYSIS METHOD

D. Jugović[1], N. Cvjetićanin[2], M. Mitrić[3], M. Miljković[4], S. Mentus[2] and D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[3]The Vinča Institute of Nuclear Sciences, Laboratory for Theoretical and Condensed Matter Physics, Belgrade, Serbia and Montenegro
[4]Faculty of Medicine, University of Niš, Niš, Serbia and Montenegro

Ultrasonic spray pyrolysis method was used for the synthesis of $LiM_xMn_{2-x}O_4$ (M = Cr, Zn) powders. Aqueous solutions of metal nitrates were atomized at a frequency of 1.7 MHz by the ultrasonic nebulizer. The aerosol was introduced in the horizontal electric furnace at the temperature of 1100 K. The crystal structure of the as-prepared powders was revealed by X-ray powder diffraction (XRPD). Structure refinements confirm that the samples crystallize in Fd3m space group. The particle morphology was determined by scanning electron microscopy (SEM). Electrochemical intercalation and deintercalation were examined in galvanostatic regime.

O.S.A.11.

ADSORPTION OF TIRON ONTO ALUMINA

J. Roćen, Lj. Čerović, S.K. Milonjić
The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

It has been shown recently that small organic molecules, used as dispersants in colloidal processing of ceramic powders to adjust the forces between the particles, are quite efficient in preparing aqueous suspensions of high solid loadings and low viscosity. One of them is 4,5 dihydroxy 1,3 benzene disulfonic acid, disodium salt monohydrate, $((OH)_2C_6H_2(SO_3Na)_2.H_2O)$, commercialy known as Tiron. The adsorption of Tiron, as a function of its concentration and solution pH, onto alumina was investigated by the solution depletion method, using UV spectrophotometry. KNO_3 (10^{-2}mol/L) was used as a background electrolyte. The obtained results indicate that the amount of adsorbed Tiron increases with its increasing concentration. The maximum adsorption was recorded at pH≈7 (pH value close to the pHpzc of Al_2O_3) when the molecule was uncharged, i.e. undissociated (pKa_1=7.6) Experimental data were fitted with different models of adsorption isotherms. The maximum amount of Tiron adsorbed as well as the constants of adsorption process were calculated.

O.S.A.12.

POROUS CERAMIC: PRODUCING AND CHARACTERIZATION

D. Tripković[2] , R. Aleksić[1], V. Radojević[1], A. Tripković[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro
[2]ICTM – Institut of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro

Porous ceramic has been produced by using two methods: polymeric sponge method and foam method. Analysis of starting ceramic powder (alumina) used in polymeric sponge method has been carried out. Particle size distribution has shown the presence of two components that differ in size. The first component has average particle size of 8 microns, while the other one has smaller particles with average size of 1 micron. Viscosity of ceramic slurry measured has been ranged about 1150 mPas. In foaming method, the problem of collapsing has been solved by using thermal blowing agent. The microstructure of the samples obtained has been characterization by using scanning electron microscopy (SEM).The samples produced by polymeric sponge method have interconnected voids surrounded by a web of ceramic.The samples produced in foaming method have closed voids within a continuous ceramic matrix.

PL.S.B.I.1.

BENDING ACTUATORS BASED ON MONOLITHIC BARIUM TITANATE-STANNATE CERAMICS AS FUNCTIONAL GRADIENT MATERIALS

R. Steinhausen, H.Th. Langhammer, A. Kouvatov, C. Pientschke, H. Beige
Martin-Luther-Universität Halle-Wittenberg, FB Physik, Halle(Saale), Germany

In the field of applications of piezoelectric materials properties, functional gradient materials (FGM) are suitable for bending devices due to reduced internal mechanical stresses and lower production costs as well as for ultrasonic transducers because of their increased band width.

This paper reports both on preparation, poling, characterization of FGM actuators, and on the description of suitable models of the poling and the bending processes. The calculations of the bending behavior show that the deflection at the end of the cantilever with a continuous gradient still reaches 2/3 of the deflection of a bimorph, whereas the maximum stress goes to zero, which is the main advantage of FGM compared to the commonly used bimorph devices.

As a model system with well-defined electromechanical and dielectric properties of the homogeneous components the solid solution of $BaTi_{1-x}Sn_xO_3$ (BTS) with $0.075 \leq x \leq 0.15$ was chosen. The FGMs approximated by a layered system with an one-dimensional gradient of the Sn-content were prepared both by repeated uniaxial powder pressing and by tape casting with the doctor blade method. The chemical gradient was transformed into a gradient of the piezoelectric properties by a poling process.

Several models were developed for the description of the non-trivial problem of the poling process in layered systems. The calculated data were compared with experimental results. It was shown that the residual electrical conductivity of the single layers generally cannot be neglected during the poling process and must be incorporated into more sophisticated models. To include the significant hysteresis effects of the ferroelectric material the Preisach model was adopted.

The bending properties of several poled BTS structures with up to 6 layers were measured und discussed.

O.S.B.I.1.

CRYSTAL CHEMISTRY APPROACH IN Yb-DOPED LASER MATERIALS

B. Viana
Laboratoire de Chimie Appliquée de l'Etat Solide UMR 7574 du CNRS
ENSCP, Paris Cedex 05, France

In the research of laser materials for high power applications, ytterbium dopant ion strongly challenges neodymium and even takes advantage for the realization of ultrafast lasers. Yb^{3+}doped materials have the advantage of exhibiting a very simple electronic structure based on only two manifolds. Depending on the matrix used, Yb doped materials may present very different emission spectra, typically between 1000 nm and 1100 nm. These materials can be pumped at 980 nm by high power InGaAs diodes leading then to a very low quantum defect. Nevertheless, hosts for high power laser applications are based on a very limited number of materials taking mainly into account elaboration and optical spectroscopic parameters. In the present work are expressed chemical and structural considerations to have high values of thermal-optical parameters.

The thermal expansion, as well as thermal conductivity parameters, could be predicted and the values optimized for the high power in the hosts presenting compact ionic structures with high melting point. Yb^{3+} ion is substituting cation with the same size, charge and comparable atomic weight. This keeps the thermal properties at their highest levels.

For a few years, our work has been concentrated on the study of laser properties and performance of new Yb doped crystals and their possible applications. The crystals tested belong to different families : silicates family Yb:YSO (Yb^{3+}:Y_2SiO_5), and Yb:SYS (Yb^{3+}:$SrY_4(SiO_4)_3O$), borates family Yb:GdCOB (Yb:$Ca_4GdO(BO_3)_3$) and Yb:BOYS (Yb:$Sr_3Y(BO_3)_3$) and vanadate hosts Yb:$GdVO_4$. The tests concern not only the optical spectroscopy and the laser performance (efficiency and tunability) but also the thermal properties (thermal expansion and thermal conductivity).

We also analyzed the suitability of these crystals regarding applications. For instance, we will analyze the relevant hosts for high power applications or to reach specific wavelengths. A review of the state of the art will be presented.

O.S.B.I.2.

INFLUENCE OF PROCESSING PARAMETERS ON SINGLE PLANAR SOFC PERFORMANCE

M.M. Vlajić, M.D. Vlajić and V.D. Krstić
Centre for Manufacturing of Advanced Ceramics and Nanomaterials
Queen's University, Kingston, ON, Canada

This paper addresses techniques used in making the electrolyte, which is the most critical component of the SOFCs. Slurry spraying and tape casting techniques employed for the yttria-stabilized zirconia (YSZ) (8 mol% yttria) electrolyte coating on the strontium- doped $LaMnO_3$ supporting cathode. The influence of slurry additives such as binders and dispersants on the sintered electrolyte coating characteristics was studied. The single SOFC performance was measured at 900^{o}C using 5% hydrogen as a fuel and air as oxidant. It was found that the cell power density is strongly dependant on its internal resistance, which is controlled by the electrolyte thickness and the interfacial reactions with the electrodes.

O.S.B.I.3.

PHASE TRANSFORMATION OF HEXACELSIANS DOPED WITH Li, Na and Ca

V.T. Dondur[1], M. Kićanović[1], R. Dimitrijević[2], A. Kremenović[2], Lj. Damjanović[1]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Mining and Geology, Department of Crystallography, Belgrade, Serbia and Montenegro

Barium aluminosilicate has been studied mainly for its use as matrix material for high temperature ceramic composites. It has been known for many years that there are four polymorphs of $BaAl_2Si_2O_8$: celsian; paracelsian; α- and β- hexacelsian. The phase transformation in hexacelsian at approximately 300^{o}C has an associated volume change and discontinuous change of thermal expansion coefficient. It was indicated that the thermal expansion behavior is very sensitive to the synthesis conditions and thermal treatment. However, the influence of various doped cations to displacive phase transformations is not studied. Here, phase transformations in synthetic hexacelsian were studied by DSC method. The series of hexacelsians with different composition were synthesized by thermally induced transformation of a LTA zeolite. It was shown that the temperature of displacive phase trasformation increase with content of Li, Na and Ca in hexacelsian phase.

O.S.B.I.4.

CHARACTERIZATION OF HZSM-5 ZEOLITE MODIFIDED WITH GOLD

Lj. Damjanović[1], V.T. Dondur[1], V. Rakić[2], R. Dimitrijević[3], W. Lutz[4]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Agriculture, Belgrade, Serbia and Montenegro
[3]Faculty of Mining and Geology, Belgrade, Serbia and Montenegro
[4]Tricat Zeolites GmbH, Berlin, Germany

During the last years, gold has attracted the high attention as a catalyst or sensor especially when it is encapsulated inside zeolite structures. Pure gold seems to be catalyticaly inactive due to its filled d-band. However, recent works have indicated that well dispersed Au^{+} species can catalyse many different reactions; among them, the reactions of NO_x decomposition. In this work, HZSM-5 zeolites (Si/Al ratio between 28 and 120) were treated with $AuCl_3$ solutions. Different amounts of gold particles were incorporated in each of these zeolites. The obtained samples were characterized by adsorption/desorption of ammonia. The adsorption of NH_3 was done at 150°C, while its desorption was studied by temperature programmed desorption technique in the temperature range 30°C - 800°C, and with mass spectrometer as a detector. The influence of Au content on the whole amount of active centers for adsorption was noticed. The obtained samples were probed for the interaction with N_2O, also.

O.S.B.I.5.

HIGH PRESSURE AND OPTICAL PROPERTIES OF 3d ELEMENTS

B.R. Jovanić
Institute of Physics, CEP(LMR) , Zemun. Serbia and Montenegro

The effect of high pressure on optical properties of 3d elements in the line [V^{2+}, Cr^{3+}, Mn^{4+}] is very interesting due to the possible application of materials doped with these elements as the bases for semiconductive lasers of new generation. Under the influence of high pressures, the R1 line suffers significant displacement – red shift. High pressures induce the increase of fluorescent life time of the R1 line in all three elements. The increase is conditioned with the strength increase of an oscillator for $^4A_2 \rightarrow {}^2E$ transition, the integral of the orbital overlapping. With the pressure increase, the 3d ion surrounding (3d ion coordinate number) changes as well. The changes stated above will affect the increase of efficiency of the energy transport ε from a 3d ion to a 4f ion which would be present in the material. The increase of ε has a major practical significance in the process of creating semiconductive lasers of new generation.

O.S.B.I.6.

THERMODYNAMIC ASSESSMENT OF THE TERNARY Cu-Pb-O SYSTEM

M. Čančarevic, M. Zinkevich, F. Aldinger
Max-Planck Institut für Metallforschung and Institut für Nichtmetallische Anorganische Materialien der Universität Stuttgart, Stuttgart, Germany

The thermodynamic assessment of the ternary Cu-Pb-O system was carried out by the CALPHAD metod. The thermodynamic properties of the phases are described using the compound energy formalism (CEF) for the solids and an ionic two-sublattice model for the liquid. The thermodynamic parameters of the sub-systems Cu-O, Pb-O and Cu-Pb are taken from recent assessments and ternary interaction parameters of the liquid phase have been optimized on the base of selected literature data (phase diagram data and activity of oxygen). The stoichiometric compound Cu_2PbO_2 has been sythesized by solid-state reaction from Cu_2O and PbO in a sealed quartz ampoule. The optimum synthesis conditions are 640°C and 260h. The enthalpy of formation of Cu_2PbO_2 has been measured with the use of high-temperature calorimeter. The system shows a large liquid miscibility gap of peculiar shape, which connects to miscibility gaps in each of the binary sub-systems. Calculated phase diagrams are compared with the experimental data.

O.S.B.I.7.

STRUCTURAL, DOPED, RADIATION DEFECTS AND PROPERTIES OF NON-STOICHIOMETRICAL SOLIDS

N. Kulagin
Kharkiv National University for Radioelectronics, Kharkiv, Ukraine

Review of experimental and theoretical relations of crystallographic and electronic structures and properties of oxides, fluoride etc. solids is presented in this communication. We made an attempt to unite the data of spectral, magnetic and electrical properties, and crystallographic structure of the non-stoichiometrical crystals in relation to concentration of separate point defects.

The following tasks are focused:
- methods of study of irradiated crystals;
- relation of the crystalline structure and irradiation of the non-stoichiometrical crystals;
- change of the spectral properties of the crystals after irradiation.

Possibility for change of the physical parameters of the crystals and separate results of employment of non-stoichiometry siolids are discussed, too.

O.S.B.I.8.

CONDUCTIVITY OF GRAINS AND GRAIN BOUNDARIES IN POLYCRYSTALLINE HETEROPOLY ACID SALTS

B. Škipina[1], T. Čajkovski[2], M. Davidović[2,3], D. Čajkovski[2], V. Likar-Smiljanić[3], U. B. Mioč[4]
[1]Faculty of Technology, University of Banjaluka, Banjaluka, Bosnia and Herzegovina (Republic of Srpska), [2]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montrenegro, [3]School of Electrical Engineering, University of Belgrade, Belgrade, Serbia and Montrenegro, [4]Faculty of Physical Chemistry, Belgrade, Serbia and Montrenegro

Conductivity of grains and grain boundaries has been investigated a great deal in ceramic polycrystals and other sintered materials. These properties have been much less studied in compressed powders of ionic conductors.

We have investigated conductivity of grains and grain boundaries in pressed polycrystalline powder of 12-tungstophosphoric acid salts with univalent (Li^+, Cs^+) and bivalent (Mg^{++}, Cu^{++}, Ba^{++}) ions. Method of impedance spectroscopy was used in the frequency range from 5 Hz to 500 kHz. We obtained grains and grain boundaries conductivities as well as corresponding activation energies. Grain conductivity is in all investigated salts always larger than the grain boundary conductivity for one or two orders of magnitude. Possible microstructure models are discussed.

O.S.B.I.9.

FFT SIMILARITY ANALYSIS IN RAMAN SCATTERING STUDY OF $RETiTaO_6$ DIELECTRIC CERAMICS

Z. M. Nikolić
Faculty of Physics, Belgrade, Serbia and Montenegro

This paper presents systematic investigation of microwave dielectric ceramics (dielectric resonator materials) $RETiTaO_6$ (RE = a rare earth ion) by Raman scattering measurements at room temperature. Raman spectra were analyzed by a set of genetic - like multicriteria similarity algorithms. Results of these analysis are: creation of the unique grey scale bar-code presentations (visualizations) of $RETiTaO_6$ Raman spectra of samples; detailed FFT analysis of spectra with calculation the multicriteria tables of similarities (selected interval of spectrum or whole spectrum analysis) which are much better than determination of similarities based on Raman active mode analysis; optimization in choosing the best similarities spectrum with designed spectrum of ideal compound.

Obtained results enable to optimize synthesis process (choosing the RE ion to produce the compound with optimal characteristics) of dielectric resonator ceramics which are indispensable for processing of materials with advanced required properties.

O.S.B.I.10.

LATTICE PARAMETERS OF Gd-DOPPED CERIA ELECTROLYTES

B. Matović[1], S. Bošković[1], M.D. Vlajić[2] and V.D. Krstić[2]
[1]Institute of Nuclear Sciences Vinča, Laboratory for Material Science, Belgrade, Serbia and Montenegro
[2]Centre for Manufacturing of Advanced Ceramics and Nanomaterials, Queens University, Nicol Hall, Kingston, Canada

This paper deals with Gd-dopped ceria solid solutions ($Ce_{1-X}Gd_XO_{2-X/2}$) with "x" ranging from 0 to 0.2. Four different powders were synthesized by applying modified glicine nitrate procedure. Results also show that all powders are nanometric in size (SEM microscopy and XRD investigations). The average size of $Ce_{1-X}Gd_XO_{2-X/2}$ particles lies in the range of about 20 nm.

The obtained powders exhibit very precise stoichiometry compared to the tailored one. The variation of the lattice parameter with the composition was studied and correlated with an equation describing the ion-packing model. It was shown that lattice parameter versus Gd concentration obeys Vegard's law very well.

O.S.B.I.11.

RAINBOW EFFECT IN CHANNELING OF HIGH ENERGY PROTONS THROUGH (10, 0) SINGLE-WALL CARBON NANOTUBES

D. Borka, S. Petrović and N. Nešković
Laboratory of Physics (010), Vinča Institute of Nuclear Sciences,
Belgrade, Serbia and Montenegro

We have investigated theoretically the angular distributions and the rainbows in the case of 1 GeV protons channeled in a rope of (10, 0) single-wall carbon nanotubes. It is assumed that transverse cross section of the rope can be represented by a (two-dimensional) hexagonal superlattice with one nanotube per superlattice site. The rope length is varied between 0.53 and 5.29 μm, corresponding to the reduced rope length associated with the transverse proton motion close to the center of the region in between three neighboring nanotubes, Λ_b, between 0.05 and 0.50, respectively. The angular distributions of channeled protons were generated using the numerical solution of the proton equations of motion in the transverse plane and the computer simulation method. We used the Molière's expression for the continuum interaction potential of the proton and the rope. The rainbow lines in the impact parameter plane and in the scattering angle plane were determined numerically too. A possible application of the results obtained for characterization of nanotubes is discussed.

O.S.B.I.12.

ALKOXY DERIVATIVES OF FULLERENE C_{60}

A. Djordjević[1], D. Orčić[1], V. Djordjević Milić[2], M. Vojinović-Miloradov[1], O. Nešković[3]
[1]University of Novi Sad, Faculty of Sciences, Novi Sad, Serbia and Montenegro,
[2]University of Novi Sad, Medical Faculty, Department of Pharmacy, Novi Sad, [3]Institute of Nuclear Sciences Vinča, Belgrade

Early studies of fullerenes pointed to a great reactivity of this group of molecules, especially concerning additions. Halogenation is one of the most important reactions, because yielded halogen fullerenes can be used as reactive intermediates for synthesis of other fullerene derivatives by the substitution reactions. One of the reactions rarely used in fullerene derivation is Williamson's ether synthesis. Highly symmetrical intermediate - $C_{60}Br_{24}$ is prepared by the reaction of C_{60} with neat Br_2 in the presence of *in situ* generated Lewis acid catalyst $FeBr_3$. $C_{60}Br_{24}$ is used as precursor for synthesis of alkoxy derivatives of C_{60}. For purpose of derivation, $C_{60}Br_{24}$ is treated by cca. double excess of alkoxide (MeONa, EtONa, PrONa, BuONa and *t*-BuONa) solution in corresponding absolute alcohols. To confirm the structures of products: FTIR, ^1H and ^{13}C NMR, and MALDI-TOF spectra are obtained. Characteristic bands in FTIR (KBr) spectra of alkoxy derivatives: 2830-2980 cm^{-1} $\nu(CH_3)$, $\nu(CH_2)$; 1620-1625 cm^{-1} ν_s (C=C); 1440-1475 cm^{-1} $\delta_{as}(CH_3)$, $\delta_s(CH_2)$; 1370-1390 cm^{-1} $\delta_s(CH_3)$ and 1075-1085 cm^{-1} ν_{as} (C-O) confirm introduction of alkoxyl-groups in fullerene cage. Broad signal of $-OCH_2-$ (in methoxy derivative: $-OCH_3$) is visible in ^1H NMR ($CDCl_3$) spectra at δ=3.5-4.2 ppm, as well as signals of remaining alkyl-group protons at δ=0.93-1.65 ppm. MALDI-TOF spectra proved introduction of 24 alkoxy groups ($C_{60}(OMe)_{24}$). Dependence of substitution reaction speed by the increase of length of alkyl chain of nucleophile indicates the bimolecular mechanism. Supposed mechanism is S_N2', i.e. nucleophilic attack on C atom in position 3 to the leaving group, together with simultaneous rearrangement of the double bond and separation of the leaving group. This mechanism is also supposed for some other substitution reactions of halogenofullerenes.At given experimental conditions it was imposible to prepare $C_{60}(O$*t*$-Bu)_{24}$ - main product is water-soluble brownish substance. It is supposed that the primarily formed *t*-buthoxy-derivative undergoes the base-catalysed elimination (E1cB mechanism) with formation of fullerenol $C_{60}(OH)_{24}$ and isobuthene. Usually, ethers hardly undergo this reaction and very strong bases are needed, but in this case steric strain helps the reaction.

O.S.B.II.1.

LIGHT OUT OF SILICON. A DREAM OR REALITY?

M.J. Konstantinović
Institute of Physics, Belgrade, Serbia and Montenegro

For the past ten years, researchers have tried to coax light out of silicon, with varying degrees of success. The main problem is that the indirect energy band gap electronic structure of bulk silicon makes it not suitable for optoelectronic applications. It is expected that this problem can be circumvented by silicon nanostructuring, since the quantum confinement effect may cause the increase of the silicon band gap, and shift the photoluminescence into the visible energy range. However, the small crystal size also limits the experimental investigations. One of the main challenges is to determine and control the nanocrystal size distribution, which is important for the formulation of a quantum mechanical description of the system. In this work, the Raman scattering results in various silicon nanocrystals are reviewed and discussed. In particular, the recent results on silicon nanoclusters, produced with a laser vaporization technique, are presented and compared with results obtained with other experimental techniques.

O.S.B.II.2.

LOWEST ENERGY STRUCTURES AND ELECTRONIC PROPERTIES OF SMALL MOLYBDENUM CLUSTERS

V. Koteski, B. Cekić, N. Novaković, J. Belošević-Čavor
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

The structural and geometric properties of small Mo clusters are studied by means of first principles density functional theory (DFT) calculations with planewaves and pseudopotentials. The lowest energy structures of Mo_n (n=2-7) clusters are determined. On selected clusters, finite temperature effects are investigated by using *ab initio* molecular dynamics. The evolution of electronic properties with increasing cluster size is discussed. The electronic structure, binding energies and magnetic moments of the stable isomers are reported and the results are compared with the available experimental and theoretical data.

O.S.B.II.3.

NATURE OF MAGNETISM IN THE $HfCo_2$ LAVES PHASE

J. Belošević-Čavor, N. Novaković, B. Cekić, V. Koteski
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

Despite the fact that the magnetic properties of the intermetallic compounds with C15-type Laves phase structure have so far been studied intensively, the nature of magnetism in some of them is still a matter of controversy. In order to establish and understand the magnetism in the $HfCo_2$ Laves phase with C15 ($MgCu_2$-type) structure, calculations using FP-LAPW WIEN 97 program package for non-polarized and spin-polarized cases are performed. They have shown that the spin-polarized case is more stable, i. e. the energy of its ground state is lower by about 0.15 Ev. This is in collision with measured TDPAC spectra, which show no sign of magnetic interaction, as well as with the earlier reported magnetization and susceptibility measurements which claim that $HfCo_2$ is Pauli paramagnet. Having in mind that the calculations yield the ground state energy at 0 K and that the measurements are performed at 4.2 K (magnetization) and at 78 K (TDPAC) this may suggest that there is a magnetic phase transition at very low temperatures.

O.S.B.II.4.

TEMPERATURE DEPENDENT SURFACE ELECTROCHEMISTRY ON SUPPORTED Pt Ru CATALYST: FORMIC ACID OXIDATION

A.V. Tripković, K.Dj. Popović, J.D. Lović
ICTM-Institute of Electrochemistry, Belgrade, Serbia and Montenegro

The effect of temperature on the kinetic of formic acid oxidation at supported PtRu (54 wt% alloy) catalyst was studied in 0.5 M H_2SO_4 at 295 K, 313 K and 333 K using thin film rotating disk electrode (RDE) method. The catalyst was characterized by HRTEM and STM prior to the electrochemical studies. Both techniques revealed cubooctahedral particle shape, twinned Pt-Ru particles and particle size ranged between 2 – 4 nm. Inspection of potentiodynamic and steady-state curves shows that formic acid oxidation at PtRu catalyst is a process highly activated by temperature. The enhancement of the reaction rate at 333 K is approximately a factor of 5 at E = 0.4 V. Tafel slope of ~120 mV dek^{-1} at 295 K may imply that the adsorption/dehydrogenation is r.d.s. in overall reaction. The effect of temperature on the reaction rate could be related to the increase in the adsorption/dehydrogenation step caused by activation of the Ru sites for this step. The change of Tafel slope at 333 K indicating the change in r.d.s. fits well with this assumption.

O.S.B.II.5.

SYNTHESIS, STRUCTURE AND PROPERTIES OF IRON-BASED BULK GLASS-FORMING METALLIC ALLOYS PREPARED BY DIFFERENT PROCESSING

N. Mitrović[1], S. Roth[2], M. Stoica[2], J. Degmova[3] and J. Eckert[4]
[1]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia and Montenegro
[2]Leibniz Institute for Metallic Materials, IFW Dresden, Dresden, Germany
[3]Department of Nuclear Physics and Technology, Slovak University of Technology, Bratislava, Slovakia
[4]TU Darmstadt, FB11 Material- und Geowissenschaften, FG Physikalische Metallkunde, Darmstadt, Germany

Iron based alloys are the family of bulk metallic glasses (BMG) with a very high melting temperature (T_m) and highest critical cooling rates ($R_c \sim 10^3$K/s) necessary to suppress nucleation of crystals during the casting process. Consequently, this class of BMG is the most difficult for preparation in a thick form.

This article deals with the materials science and engineering of glass-forming alloys in Fe-(Nb)-(Al, Ga)-(P, C, B, Si), Fe-(Cr, Mo)-(P, C, B, Ge) and Fe-(Co, Ni)-(Cu)-(Zr, Nb)-B BMG systems with high thermal stability of the undercooled melt against crystallization. Different liquid quenching techniques (melt-spinning or cooper mold casting) as well as hot pressing of the powder obtained by milling of the melt-spun ribbons were used to prepare samples in various shapes. Synthesis of the investigated BMG alloys is discussed according to the Inoue's empirical components rules for the achievement of the large glass forming ability (GFA) and its evaluation by fragility parameter. Thermal and microstructure characterization (performed by DSC, XRD and Mössbauer spectroscopy) was used to correlate GFA, microstructure and thermo/thermo-magnetic treatments with optimum soft magnetic properties.

O.S.B.II.6.

THE ISOTHERMAL ANNEALING EFFECT ON THE CHANGE IN THE ELECTRONIC STATE DENSITY AT THE FERMI LEVEL OF THE $Fe_{89.8}Ni_{1.5}Si_{5.2}B_3C_{0.5}$ AMORPHOUS ALLOY

A. Maričić[1], N. Mitrović[1], B. Jordović[1], M.M. Ristić[2]
[1]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro
[2]Serbian Academy of Science and Arts, Belgrade

Structural changes of the $Fe_{89.8}Ni_{1.5}Si_{5.2}B_3C_{0.5}$ amorphous alloy within the 300 K to 980 K temperature interval were investigated. The structural relaxation process was performed in the amorphous alloy within the temperature interval from 660 K to 740 K. The process was studied by the analysis of the results of the measurement of thermoelectromotive force (TEMF) of the Cu – amorphous alloy thermocouple in non-isothermal and isothermal conditions at temperatures T_1=683K, T_2=718K and T_3=738K of 1000s duration. From the change of the temperature coefficient TEMF, following each annealing, the relative electronic state density change at the Fermi level in the amorphous alloy was determined: $\frac{\Delta n_1}{n} = 2.44\%$, $\frac{\Delta n_2}{n} = 2.61\%$ and $\frac{\Delta n_3}{n} = 2.93\%$ .By TEMF measurement, depending on time, at constant temperatures T_1=683K, T_2=718K and T_3=738K, kinetic parameters of the structural relaxation process for the alloy and activation energy being, respectively, $k_1=4.29\cdot10^{-5}s^{-1}$, $k_2=10\cdot10^{-5}s^{-1}$, $k_3=18.33\cdot10^{-5}s^{-1}$ and E_{ar}-110,16 kJ/mol were determined. The crystallization of the examined alloy was performed within the temperature interval from 590 K to 900 K. Using the same procedure as in the structural relaxation process, the changes of the electronic state density after isothermal annealings at temperatures T_4=793K, T_5=843K and T_6=893K, being $\frac{\Delta n_4}{n} = 12.54\%$, $\frac{\Delta n_5}{n} = 15.31\%$ and $\frac{\Delta n_6}{n} = 26.22\%$ were determined. Activation energy for the crystallization process was E_{ac} = 208.88 kJ/mol.

O.S.B.II.7.

SHORT RANGE STRUCTURE OF AMORPHOUS METALLIC ALLOYS Zr-Ti-Al-Cu-Ni

P. Tomić[1], M. Davidović[2]
[1]Research and Development Department, Factory of Birač, Zvornik, Bosnia and Herzegovina (Republic of Srpska)
[2]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montrenegro

Yr-Zi-Al-Cu-Ni alloys belong to the family of new multicomponent metallic glasess with exteded supercooled liquid region which can be obtained not only by rapid quenching but also by slow cooling from the melt. This allows preparation of thin ribbons as well as of bulk glassy samples. The question wether or not structural differences exist in the amorphous state due to different cooling ratecould be answered by the diffraction measurements. Annealig at elevated temperatures allows structural investigations of the progress of crystallization and the development of stable or metastable nanoscale phases from the supercooled luiquid. This also offers the possibility to produce nanoscale materials or amorphous/nano(quasi)cristalline phase mixtures by crystallization. Amorphous Zr62-xTixCu20A110Ni8 with 3 at% Ti formes quasicrystals as the first stage of crystallization. With inceasing Ti content the formation of nano-quasicrystals was concluded from conventional X-ray diffraction measurements. The XRD of the annealed states are characterized by an increase of the intensites of the first and the second maximum but strongly broadened. The formation of an ultrafine nanostructured state 2-3 nm in size can be concluded from the diffraction curves for Ti cintent| 5at%.

O.S.B.II.8.

EXPERIMENTAL EVIDENCE OF NONLINEAR PHOTOTHERMAL EFFECTS IN MATERIALS DETECTED BY SECOND HARMONIC PHOTOACOUSTIC SPECTROSCOPY (SHPAS) TECHNIQUE

M.D. Dramićanin and A. Kapidžić
Institute of Nuclear Sciences "Vinča", Laboratory for Radiation Chemistry and Physics, Belgrade, Serbia and Montenegro

A new experimental procedure for the analysis of nonlinear photothermal effects in materials is presented. The method is based on a photoacoustic detection of second harmonic thermal waves optically induced in a solid material using laser source with variable power intensity output. The details of experimental set-up are shown and discussed. For the first time second harmonic photoacoustic spectra of some selected materials are measured and presented. Correlation of measured data and existing theories is established and applicability of this novel method in a field of materials science is discussed.

O.S.B.II.9.

HYPERBOLIC PROPAGATION OF A THERMAL SIGNAL IN AN INHOMOGENEOUS MEDIUM

S. Galović, D. Miličević, E. Suljovrujić
The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

A numerical procedure is presented for the calculation of space distribution of the thermal field in thermally inhomogeneous solids with thermal memory induced by a harmonically modulated surface heat source. The procedure is based on the separation of the complex hyperbolic heat conduction equation into four real first-order differential equations followed by the employment of the Bulirsch-Stoer's method with the adoptive step. The applicability of the procedure is then demonstrated in a few issues, which are important for understanding thermal signal distribution in surface modified solids and in biological tissues.

O.S.B.II.10.

DETERMINATION OF SURFACE CHARACTERISTICS OF GLYCIDYL METHACRYLATE BASED COPOLYMERS BY INVERSE GAS CHROMATOGRAPHY UNDER FINITE SURFACE COVERAGE

A.B. Nastasović[1], A.E. Onjia[2], S.K. Milonjić[2], Z. Vuković[3], S.M. Jovanović[4]
[1]Institute for Chemistry, Technology and Metallurgy, Center for Chemistry, Belgrade, Serbia and Montenegro, [2]Vinča Institute of Nuclear Sciences, Chemical Dynamics Laboratory, Belgrade, [3]Institute for Chemistry, Technology and Metallurgy, Center for Catalysis and Chemical Engeneering, Belgrade, [4]Faculty of Technology and Metallurgy, Belgrade

The inverse gas chromatography under finite surface coverage conditions was used for the sorption of n-hexane, benzene, chloroform and tetrahydrofuran on macroporous crosslinked poly(glycidyl methacrylate-co-ethylene glycol dimethacrylate), PGME and copolymer modified with ethylene diamine, PGME-en, in the temperature range 333-363 K. Two samples of macroporous crosslinked PGME with different porosity parameters were synthesized by suspension copolymerization and modified with ethylene diamine. The adsorption isotherms determined from IGC peaks of adsorbates were analyzed using the BET theoretical model and used for estimation of the surface area, the isosteric heat of adsorption and the adsorption energy distribution on the surface of initial and modified samples.

O.S.B.II.11.

EXAMINATIONS OF CROSS-LINKED POLYVINYLPYRIDINE IN OPEN REACTOR

M. Milošević[1], N. Pejić[2], Ž. Čupić[3], S. Anić[1] and Lj. Kolar-Anić[1]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Pharmacy, Belgrade
[3]Institute of Chemistry, Technology and Methalurgy, Departement of Catalysis and Chemical Engineering, Belgrade

Macroporous cross-linked copolymer of 4-vinylpyridine and 25% (4:1) divinylbenzene is analyzed under open conditions, that is in the continuous well stirred thank reactor (CSTR). With this aim the appropriate bifurcation diagram is found and the behavior of the system with and without polymer in the vicinity of the bifurcation point is used for the polymer examinations. Two different granulations of polymer were considered. Moreover, some physicochemical characteristics of the polymer, such as the specific surface area, the skeletal density and the particle density, have been determined.

O.S.B.II.12.

MICROSTRUCTURAL AND MECHANICAL PROPERTIES OF Ti_3Al-BASED INTERMETALLICS PRODUCED BY POWDER METALLURGY

B. Dimčić, M. Vilotijević, D. Božić, M.T. Jovanović
Institute of Nuclear Sciences "Vinča", Material Science Laboratory,
Belgrade, Serbia and Montenegro

This paper describes a study of the structural and mechanical properties of Ti_3Al-based intermetallics produced by powder metallurgy techniques. The as-milled powders were compacted by hot pressing to non-porous, homogenous compacts. Prior to compressive testing, all hot- pressed materials were homogenized by a solution treatment followed by water quenching to room temperature. After homogenization, one group of the Ti_3Al intermetallics with additions of Nb and Mo were aged at 800°C for 5h. The compressive strength testing is performed on the Instron testing machine in the temperature range from 20°C to 500°C in a vacuum at 10^{-2} MPa at a constant strain rate of $2{,}4 \times 10^{-3}$ s^{-1}. Detailed microstructure characterization of the samples has been evaluated by optical and scanning electron microscopy.

O.S.B.II.13.

THE AUSTEMPERING STUDY OF Cu-ALLOYED DUCTILE IRON

O. Erić[1], D. Rajnović[2], L. Šidjanin[2], S.P. Zec[1]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro
[2]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia and Montenegro

Austempered Ductile Iron (ADI) proved itself to be an excellent advanced material as it has combination of attractive properties: high strength, toughness, ductility, fracture toughness, wear resistance and machinability. These excellent properties of ADI can be only achieved upon adequate heat treatment which yields optimum microstructure for given chemical composition. In this paper an investigation has been conducted on an austempered ductile iron alloyed with 0.45% Cu and austempered in a range of temperatures and times. The complex micro-structural constituents and fracture mode, developed throughout these treatments have been identified by means of light microscopy, scanning electron microscopy and X-ray diffraction and related to the mechanical properties. Based on these results, an optimum processing window has been established.

PL.S.C.1.

MAIN PROBLEMS OF NANOSTRUCTURED MATERIALS SCIENCE

R.A. Andrievski
Institute of Problems of Chemical Physics, Russian Academy of Sciences
Chernogolovka, Moscow Region 142432, Russia

As from pioneer works of Gleiter, the interest to nanostructured materials (NM) because of their unique properties is growing steadily. Itself matter of NM is widening in considerable extent also. At the present time it is common practice to consider several varieties of NM such as consolidated subjects, nanosemiconductors, nanopolymers, nanobiomaterials, numerous tubular subjects, nanoporous materials, catalysts and supramolecular structures. The general future of all these varieties is that their main structure components (crystallites, phases, pores, ensembles, etc.) are usually lower than about of 100 nm. Essentially all varieties of NM with exception of supramolecular structures are in the non-equilibrium state. In spite of the foregoing diversity of NM, there at least two general main problems which seem to be very important for the development of new NM with given properties. First of all this is a problem of size effect. The study of the crystallite effect on NM properties revealed the presence of specific points with change of the nature effect. These specific points may be connected with different mechanisms, progress influence of the grain boundary segregations, quantum effects, and so on. Different cases of relationships between properties and crystallite size are discussed. The NM stability is also very important problem. The annihilation of nanostructure that can be developed in thermal, chemical, deformation and radiation fields, results in complete or partial degradation of NM. An additional aspect of stability is a reproducibility of nanostructures and their properties. It is assumed that this question is not connected only with the strong regime maintenance but also with increased instability of chaotic systems. Nanostructures with their considerable deviations from equilibrium state and great surface and volume fluctuations are believed to concern to chaotic systems. In this connection self-organization in nanostructures is also very important. The modern data of the NM stability are discussed.

PL.S.C.2.

SYNTHESES AND CHARACTERIZATION OF MAGNETIC NANOPARTICLES

M. Drofenik[1,2], D. Lisjak[1], D. Makovec[1]
[1]Jožef Stefan Institute, Ljubljana, Slovenia,
[2]Faculty of Chemistry and Chemical Engineering, University of Maribor, Slovenia

In last years the intensity of research into the chemical syntheses of various materials has increased due to the potential advantages of better homogeneity, chemical purity and the wide variety of forms of ferrite materials, which cannot be realized by conventional solid-state processing. Most promising combustion free procedures are based on hydrothermal syntheses, sol-gel, co-precipitation syntheses, machano-chemical syntheses, sono-chemical syntheses and microemulsion assisted syntheses. One of the most prospected procedure for the synthesis of submicron and nano sized particles is the sol-gel route. Here the metal alkoxides are the most popular precursors because they react readily with water. The modification to the reaction conditions makes possible the syntheses of particles, films, fibers, gels and ceramics. For the syntheses of nanostructured materials is mechanical alloying, at present, a very active field of investigation. The prolonged dry comminution of solid material induces various processes. Particular interesting is the mechanochemical reaction since it makes possible to synthesize nanometric particles of ferrite phases. Not only the simple ferrites were synthesized also the more complex hexagonal ferrites were synthesized by the assistance of high energy milling. Hydrothermal syntheses as applied to ceramic powders production, is an aqueous process for the preparation of crystalline, anhydrous ceramic particles. To obtain the nanometric monodispersed particles, with an almost monodispersed size distribution and of uniform compositional and shape characteristics, must have been the nucleation and grain growth stage apparently separated. Another challenge of hydrothermal synthesis is to produce the ferrite ceramic directly from oxide. This is particular important since in that way one can circumvent the calcinations and obtain nanosized ferrite particles directly from the oxide precursors. Reverse micelle syntheses is shown to be an excellent way to produce nanocrystaline ferrite particles which are of great importance. The MnZn-ferrites were obtained in situ by hydrolyzing and oxidizing a mixture of two valent metal hydroxides within a reverse micelle. Sonochemistry has been sucessfully used to prepare nanoparticles. The chemical effects of ultrasound arise from acoustic cavitation, that is, the formation, growth and subsequent implosive collapse of gas bubbles in an ultrasonically irradiated liquid. The first synthesis of ferrite nano particles was reported in 1997 since then this method was found promising for the synthesis of nano-particles including ferrites.

O.S.C.1.

SYNTHESIS OF SILICA-COATED PERMALLOY NANOPARTICLES USING WATER-IN-OIL MICROEMULSION

I. Ban[1], M. Drofenik[1,2], D. Makovec[2]
[1]Faculty of Chemistry and Chemical Engineering, University of Maribor, Slovenia
[2]Jožef Stefan Institute, Ljubljana, Slovenia

A water in oil microemulsion method has been applied for the preparation of silica-coated permalloy particles. They were prepared by the reduction of their salts with sodium borohydride $NaBH_4$ in a cationic water-in-oil (w/o) microemulsion of water/cetyl-trimethyl-amonium bromide (CTAB) and n-butanol/isooctane at 25°C. The nanoparticles were coated with silica by hydrolyzing of tetramethoxysilane (TMOS) in the microemulsion media. Transmission electron microscopy, x-ray diffraction and superconducting quantum interference device (SQID) magnetometry have been employed to study both uncoated and silica-coated permalloy nanoparticles. According to the TEM and x-ray diffraction analysis, the synthesized particles were of a nanosize. The examination of the synthesis from the reverse micelle reveals that the size of the iron-nickel alloy nanoparticles depends to a grate extent, at a constant [1-butanol]/[CTAB] = P ratio, on the $[H_2O]$/[CTAB] ratio. All this particles show magnetic behavior close to superparamagnetic materials. The magnetization of coated nanoparticles was much lower than that of uncoated particles and that of bulk values reflecting the influence of nanodimension and of nonmagnetic surface layer on the particles magnetization.

O.S.C.2.

SYNTHESIS OF LANTHANUM-STRONTIUM MANGANITES BY A HYDROXIDE-PRECURSOR CO-PRECIPITATION METHOD IN SOLUTION AND REVERSE MICELLAR MICROEMULSION

V. Uskoković[1], M. Drofenik[1, 2]
[1]»Jožef Stefan « Institute, Ljubljana, Slovenia
[2]Faculty of Chemistry and Chemical Engineering, Maribor

Nanostructured lanthanum-strontium manganites have been synthesized using two different co-precipitation approaches, one in bulk solution, and the other in reverse micelles of CTAB/1-hexanol/1-butanol/water microemulsion. In both cases, precursor cations were precipitated by alkali precipitating agents. The properties of the material synthesized by using these two methods were compared in order to reveal potential advantages of microemulsion-assisted approach. Beside ion concentration, pH, aging time, temperature and composition of the microemulsion, the influence of annealing conditions on the properties of synthesized manganites was investigated by using X-ray diffraction, transmission electron microscopy, differential thermal analysis, thermogravimetric analysis and magnetic measurements.

O.S.C.3.

PHOTOLUMINESCENCE OF LASER-SYNTHESIZED ANATASE TITANIUM DIOXIDE NANOPOWDERS

M. Šćepanović, Z.D. Dohčević-Mitrović, I. Hinić, M. Grujić-Brojčin, G. Stanišić, Z.V. Popović
Institute of Physics, Center for Solid State Physics and New Materials, Belgrade, Serbia and Montenegro

Titanium dioxide (TiO_2) nanopowders were prepared by a laser-induced pyrolysis. X-ray diffraction and Raman scattering showed that prepared TiO_2 nanocrystals have anatase structure of TiO_2. Specific surface of the powders varies from 71 to 110 m^2/g, while the grain size of the nanoparticles is between 30 and 70 nm, depending on preparing conditions. We measured photoluminescence (PL) spectra of the TiO_2 nanocrystals. Under laser irradiation with photon energy between 2.41 and 2.71 eV the TiO_2 nanocrystals displayed strong visible light emission, even at excitation power as low as 0.05 W/cm^2. The line shape and maximum of this broad luminescence band are different for the samples with different size, and they are also changed by the excitation energy. The band is decomposed into three Gaussian-type bands attributed to three kinds of physical origins: self-trapped excitons, oxygen vacancies and surface states. These three emission bands are discussed for several TiO_2 samples under the different irradiation conditions.

O.S.C.4.

CHARACTERIZATION OF NANOPOROUS LANTHANIDES-DOPED GADOLINIUM GALLIUM GARNET POWDERS OBTAINED BY PROPELLANT SYNTHESIS

R. Krsmanović, S. Polizzi, P. Canton
Dipartimento di Chimica Fisica, Laboratorio di Microscopia Elettronica, Università Ca' Foscari di Venezia, Venice, Italy

In the present work, we studied the nanocrystalline powders of lanthanide-doped $Gd_3Ga_5O_{12}$ obtained using propellant synthesis. A series of samples containing a number of different trivalent lanthanide ions (Eu, Er, Sm, Pr, Ho, Tm) in different quantity (1%, 5%, 10%) were produced. Samples were characterized by X-ray diffraction (at pre and post calcinations) for phase identification and line broadening analysis, and electron microscopy (SEM and HRTEM) for morphological and nanostructural investigation. Thermal behavior was investigated by thermal gravimetric analysis and differential thermal analysis. The samples have a polycrystalline porous structure made up of particles in the nanometer range and high degree of disorder of crystallites.

O.S.C.5.

PREPARATION AND ELECTROCHEMICAL CAPACITANCE OF NANO-STRUCTURED NiO-Fe_2O_3 SUPPORTED ON CARBON CRYOGEL

B. Babić[1], D. Djokić[1], T. Trišović[2], Lj. Gajić-Krstajić[2]
[1]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro,
[2]Institute of Technical Science of SASA, Belgrade,

NiO-Fe_2O_3 nanoparticles composites were prepared by a modified polyol synthesis method in an ethylene glycol (EG) solution on carbon-cryogel as a support. The electrochemical capacitance performance of the nanocomposits in these supercapacitors was investigated by cyclic voltammetry, galvanostatic charge discharge tests and impedance spectroscopy. The results show that three dimensional network of carbon-cryogel offers a solid support structure for active NiO-Fe_2O_3 materials, allows the active material to be readily accessible for electrochemical response. A maximum specific capacitance of 650 F/g was obtained.

O.S.C.6.

PARTICLE SIZE EFECT: METHANOL OXIDATION ON SUPPORTED PT CATALYST IN ALKALINE SOLUTION

A.V. Tripković[1], K.Dj. Popović[1], J.D. Lović[1], A. Kowal[2]
[1]ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro
[2]Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Krakow, Poland

Methanol oxidation was studied in 0.1 M NaOH at supported Pt electrodes, and compared with single crystal Pt electrodes: Pt(111), Pt(110) and Pt(332), chosen as model systems, and with polycrystalline Pt electrode. The supported Pt electrodes were obtained by chemical (Pt-C/GC) and electrochemical (Pt/GC) deposition of the catalyst layer on a glassy carbon resulting in the same metal loading of 20 μg_{Pt} cm^{-2}. Using STM in the air the average particle size distributions, 3 – 6 nm at Pt-C/GC and 4 – 32 nm at Pt/GC were determined. Both supported Pt catalysts were less active than polycrystalline Pt. Negligible differences in the kinetics observed between Pt-C/GC and Pt(110) as well as Pt/GC and Pt(111) suggested that the activities of supported Pt electrodes could be correlated with activities of single crystal Pt electrodes oriented as the sites dominating in the Pt particles in catalyst deposits.

O.S.C.7.

RESONANT RAMAN SCATTERING IN STRAINED AND RELAXED InGaN/GaN MULTIPLE QUANTUM WELLS

S. Lazić[1], M. Moreno[1], J.M. Calleja[1], F. Naranjo[2], E. Calleja[2]
[1]Departamento de Física de Materiales, Universidad Autónoma de Madrid, Madrid, Spain
[2]Departamento de Ingeniería Electrónica, Universidad Politécnica de Madrid, Madrid, Spain

In this abstract we report Resonant Raman Scattering (RRS) results on samples that contain five quantum wells (MQWs) of InGaN with nominal In concentration around 15% and widths ranging from 2.5 to 5 nm separated by GaN barriers. The samples were grown by molecular beam epitaxy (MBE) on a (0001) 300 nm thick GaN template deposited on a sapphire substrate. The RRS measurements were preformed in the 2.0-3.0 eV range at constant temperature to avoid thermal strain effects on the line shapes of the resonant profile. Depending on their widths, the MQWs are either fully strained or relaxed. The pseudomorphic MQWs do not show significant deviation of the A_1(LO) phonon frequency with respect to GaN value due to a strong compensation of composition and strain effects which makes the frequency of this mode almost independent on In concentration, while the relaxed MQW shows a marked decrease of the Raman frequency.

As a result of the inhomogeneous In distribution, RRS spectra are significantly blue-shifted with respect to the photoluminescence emission. In the relaxed MQW the average In concentration and its variation are independently determined from the Raman shift of the A_1(LO) mode and from the energy of its resonance. Both measurements give similar results, thus confirming that Raman spectroscopy is an adequate method to investigate structural properties in semiconductor nitride structures. Our results also indicate that most of the conclusions previously reported from Raman measurements on InGaN films are also applicable to MQWs.

O.S.C.8.

GaN/AlGaN NANOCAVITIES WITH AlN/GaN BRAGG REFLECTORS GROWN IN AlGaN NANOCOLUMNS BY PLASMA-ASSISTED MBE

J. Ristić[1], E. Calleja[1], S. Fernández-Garrido[1], A. Trampert[2], K.H. Ploog[2], M. Povoloskyi[3] and A. Di Carlo[3]

[1]ISOM-Dept. Ingeniería Electrónica, Universidad Politécnica, Ciudad Universitaria s\n, Madrid, Spain, [2]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany, [3]Dpt. di Ingegneria Elettronica, Universita di Roma "Tor Vergata", Roma, Italy

The growth of GaN multi-quantum discs (MQDs), embedded in (Al,Ga)N nanocolumns grown by MBE on Si(111) substrates, was recently reported [1,2]. The self-assembled nanostructures grow under highly N-rich conditions, showing an outstanding crystal quality and very high luminescence efficiency, with no traces of extended defects, like dislocations or stacking faults. The (Al,Ga)N nanocolumns, with diameters ranging from 30 to 150 nm, are strain free, whereas the GaN MQDs are fully strained, though the strain is inhomogeneously distributed. Photoluminescence and cathodoluminescence data revealed quantum confinement effects in a nanostructure with 4 nm thick 5xGaN MQDs.

In this work we report on the growth of a wide variety of nanostructures with GaN MQDs of different disc thicknesses (2 nm to 8 nm), and 8 to 10 nm thick (Al,Ga)N barriers (Al content between 16% and 100%). The nanostructures were grown on Si(111) substrates starting with GaN and followed by the (Al,Ga)N and the GaN MQDs. This new approach avoids the growth of mixed compact/columnar material when starting to grow (Al,Ga)N nanocolumns, due to a much higher surface diffusion of the Al versus Ga adatoms. Photoluminescence measurements clearly show emissions related to the GaN MQDs that blueshift as their thickness is reduced from 8 to 2 nm.

AlN/GaN Bragg reflectors, with 10 (bottom) and 5 (upper) periods and nominal reflectivities of 87% and 50% at 345nm respectively, have been grown on the nanostructures previously mentioned, to form a nanocavity with an active region of 5xGaN MQDs in between. Results from photoluminescence experiments, transmission electron microscopy, and strain distribution calculations will be presented.

O.S.C.9.

GaAs/AlGaAs QUANTUM CASCADE LASERS BASED ON DOUBLE RESONANT ELECTRON – LO PHONON TRANSITIONS

A. Mirčetić[1,2], D. Indjin[1,3],V. Milanović[1], P. Harrison[3], Z. Ikonić[1,3], R. W. Kelsall[3], M. Giehler[4], R. Hey[4], H.T. Grahn[4]
[1]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro
[2]"Telekom Srbija" a.d., Zona održavanja Pančevo, Pančevo, Serbia and Montenegro
[3]Institute of Microwaves and Photonics, School of Electronic and Electrical Engineering, University of Leeds, Leeds, UK
[4]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany

In this paper we wish to present a procedure for the global optimization of mid-infrared GaAs/AlGaAs quantum cascade lasers that relies on the method of simulated annealing. We have proposed a double LO phonon resonance design obtained by a ladder of three states separated by optical phonon energy each, instead of the usual two lower laser states in the active region. The addition of an extra level significantly decreases the lower laser level population by enabling an efficient extraction into the injector region. The output characteristics of the obtained optimized structures are calculated with the use of the full self–consistent rate equation model, which includes all of the relevant scattering mechanisms. Some of the obtained optimized designs are presented and their output characteristics are compared with previously realized structures.

O.S.C.10.

CONTROL OF OPTICAL GAIN IN THE ACTIVE REGION OF QUANTUM CASCADE LASER BY STRONG PERPENDICULAR MAGNETIC FIELD

J. Radovanović[1,2], V. Milanović[2], Z. Ikonić[2,3], D. Indjin[2,3]
[1]Institute of Physics, Belgrade, Serbia and Montenegro
[2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro
[3]Institute of Microwaves and Photonics, School of Electronic and Electrical Engineering, University of Leeds, Leeds, UK

The variations of optical gain in the active region of quantum cascade laser under the influence of external magnetic field are analyzed. When the magnetic field is applied in the direction perpendicular to the plane of the layers, electron dispersion is broken into series of discrete Landau levels. This additional confinement strongly modifies the lifetime of electrons in the upper state of the laser transition, which is controlled by electron-phonon scattering. Landau levels are magnetically tuneable and, depending on their configuration, phonon emission is either inhibited or resonantly enhanced. This translates into strong modulations of the population inversion and consequently the optical gain as a function of magnetic field. Numerical results are presented for a structure designed to emit radiation at $\lambda \sim 11.4\mu m$, while the magnetic field is varied in the range of 10-60T. The effects of band nonparabolicity are taken into account in this model.

O.S.C.11.

POTENTIAL FOR OPTIMAL DIPOL MATRIX TRANSITION ELEMENTS IN CdS-HgS QUANTUM DOTS

G. Todorović[1], V. Milanović[2], R. Gospavić[1], V. Popov[3]
[1]Faculty of Civil Engineering, Belgrade, Serbia and Montenegro
[2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro
[3]Wessex Institute of Technology, Ashust Lodge, Southampton, UK

A method for dipole matrix transition elements optimization in semiconductor CdS-HgS heterostrutured quantum dot using supersymmetric (SUSY) quantum mechanics has been developed. Starting from spherically symmetric potential in analytical form we used SUSY to construct isospectral potential family and an optimal potential shape for dipole transition between ground states belong to different orbital quantum number has been obtained. Then we used the coordinate transform method to find an electron effective mass variation and realistic isospectral potential shape suitable for realization as a layers made of CdS as wide and HgS as narrow band gap material.

O.S.C.12.

HEMT CARRIER MOBILITY ANALYTICAL MODEL

P.M. Lukić[1], R.M. Ramović[2], R.M. Šašić[3]
[1]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro
[2]Faculty of Electrical Engineering, Belgrade
[3]Faculty of Tecnology and Metallurgy, Belgrade

In this paper the new analytical carrier mobility model of a heterostructural unipolar transistor - High Electron Mobility Transistor (HEMT) is presented. In the model, the quantum effects are taken into account, because these effects have significant influence and they directly determine many of the phenomena that take place in the heterostructural devices. The influence of two dimensional electron gas confined in a HEMT quantum gap, on the carrier mobility of this transistor, is considered. The mobility dependence on temperature is included in the model, also. Proposed model is applicable to the standard AlGaAs/GaAs HEMTs that are in use for the longest time and are well known, as well as to the InGaAs/GaAs HEMTs whose physical parameters are less known. The model is also applicable to the newest nitride based HEMTs. Developed model is simple, although it describes very complex physical processes. The results derived from simulations using the proposed model are in very good agreement with the already known experimentally and theoretically obtained ones available in literature.

PL.S.II.1.

FRAMEWORK FOR RESEARCH AND TECHNOLOGY DEVELOPMENT POLICY IN SMALL COUNTRIES – THE CASE OF SLOVENIA

M. Komac
Ministry of Education, Science and Sport, Ljubljana, Slovenia

New EU member states are striving to develop into dynamic and competitive economies, meaning that substantial investments in research, technological development and innovation will be needed. In general, this implies that predominantly curiosity driven research performed in the past has to be equilibrated with problem driven research and upgraded with knowledge transfer and knowledge commercialisation in the next step. Due to budget constraints this in turn calls for the selectivity in the choice of research topics, i.e. identification of research priorities, involvement of business sector in programme definition, and, last but not least increased transparency as well as efficiency of the expenditure of public funds. However, increased utility of research must not hamper the basic mission of academic research establishments, they must retain their culture by performing basic research, education and training.

Internationalisation of research policy, i.e. increased international networking looking for, *inter alia* the synergy between national and international research programmes, especially those of EU represents another strategic issue. The countries are building up competence of research in areas such as ICT, materials, biotechnology etc., whereas instruments promoting mobility enable inclusion in networks of centres of excellence (real or virtual).

In order to illustrate the above framework the evolution of RTD system in Slovenia, including experiences and recommendations will be presented.

PL.S.II.2.

SURFACE SENSITIVE SEMICONDUCTING NANOMATERIALS

R.M. Leblanc and K.M. Gattás-Asfura
Department of Chemistry, University of Miami, Coral Gables, Florida, USA

Peptides with engineered amino acid sequences facilitated the synthesis and surface functionalization of cadmium chalcogenides nanoparticles. Besides demonstrating quantum confinement effects, the luminescence properties of these quantum dots detected Cu^{2+} and Ag^{+} selectively with high sensitivity. Similar sensing capabilities were resolved for the optical detection of paraoxon in which negatively charged quantum dots were deposited within composite films onto solid substrates through utilization of the layer-by-layer technique. Langmuir-blodgett films could also facilitate the deposition of quantum dots onto different solid substrates with the capacity to control the 2D organization of the nanoparticles. Deposition of quantum dots onto solid substrates creates more convenient optical sensors and monitoring systems. Photo-cross-linkable polyethylene glycol (PEG)-based hydrogels physically trapped quantum dots efficiently. PEG biocompatibility properties and surface sensitive quantum dots could be combined to fabricate quantum dots-enriched materials with enhanced potential for applications including chemo- and biosensing. Results confirmed the great potentiality of surface modifications and immobilization of quantum dots.

PL.S.II.3.

EVIDENCE OF DOPANT MATRIX INTERACTION - DMI - IN OPTICAL SPECTRA OF RARE EARTH IONS

E. Antić-Fidančev
Laboratoire de Chimie Appliquée de l'État Solide, CNRS, UMR-C7574, ENSCP
Paris Cédex 05, France

A rare earth (R^{3+}) ion introduced in a solid host lattice is submitted to a great number of perturbations non-existing in the free ion. These perturbations are represented by Hamiltonians taking into account different major interactions: between the electrons, between orbital and spin angular momenta and, finely, a crystal field. Due to all these forces a degeneracy of states is progressively removed and can be partly or completely lifted giving very complex optical spectra. In fact, this complexity is connected with the local environment around the R^{3+} ion and depends on the point symmetry site of this ion. So, for Eu^{3+} ion 3003 states exists, but only a small number of them is accessible effectively. And, in fact, two terms of $4f^6$ configuration are the most frequently analysed, a ground term and the first excited term, ^7F and ^5D, respectively, via the $^5D_{0\text{-}2} \Leftrightarrow {}^7F_{0\text{-}4}$ transitions in absorption as well as in emission spectra. When the crystalline host lattice is concentrated, undoped, in that case no extra perturbation is introduced. Only some satellite lines may appear in optical spectra and these lines are attributed to vibronics associated with the electronic transitions, and first of all, to the hypersensitive 0-2 transition. When the rare earth is embedded as a dopant, then Dopant Matrix Interaction (DMI) provokes an extra perturbation which can be very important. This DMI is demonstrated following the crystal field strength parameter, N_v, in function of the ionic radii of the host lattice cation. When the rare earth ions (R^{3+}) are introduced in the same host lattice, for example cubic C-type Y_2O_3, the N_v decreases with decreasing ionic radius of the host lattice cation. This diminution of N_v is consistent with the decrease of the metal-ligand distance in the oxygen covalent bonding. But another feature is met, too. In fact, when a given rare earth is introduced in an isostructural series, here cubic C-type R_2O_3 doped with Eu^{3+} (R=Gd, Y, Lu, In, Sc), then the N_v parameter exhibits quite different trend: the N_v increases with decreasing ionic radius of the host lattice cation. It is evident that the large dopant (Eu^{3+}) induces high internal pressure and leads to important modifications in the metal-ligand bond distances and therefore to an increase in the crystal field strength. So far, according to the spectral shift of the intense 0-2 electronic line of Eu^{3+} in this oxide series, 0, 13, and 34 kbar pressures are deduced as imposed on the Eu^{3+} ion when embedded in Gd_2O_3, Lu_2O_3, and Sc_2O_3, respectively. From these values it is clear that the DMI is very important. The effect of the rigidity of the oxide lattice is evidenced, but it is not excluded that the dopant ion can modify the lattice, too. This feature is encountered in garnet family as well. In both series, oxides and garnets, pair lines are observed, especially for large R^{3+} ions such as Pr^{3+} and Nd^{3+}, but in case of co-doped crystals, pairs have been observed even if one of the dopants is a small ion, highlighting separate contributions on reciprocal stress outcome. The structure of the pairs in crystals depends on the dopant concentration and on the crystal structure.

PL.S.II.4.

HYDROGEN STORAGE USING LIGHT METAL HYDRIDES CHOICE BETWEEN THERMODYNAMIC OR CHEMICAL WAYS

S. Jacques, M.P. Berthet and B. Bonnetot
L. M. I., UMR 5615, UCB Lyon 1, Villeurbanne Cedex, France

The importance of hydrogen in a near future has no more to be discussed. However hydrogen is not a crude product like oil or coal and it has to be produced from a starting material and energy. An important work is done actually to produce hydrogen from methane, light hydrocarbon derivatives or alcohols produced from bio mass using well known techniques of reforming with or without CO_2 sequestration to lead to an ecological hydrogen production.

Hydrogen must be considered as a secondary energy source or a tool in energy storage, usually electric energy produced by hydroelectric, geothermal, solar or nuclear plants. Hydrogen produced can easily be stored when electricity can hardly be.

In a second time this stored hydrogen has to be converted in energy using the more efficient way. Actually the more convenient process to convert hydrogen into energy are fuel cells. The yield can be up to 60 % if the cells are used under the best conditions. The feeding of the cells must be regulated and the way of hydrogen storage and releasing must consider this important point.

Industrially, especially for on-board applications as in automobile, hydrogen storage actually is assumed only using two ways: -compressed hydrogen into steel containers - or using sodium borohydride solutions. If the first way of storage can only be developed using technical known solutions, the storage using light metals is under progress.

In fact under in the same class of "light metal hydrides" are two very different ways of hydrogen recovering depending of the thermodynamic data which imposed the conditions of reversibility of the storage. Due to their thermal behaviour, the thermal decomposition of borohydrides in a reversible scheme could not be considered and the classical mean for hydrogen recovering must pass through an hydrolysis process of borohydride leading to borates followed by a borate conversion into borohydride. This scheme must be considered into an large industrial process

The storage mode using aluminium derivatives can be very different. Among complex aluminium hydrides, commonly called alanates, only sodium and potassium derivatives can be expected for a reversible path way. However for theses compounds, $NaAlH_4$, $KAlH_4$, the amount of stored hydrogen is a little smaller (5.6 and 4.3 % weight) than the required DOE specifications. An important key of the success of hydrogen storage using alanates will be the hydrogen charging and discharging delay. A lot of work has been done to catalyse the hydrogen storage to lower the absorption time but, for the reported experiments, the five minutes refueling imposed by the DOE are not reached. More over the catalyst addition to the alanate trend to lower the amount of stored hydrogen.

Several technical unconsidered points have appeared when the constraints bounded to the automobiles word were reached including fuel preparation, fuel life time when prepared for borohydrides, hydrolysis and storage decreasing with alanates.

These point will be discussed in the present paper taking in accound literature and own experience.

PL.S.II.5.

INORGANIC FLUORIDES AND OXIDES BY THERMAL DECOMPOSITION OF HYDRAZINIUM(+1) AND HYDRAZINIUM(+2) FLUOROMETALLATES

A. Rahten, M. Remškar, A. Jesih
Jožef Stefan Institute, Ljubljana, Slovenia

Thermal decomposition of thermally unstable compounds, which includes hydrazinium(+1) and hydrazinium(+2) fluorometallates is one of the very efficient methods for the syntheses of metal fluorides and oxides (J. Slivnik, J. Maček, A. Rahten, B. Sedej, Thermochim. Acta, 39, 21, (1980)). By the thermal decomposition of $(N_2H_5)_2AlF_5.H_2O$ the γ-AlF_3 with traces of β-AlF_3 was prepared (S. Milićev, A. Rahten, Eur. J. Solid State Inorg. Chem., 28, 557, (1991)). $(N_2H_5)_2CrF_5.H_2O$, the precursor for CrF_3 was prepared in water solution from $N_2H_6CrF_5.H_2O$ by the addition of $N_2H_4.H_2O$. $(N_2H_5)_2CrF_5.H_2O$ was studied by infrared spectroscopy and thermal analysis. $(N_2H_5)_2CrF_5.H_2O$ decomposes at 590 °C to the final product rhombohedral CrF_3 with Cr_2O_3 and Cr_2F_5 in minor quantities. Crystallite dimensions were determined by transmission electron microscopy and range from 20 nm to 100 nm.

PL.S.II.6.

THE INFLUENCE OF SURFACE MODIFICATION ON RELATED FUNCTIONAL PROPERTIES OF WOOL AND HEMP

P. Jovančić[1], D. Jocić[1], M. Radetić[1], T. Topalović[2], Z.Lj. Petrović[3]
[1]Textile Engineering Department, Faculty of Technology and Metallurgy,
University of Belgrade, Belgrade, Serbia and Montenegro
[2]Textile Technology Group, Faculty of Science and Technology,
University of Twente, Enschede, The Netherlands
[3]Institute of Physics, Zemun, Serbia and Montenegro

Among different physical methods of fibre surface modification, low-temperature plasma treatment is considered as very useful for treatment of wool and hemp. Additionally there are efficient ecologically acceptable chemical methods available such as peroxide, biopolymer and enzyme treatment. Some interesting combinations of these surface modification methods are presented in this lecture as they result in an increase of wettability, dimensional stability, polymer adhesion, and better dyeing ability equally on wool and hemp fabrics. The new concept of the combined treatment consisting of specific fibre surface tailoring and activation prior to biopolymer or enzyme post-application is introduced. To provide evidence of the extent of surface modification, we used wettability, swelling and contact angle measurements as well as FTIR-ATR and XPS analysis. The SEM and AFM technique are used for routine examination and gaining information about fiber topography.

PL.S.D.1.

INVESTIGATION ON THE STATIC AND FATIGUE FAILURE OF BI-DIRECTIONAL COMPOSITE PIPES

D. Perreux[1], F. Thiébaud[1], L. Farines[1], P.S. Uskoković[1,2]
[1]Laboratoire de Mécanique Appliquée. R Chaléat, Besançon-France
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

The process of filament winding is particularly suited to the manufacturing of composite pipes. This paper first describes the overall process and its advantages for composite structures. Particular attention is devoted to bi-directional pipes $[+\varphi, -\varphi]_n$. The static behaviour exhibits damage and plastic phenomena depending on the loading and stacking sequence.

In the main part of the paper we focus our presentation on $[+55, -55]_n$. The failure mode under tensile loading-internal pressure loads of bi-directional pipes is described, as well as their fatigue behaviour with the effect of several parameters (such as frequency of stress or moisture content) on the lifetime and the kinetics of damage.

In particular, this paper shows that the effect of frequency is related to two phenomena: temperature and fatigue-creep coupling, which have opposing action on the lifetime.

O.S.D.1.

NANOTRIBOLOGICAL PROPERTIES OF UHMWPE/QUARTZ COMPOSITES

C.Y. Tang[1], P.S. Uskoković[1,2], C.P. Tsui[1],K.C. Chan[1], S.C.L. Lo[3]
[1]Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, P.R. China
[2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro
[3]Department of Applied Biology and Chemical Technology, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, P.R. China

Wear of ultra-high molecular weight polyethylene (UHMWPE) and its composites is one of the main obstacles that limit the longevity of total joint replacements. Compression molded UHMWPE/quartz composites with organosiloxane as a cross-linking agent for UHMWPE matrix, were tested in nanoindentation and nanowear. The nanomechanical properties of the composite were examined in light of nanoindentation experiments performed with a diamond tip of nominal radius of curvature of about 130 nm under conditions of maximum contact load in the range of 50-500 μN and loading/unloading rates of 30 μN/s. The wear behavior of the composite is interpreted in terms of the wear depth and critical wear cycle. Results from nanowear tests show that, in addition to the nanohardness and elastic modulus, the cross-linking procedure has the most pronounced effect on the tribological properties and at 0.5 phr organosiloxane, composites reaches their maximum nanowear resistance. These findings are in agreement with the results of conventional mechanical and wear tests performed on these materials.

O.S.D.2.

GAMMA RADIATION EFFECTS ON SHORT TERM MECHANICAL PROPERTIES OF CARBON/EPOXY COMPOSITES

M.M. Stevanović, D.R. Sekulić, I.M. Djordjević
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

Unidirectional and angle-ply carbon/epoxy laminates were gamma irradiated up to dose of 12 MGy. Composites with two different - low and high temperatures, epoxy matrices have been submitted to the irradiation and to subsequent mechanical testing. By measuring the in-plane shear static and dynamic properties, interalminar shear, transverse tensile and compression strengths of tested composites the radiation effects were studied. Lowering of glass transition temperature of the epoxy matrix due to irradiation was detected by dynamic-mechanical analysis and electron microscopy was used to study the fracture behavior of tested specimens. The immersion of composite plate in water at 80 ^{o}C and mechanical measurements on elevated temperatures emphasized the irradiation effects on mechanical properties.

O.S.D.3.

SiC/SiC COMPOSITES PREPARED WITH A BN INTERPHASE PROCESSED BY LP-CVD FROM MOLECULAR PRECURSOR

S. Jacques, M.-P. Berthet and B. Bonnetot
Laboratoire des Multimatériaux et Interfaces, UMR 5615 University of Lyon 1 / CNRS, Villeurbanne Cedex, France

Ceramic-ceramic composites are very hard but brittle compounds usually composed from high modulus fibres imbedded into high temperature obtained ceramic used as a matrix. Among the large number of couple fibres-matrix which have been studied, SiC-SiC composites are one of the more promising solution but as it is two brittle ceramics, the interface between the fibres and the matrix have to be optimised. Usually pyrolytic carbon is used as interface but the composites can hardly be used at higher temperature than 450°C. For higher temperature boron nitride, BN, is more promising. The coating of high Nicalon fibres by BN involves usually very corrosive compounds which do not allow industrial applications. Another way of coatings has been developed from organometallic precursors.

Carbon-containing boron nitride coatings (BN(C)), were prepared by LPCVD (Low Pressure Chemical Vapour Deposition) at different temperatures (from 900°C to 1200°C) and characterised from the physico-chemical point of view by FTIR, X-ray diffraction, X-ray photoelectron spectroscopy (XPS) and scanning electron microscopy (SEM).

A set of specific conditions have been implemented for an optimal deposit from $C_6H_{18}BN_3/H_2/NH_3$ gaseous mixture. These conditions were used to prepare BN interphases within SiC/SiC minicomposites materials.

Subsequently, these samples underwent mechanical tensile tests with loading-unloading cycles in order to evaluate the ability of these interphases to act as a mechanical fuse in ceramic matrix composites.

O.S.D.4.

HOT PRESSING OF Y_2O_3 DOPPED Si_3N_4 CERAMICS

D. Bučevac and S. Bošković
Institute of Nuclear Sciences Vinca, Materials Science Laboratory 170,
Belgrade, Serbia and Montenegro

Si_3N_4 / Si_3N_4 composites were obtained by introducing β-Si_3N_4 seeds into the α-Si_3N_4 matrix. β-Si_3N_4 seeds were obtained from mixture of Y_2O_3, SiO_2 and α-Si_3N_4, which was heating at 1850°C, for 6 hours in flowing nitrogen. The preparation of seeds from mentioned samples was described. Pure Y_2O_3 in the quantity of 10 mass % was used as sintering aid. Homogenization of seeds and previously prepared mixture with additives (in vibro mill) was performed in attritor in isopropanol, for 6 hours. The concentration of seeds varied from 1-5 mass %. Hot pressing was performed at 1800°C under the preasure 39 MPa in flowing nitrogen. Isothermal heating time ranged from 1-6 hours. Densification degree during hot pressing, according to our results, was affected by seeds concentration. Isothermal heating time did not affect density change to a great extent. Microstructure was affected both by isothermal heating time and by the seeds concentration. The phases present were detected by X-ray analysis. Hardness and fracture toughness were determined by indentation method. These results will be discussed, as well.

O.S.D.5.

INFLUENCE OF ADDITIVE TYPE ON DENSFICATION AND PHASE TRANSFORMATION OF SEEDED Si_3N_4

A. Vučković, B. Matović and S. Bošković
Materials Science Laboratory, Institute of Nuclear Sciences "Vinča",
Belgrade, Serbia and Montenegro

This paper deals with densification and α→β phase transformation of Si_3N_4, with constant β-Si_3N_4 seeds concentration regarding sintering temperature and different additive type. Seeds of β-Si_3N_4 had been obtained by sintering of silicon nitride in α-form (H.C. Starck LC12-SX) and additive mixture consisting of Y_2O_3 and SiO_2. Two different Si_3N_4 / additive mixtures, M1 and M2, containing constant amount of seeds, were fabricated and tested. Each composition was formulated based on an addition of 10-wt% of additive. The additive in M1 consisted of yttria + alumina with 7 wt % Y_2O_3 and 3 wt % Al_2O_3. Composition M2 was prepared by using CeO_2 as the sole additive. Characterization of sintered samples involved phase analysis by X–ray diffraction, density measurement as well as hardness, fracture toughness measurements and microstructure observation. The results indicated that in the presence of yttria alumina mixture as sintering aid, phase transformation and densification were enhanced as compared to samples containing CeO_2 as sintering additive. The reasons for observed behaviour are discussed in detail.

O.S.D.6.

MORPHOLOGY AND CAPACITIVE PROPERTIES OF DIFFERENTLY PREPARED RuO_xH_y/C COMPOSITE MATERIALS

V. Panić[1], A. Dekanski[1], S. Gojković[2], S.K. Milonjić[3], V. Mišković-Stanković[2], B. Nikolić[2]
[1]ICTM – Center of Electrochemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade
[3]Vinča Institute of Nuclear Sciences, Belgrade

The composite material of hydrous ruthenium-oxide supported on carbon blacks has the supercapacitive performances due to oxide pseudocapacitive behavior and double layer capacitance of high surface area carbon black, with the application in energy storage devices. In this work, the morphology and capacitive behavior of composite material prepared from oxide sols, which are obtained by forced hydrolysis of chloride or alcoxide, by the impregnation of Vulcan® XC-72 R carbon black were investigated by scanning electron microscopy, cyclic voltammetry electrochemical impedance spectroscopy. Two distinctive phases were detected in the composites annealed at low temperatures and prepared from impregnating media with high oxide content. The capacitance and cycle life of these composites depends on oxide content and annealing temperature.

O.S.D.7.

MECHANICAL BEHAVIOUR OF SPHEROIDAL GRAPHITE UNDER DIFFERENT LOAD TYPES

S. Baloš, D. Rajnović, L. Šidjanin, P. Kovač
Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia and Montenegro

Most metal matrix composites (MMC) contain hard particles. Upon deformation of such a MMC the particles offer significant restraint to local matrix deformation. Composites containing soft particles are much less common, but are finding increased usage and recent attract the attention of researches. Such MMC material is a cast iron with spheroidal graphite. Graphite nodules were assumed to change their shape during plastic deformation of the bulk material. However, those shape changes strongly depend on the load type and metal matrix, which was proved by a series of experiments with ferritic and pearlitic cast iron matrix. For this purpose, the specimens have been compressed and tensile stressed. In addition, some specimens were machined and quick stop sectioned samples of chip formation were obtained.

PL.S.E.1.

BIODEGRADABLE AND BIOACTIVE COMPOSITE FOAMS FOR TISSUE ENGINEERING SCAFFOLDS

A.R. Boccaccini
Department of Materials and Centre for Tissue Engineering and Regenerative Medicine, Imperial College, London, UK

The design of composite materials offers an exceptional opportunity for the development of biodegradable and bioactive scaffolds for tissue engineering. A brief review of the current developments in the field of biodegradable and bioactive composites for tissue engineering applications, including combinations of polylactide (PLA), polyglycolide (PGA) and other resorbable polymers with hydroxyapatite (HA), tri-calcium phosphate (TCP) or bioactive glasses and glass-ceramics in different porous scaffold architectures, will be presented.

Our own investigations on the fabrication and characterisation of composite materials for tissue engineering scaffolds, based on macroporous poly(DL-lactide) (PDLLA) foams and bioactive glass (Bioglass®) particles will be presented. Foams exhibiting high porosity (> 90%) and controlled pore structure are produced by thermal induced phase separation processes. Bioglass® is added both as a filler into the polymer matrix and in the form of a coating covering all external surfaces of the porous PDLLA structure. In-vitro studies in simulated body fluid (SBF) and phosphate buffered saline (PBS) were performed to study the degradation rate and simultaneous formation of hydroxyapatite (HA) layer on the surface of PDLLA/Bioglass® composites. Furthermore the dynamic mechanical and thermal properties as well as the changing surface properties of the scaffolds as function of degradation time were studied. Increasing Bioglass® content and time of immersion in SBF were shown to influence the surface characteristics and reduce the hydrophobicity of the scaffolds.

The initial attachment and proliferation of human osteoblasts within the polymer/Bioglass® foams were investigated. It was found that osteoblasts attached within the porous network throughout the depth of the foams confirming the potential of the bioactive scaffolds for bone tissue engineering. Recent studies to assess the suitability of PDLLA/Bioglass® composites for soft tissue engineering scaffolds will be also presented, in particular for scaffolds of tubular structure for intestine constructs and for lung tissue engineering.

O.S.E.1.

SYNTHESIS, CHARACTERIZATION AND APPLICATION OF COMPOSITE BIOMATERIALS BIPHASIC CALCIUM PHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLIDE AS FILLER AND BLOCKS FOR REPARATION HARD BONE TISSUE

N. Ignjatović[1], P. Ninkov[2], Z. Ajduković[3], V. Konstantinović[4], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Faculty of Medicine, Clinic of Stomatology, University of Novi Sad, Novi Sad
[3]Faculty of Stomatology, University of Nis, Nis
[4]Clinic for Maxillofacial Surgery, Faculty of Stomatology, Belgrade

Composite biomaterials, like calciumphosphate/bioresorbable polymer, showed great possibilities in reconstruction and reparation of bone tissue defects induced by different causes. This paper investigates synthesis possibilities of bi-phased calciumphosphate/poly-DL-lactide-co-glycolide (BCP/DLPLG) composite biomaterial formed as filler and as blocks.

BCP/DLPLG composite biomaterial was obtained in a form of spherical granules of BCP covered by a DLPLG layer, average diameter of 150-250 μm. By cold and hot pressing of granules at up to 10000 kg/cm^2 pressure, blocks with fine distribution of phases and with up to 3% porosity were obtained. With the increase of pressing pressure, compressive strength and modules of elasticity of obtained blocks increase.

Characterization was performed with wide angle X-ray structural analysis (WAXS), scanning electron microscopy (SEM), infrared spectroscopy (IR), differential scanning calorimetry (DSC), and mechanical properties by defining the compressive strength and module of elasticity. *In vitro* citotoxicity research was implemented on cellular culture of fibroblast like of the Human cell (MRC-5) and mouse (L929). *In vivo* research was implemented in two steps. The first step examined reparatory possibilities of BCP/DLPLG on Sprague Dolly mice, singenic type (32 mice). Next step examined bone tissue reconstruction possibilities on patients.

In vitro test showed a great fibroblast adhesion and non-citotoxicity of the composite. It is considered that material is not citotoxic if the cell survival is above 82%, and in our case it is 92%. *In vivo* research on mice indicated high level of reparatory ability of this composite with the forming of new bone and vascular tissue after six weeks of reparation. Application of this composite for healing of infrabony defects on patients showed a high level of osseous regeneration.

O.S.E.2.

RADIATION EFFECTS ON POLY-L-LACTIDE AND HYDROXYAPATITE/ POLY-L-LACTIDE COMPOSITE

E. Suljovrujić[1], N. Ignjatović[2], M. Mitrić[1], M. Mitrović[3], D. Uskoković[2]
[1]Vinca Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro
[2]Institute of Technical Sciences of SASA, Belgrade,
[3]Faculty of Physics, Belgrade

Radiation processing, a widely used step in certain modern technologies, can be utilized for modification and sterilization of implants based on sensitive polymers and composites. In this paper effects of gamma radiation on structure and physical properties of poly-L-lactide (PLLA) polymer and hydroxyapatite/poly-L-lactide (HAp/PLLA) ceramic/polymer composite biomaterial were studied. Unfilled and hydroxyapatite-filled PLLA films at 0.50 and 0.80 filler weight fractions were gamma-irradiated to various absorbed doses (10, 25, 50, 100, 200 and 300 KGy) of gamma radiation in a ^{60}Co radiation facility, in air, at room temperature, at a dose rate of 9 KGy/h. Since the morphology of PLLA and HAp/PLLA films is very sensitive to gamma irradiation, surface microstructure was analyzed by scanning electronic microscopy (SEM). Structural changes occurring in the material, mostly changes in PLLA, which is more sensitive to irradiation than HAp, were studied by wide angle X-ray structural analysis (WAXS) and infrared (IR) spectroscopy. The dominant effect of gamma irradiation, in the presence of air, on both the polymer and the composite (PLLA and HAp/PLLA), is chain scission in PLLA. The degradation of the films was studied by measuring the changes in their molecular weights by gel permeation chromatography (GPC). Differential scanning calorimetry measurements (DSC) were used to study the changes in thermal behavior and crystallinity. Effects of radiation on the thermal stability were determined by thermogravimetric analysis (TGA). Conclusions derived according to different methods were compared.

O.S.E.3.

INFLUENCE OF γ RADIATION ON THE PROPERTIES OF CARBON CLOTH AS A BANDAGING MATERIAL

B. Kaludjerović, B. Babić and Lj. Milovanović
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

Activated carbon cloth has high surface area and its surface contains oxygen groups such as carbonyl, carboxyl and others. Carbon cloth as a bandage is used at first healing stages for drainage and purification of wounds. Due to high hygroscopicity the material can adsorb microorganisms, wound secretion including pus and prevent penetration of toxic substances into blood.

Carbon bandaging materials are put in the package and sterilized by γ radiation. This ensures sterility of the package for a long period.

In this work we examine the influence of γ radiation on the properties of the material such as specific surface area and content of oxygen groups.

O.S.E.4.

MATHEMATICAL MODELING OF CELL DISTRIBUTION IN ALGINATE MICROBEADS

B. Obradović[1], B. Bugarski[1], D. Bugarski[2], Z. Todosijević[1], G. Vunjak-Novaković[3]
[1]Chemical Engineering Department, Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro; [2]Institute for Medical Research, Belgrade, [3]Division of Health Sciences and Technology, Massachusetts Institute of Technology, Cambridge, USA

Alginate is one of the mostly used hydrogels for cell entrapment aimed for applications in food industry, environmental engineering, pharmacy and biomedicine. One of the major parameters affecting cell viability and activity is cell distribution inside the immobilization matrix. In addition, changes in cell distribution over the cultivation time could indicate mass transfer limitations, favorable local environments or cell differentiation. In this study, immobilization and distribution of brewing yeast and bone marrow stromal cells in alginate microbeads were investigated as model systems. Cell distributions were attained by image analysis of histological cross-sections of microbeads cultivated for different time periods. A mathematical model based on cellular automata approach was developed for 3-dimensional simulations of cell arrangement over the cultivation time.

O.S.E.5.

SYNERGY OF MATTER, ENERGY AND INFORMATION IN BIOLOGICAL NANOSTRUCTURES

Dj. Koruga
Molecular Machines Research Center, Faculty of Mechanical Engineering, University of Belgrade, Serbia and Montenegro

Under the term synergy, we usually mean an action where the total effect of two active components in a mixture is greater then the sum of their individual effects. For example, a mixture volume that is greater than the sum of the individual volumes. Also, that can be situation when using two or more stabilizers, where the combination improves polymer stability more than expected from the additive effect of the stabilizers. A material that causes such an effect is known as a synergist. However, biological molecular nanostructures such as DNA, clathrin and microtubules showed new types of synergetic affects from matter, energy and information (MEI) point of view. In this paper, theoretical and experimental approaches of MEI synergetic effects in biological nanostructures are presented.

O.S.E.6.

A KINK-SOLITON MODEL OF CHARGE TRANSPORT THROUGH MICROTUBULAR CYTOSKELETON

G. Kekovi[1], D. Raković[2], M. Satarić[3], Dj. Koruga[4]
[1]Military Academy, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, [3]Faculty of Technical Sciences, Novi Sad, [4]Faculty of Mechanical Engineering, Belgrade

Contemporary trends in science and technology are characterized by integration of biological and technical systems, like in nanotechnology, nanobiology, and quantum medicine. In our case, we were motivated by necessity to understand charge transport through microtubular cytoskeleton as a constitutive part of acupuncture system. The high frequency component of acupuncture currents, widely exploited in microwave resonance stimulation of acupuncture system in the past decade, implies that explanation of the cytoplasmatic conductivity should be sought in the framework of Frohlich theory. Accordingly, in this paper we critically analyze the problem of the microwave coherent longitudinal electrical oscillations as a theoretical basis for understanding the solitons phenomena in microtubules, showing that charged kink-soliton nonlinear microtubular excitations might be a good candidate for charge transport in microtubules.

O.S.E.7.

BIOPOLYMER CHAIN FOLDING AND BIOMOLECULAR RECOGNITION: A QUANTUM DECOHERENCE THEORY APPROACH

D. Raković[1], M. Dugić[2], M.B. Plavšić[3]
[1]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro
[2]Department of Physics, Faculty of Science, Kragujevac,
[3]Faculty of Technology and Metallurgy, Belgrade

In this paper we describe the biopolymer chain folding problem in the framework of the so-called quantum decoherence theory. As we propose a rather qualitative scenario yet bearing generality, it seems this provides promising basis for the solution-in-principle of the (semi-)classically hard kinetic problem of biopolymer chain folding from coiled to native conformation in highly selective ligand-proteins/target-receptors biomolecular recognition processes, implying underlying macroscopic quantum nonlocallity on the level of biological cell.

O.S.E.8.

APPEARANCE OF A HARD LAYER ("α CASE") ON THE SURFACE OF TITANIUM-BASED CAST ALLOYS

Z. Mišković, B. Dimčić, I. Bobić, S.P. Zec, M. T. Jovanović
Institute for Nuclear Sciences «Vinca», Belgrade, Serbia and Montenegro

Titanium-based alloys represent a wide range of modern metallic materials for specific industrial (automotive, aerospace, gas and chemical industry) and biomedical applications. Processing by forging or melting and casting of products made of these materials is very complicated due to the high reactivity of titanium at elevated temperatures. During melting and casting very restricted conditions have to be set, involving the usage of vacuum furnaces, argon protective atmosphere and ceramic shell molds with very high chemical and thermal-shocks stability. However, in spite of all applied precautions, appearance of the hard surface layer (also known as the "α case") was noticed during casting of titanium-based alloys. X-ray diffraction analysis, optical and scanning electron microscopy, and hardness measurements were performed for the microstructural and mechanical characterization of the hard layer.

Poster Presentation

P.S.A.1.

FORMATION OF SOLID TiC FROM THERMAL PLASMA. THERMODYNAMIC CONSIDERATION

J. Radić-Perić
Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

Thermal plasma, as high temperature mixtures of atoms, molecules, ions and electrons are nowadays widely used for the synthesis of high purity ultra fine powders of silicon, boron, aluminum, titanium etc. and their oxides, nitrides or carbides [1]. A reactants, introduced into thermal plasma evaporates and, depending on the temperature, partially dissociate into atoms and ionize, producing ions and electrons. The formation of molecular and radicals stable at high temperatures also occurs. These species can be transported to the reaction zone where, under definite temperature, the desired gas product can be formed. By rapid cooling (quenching) of such system, under controlled conditions, a saturated or supersaturated vapor can be formed and the formation of ultra fine (solid) particles can be achieved.

Titanium is the ninth most abundant element (0.6% by mass) in the Earth crust. It was found in the meteorites and in the sun. Titanium carbide is extremely hard and light refractory material with high thermal and abrasion resistance. Recently, infrared spectra of gas phase Titanium carbide (cluster) around low mass stars were detected.

In this paper we consider the formation of atomic titanium and TiC molecule at high temperatures in thermal plasma. This process is investigated theoretically by computing the equilibrium composition of the gas mixture containing titanium and chlorine (titanium as reactant is assumed to be in the form of titanium tetrachloride) with argon and hydrogen and of the mixture involving also carbon beside mentioned elements. The calculation is performed for temperature range between 500 and 6000 K , for different Ti/C rations and for the total pressure in the system of 1 bar and 0.5 bar. Use is made of the fact that thermal plasma is plasma in (local) thermodynamic equilibrium, which makes possible the theoretical determination (by employing Gibbs free energy data for the compounds present in the system and assuming that the equilibrium of the system corresponds to its minimum energy state) of its equilibrium composition. From the calculated compositions of the investigated gas systems the temperature zones with saturated and/or over saturated vapor of Ti, TiC and C were determined and the formation of Ti and TiC *via* different reaction routes was analysed.

P.S.A.2.

LOW PRESSURE RF PLASMA REACTOR FOR MODIFICATION OF POLYMERS AND TEXTILE MATERIALS

N. Puač[1], Z.Lj. Petrović[1], M. Radetić[3] and A. Djordjević[2]
[1]Institute for Physics, Zemun, Serbia and Montenegro,
[2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro
[3]Department for Textil Engineering, Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

Plasma reactor operating at low pressures (0.2-1 Torr) at 13.56 MHz has been developed with an idea to optimize the treatment of polymers and textile materials. The reactor proved very effective in treatment of polymer surfaces and wool fabrics in order to improve wettability, efficiency of dyeing and printing as well as to reduce felting shrinkage. The conditions that reactor has to satisfy are basically that ion energy has to be low and the reactor should be efficient in production of active radicals. The system is a cylindrical capacitively coupled reactor operating at 13.56 MHz. We have selected geometry in order to minimize the energy of ions reaching the surface and we have developed probes to measure directly voltage and current waveforms. However, for this geometry, the energy of ions could not be determined by standard formulae based on the ratio of areas of two electrodes so we had to perform modeling. Oxygen, air and argon were all used with different results.

P.S.A.3.

NEUTRALIZATION OF IONS BEAMS FOR REDUCTION OF CHARGING DAMAGE IN PLASMA ETCHING

A. Stojković, M. Radmilović-Radjenović and Z. Lj. Petrović
Institute of Physics, Belgrade, Serbia and Montenegro

Sources of high energy neutrals need further development for application in etching. Neutral-beams were proposed for plasma etching in order to reduce damage due to charging. These are very serious problems that must be overcome in the fabrication of future nanoscale devices. We analyze efficiency of neutralization in a system proposed recently in NEC where a beam of ions is neutralized in the gas phase and in set of narrow tubes. We have considered surface neutralization of ions as well as collisions of ions in the gas. In the case of collisions of ions with the aperture walls, efficiency of neutralization was assumed to be 100%. We have investigated the influences of various parameters such as aperture length, diameter of the tube and the initial energy of ions on efficiency of neutralization using a Monte Carlo code for simulation of ion motion. In our calculations we have used a well established cross section set for argon.

P.S.A.4.

WATER TREATMENT USING PULSED CORONA DISCHARGES

N. Popović[1], N. Stančić[2], I. Vidović[2], J. Krstić-Simić[1], M. Simičić[1], M. Dimitrijević[3]
[1]IHIS, Zemun, Serbia and Montenegro, [2]NAISSUS, Niš, Serbia and Montenegro,
[3]Astronomical Observatory, Belgrade, Serbia and Montenegro

Water treatment method using electrical discharges is based on corona discharges in air-water reactor. The discharges created above the water create lots of oxidizers and are in principle similar to ozone generation. This method promices to be efficient in waste water treatment.

P.S.A.5.

DYNAMIC VOLTAGE-CURRENT CHARACTERISTICS OF UNIPOILAR PULSE GLOW DISCHARGE

I. Popović, V. Rajović and M. Zlatanović
Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

Introduction of pulse plasma power supply is one of the major contributions to plasma surface engineering. The voltage-current characteristics of the nitrogen and nitrogen/hydrogen glow discharges in the frequency range from 80 Hz to 20 kHz were recorded and analyzed concerning the discharge instabilities, glow-to-arc transition, hollow cathode effect and the influence of surface treatment process parameters. It was found that the shape of voltage and current records contain the information on characteristic time for glow-to-arc transition, appearance of local hollow cathode discharges which can cause the local overeating of the cathode, on the energy stored in the system which can be transferred to the cathode surface and on the discharge chemical composition. The influence of discharge power on current-voltage characteristics was also considered.

P.S.A.6.

DRM-MD FORMULATION FOR LASER-MATERIAL INTERACTION

R. Gospavić[1], G. Todorović[1], V. Popov[2], M. Srećković[3]
[1]Faculty of Civil Engineering, Belgrade, Serbia and Montenegro
[2]Wessex Institute of Technology, Ashust Lodge, Southampton, UK
[3]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

Modeling of laser-material interaction using the dual reciprocity method multi-domain (DRM-MD) was presented. Thermal effects in case of cylindrical geometry for mono as well as multi layer structures were considered. The laser-material interaction was modeling using the thermal model of interaction. Different aspects of interaction up to melting point of considered materials were presented. The influence of laser beam parameters to the temperature field distribution was evaluated. Numerical results for spatial as well as temporal temperature distribution in side of bulk of material were presented. In case of mono layer structure DRM approach was used. Also numerical results in case of mono layer structure with analytical ones were compared. In case of multi layer structure there isn't analytical solutions and DRM-MD was used. Imposed numerical method offers flexibility as with domain methods and high accuracy.

P.S.A.7.

SURFACE STRUCTURES FORMED ON THE AISI 420 STAINLESS STEEL BY PULSED LASER IRRADIATION

B. Gaković[1], M. Trtica[1], S. Petrović[1], P. Panjan[2], M. Čekada[2], Z. Samardžija[2]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro
[2]Jožef Stefan Institute, Ljubljana, Slovenia

The laser surface treatment of different materials has received great attention and presents advantage in relation to the conventional materials handling. With laser irradiation is possible to processing and change localized areas of metal samples. In this work, the effects of focused laser irradiation of the AISI 420 stainless steel and formed surface structures are presented. Polished steel wafer was multi-pulse irradiated in air by TEA CO_2 laser (wavelength-10.6 microns; pulse duration 2 micro seconds; pulse repetition rate 2 Hz). The laser intensity was slightly above the intensity needed for plasma formation in front of the steel surface for single laser pulse. Depending on the successive pulse number the obtained surface structures were monitored by optical and scanning electron microscopy. Quantitative estimation was done by profilometer surface monitoring. Qualitative microscopy observations were revealed nano-structured features formed inside the micro-structured irradiated areas.

P.S.A.8.

COMPARISON OF HYDROXYAPATITE SORPTION PROPERTIES TOWARDS Pb, Cd, Zn and Sr IONS

I.D. Smičiklas, A. Onjia, J. Marković, S. Raičević
The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Apatites are well known matrix for heavy metal immobilization and remediation of ground water and contaminated soils. In this work, Pb, Cd, Sr and Zn sorption capacities of different types of synthetic hydroxyapatite (HAP) samples were analyzed. Initial concentration of heavy metals was 10^{-2} mol/dm^3, and initial pH =5.0 ± 0.1. After 24 h equilibration of HAP samples with single heavy metal solutions (solid/liquid ratio 1:200), the remainder concentration of metal, concentration of Ca^{2+} released from crystal lattice, and final pH values were measured. The sorption capacities of all samples, regardless of the differences in their composition, crystallinity, specific surface area, and points of zero charge, were as follows: Pb > Cd > Zn > Sr. In all cases, sorption was followed by decrease in pH values. These final pH values were compared with the pH_{PZC} values obtained by equilibration of HAP samples with inert electrolyte (KNO_3). On the basis of experimental results, sorption mechanisms were discussed.

P.S.A.9.

REDUCTION OF NiO-WO_3 OXIDE MIXTURES SYNTHESIZED BY GEL-COMBUSTION TECHNIQUE: A ROUTE TO NiW ALLOYS

S. Mentus[1], D. Majstorović[2], B. Tomić[2], R. Dimitrijević[2]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro
[2]Institute of General and Physical Chemistry, Belgrade, Serbia and Montenegro
[3]Faculty of Mining and Geology, Belgrade, Srebia and Montenegro

The mixtures NiO-WO_3 mixtures were synthesized in the following way: tungsten powder was dissolved in concentrated hydrogen peroxide to obtain polytungstic acid solution, which was mixed with the solution of nickel nitrate and citric acid in appropriate mole ratio. The solutions were then heated to remove solvent, and upon almost all water was evaporated, a very viscous transparent gel remained. The gel was heated in an open oven at a slowly rising temperature, until a combustion of citric acid happened, and a fine oxide mixture remained. The X-ray diffractograms of the mixtures evidenced that a new phases, $NiWO_4$ appeared apart of NiO and WO_3.

The oxide mixtures were reduced in a hydrogen stream, and the reduction process was followed by thermogravimetry. The reduction temperature increased systematically with the increase of WO_3 mole ratio, but for all mixtures the reduction completed up to 800 C. The x-ray diffractometry of metallic residue evidenced NiW alloys and tungsten in excess.

P.S.A.10.

THE INFLUENCE OF CHANGE OF SYNTHESYS PROCEDURE ON PHISICO-CHEMICAL PROPERTIES OF Ni-SILICATE PRECURSOR

J. Krstić[1], N. Vukelić[2], Z.P. Nedić[2], A. Milutinović-Nikolić[1], A. Šućurović[1], D. Jovanović[1]
[1]Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

The aim of this paper was the investigation of the influence of synthesis parameters as well as the order of synthesis steps, in procedure of chemical precipitation, on properties of synthesized nickel precursor. Water solutions of $Ni(NO_3)_2 \cdot 6H_2O$ and $Mg(NO_3)_2 \cdot 6H_2O$ of constant molar ratio, were added in reaction vessel with pH and temperature monitoring during entire synthesis. After heating at 90°C the 2% solution of SiO_2 in a form of water glass and 10% solution of Na_2CO_3 were added at constant rate. The formed precipitate aged 30 minutes at synthesis temperature. By changing the order and conditions of adding SiO_2 and Na_2CO_3 solutions and keeping the treatment of precipitates the same (rinsing with hot distilled water followed by drying at 110°C for 24 hours) six different precursors were obtained. Sample characterization was performed using different experimental techniques: XRD analysis, thermal analysis, IR spectroscopy, reflection spectroscopy, N_2 physisorption and Hg-porosimetry. The relation between synthesis procedure and precursor properties was established. The hypothesis was given assuming that precursor condition might be responsible for formation and polymerization of complex silicate compounds.

P.S.A.11.

THE PROPERTIES OF BORON DOPPED GLASSY CARBON

A. Udovičić[1], M. Baćić[2], M. Laušević[2] and Z. Laušević[1]
[1]The Institute of Nuclear Science VINCA, Laboratory of Physics 010, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade

The aim of this work was to show the differences between properties of glassy carbon (GC) and boron-doped glassy carbon (B-GC). B-GC has been prepared with addition of 0.3% of boron to the furfurol resin. The samples were prepared in the shape of thin plates at 3 different carbonization temperatures: 750, 825 and 1000 ^{0}C. A comparative study showed that the addition of boron decreases electrical conductivity of the material and influences mechanicals properties. Besides physical properties, the addition of boron increased the rate of spontaneous deposition of silver from $AgNO_3$ aqueous solution. The deposition rates, total amount of silver deposit as well as the mechanical properties and conductivity were dependent on carbonization temperature for both B-GC and GC samples.

P.S.A.12.

THE EFFECT OF THE ELECTROLYSIS PARAMETERS ON MORPHOLOGY STRUCTURE AND CHEMICAL COMPOSITION OF COBALT AND NICKEL POWDER

M. Spasojević[1], L. Rafailović[1], L. Ribić-Zelenović[1], B. Jordović[2]
[1]Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro
[2]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro

The cobalt and nickel alloy powder were obtained by electrochemical deposition on titanium cathode from cobalt and nickel sulfate ammonium solutions.

The powders of specific chemical structure and composition, particle shape and size were obtained by an appropriate choice of the electrolysis parameters. The Ni and Co content in the obtained powders is approximately equal to that in the solutions. Within the current densities range of 10 – 450 $mAcm^{-2}$, current density did not significantly affect the chemical composition of the powders, but had significant effect on the particle structure, shape and size. The crystal particles were formed on the lower current density than 30 $mAcm^{-2}$. Smaller and more dendritic particles with more developed high ordered branches were formed at higher current densities within the current densities range of 10 – 30 $mAcm^{-2}$. The amorphous powder was obtained at current densities more than 30 $mAcm^{-2}$.

P.S.A.13.

THE FLOWABILITY OF ELECTROLYTIC COPPER POWDER

M.G. Pavlović[1], K.I. Popov[2], S.B. Krstić[2], Lj.J. Pavlović[1]
[1]ICTM-Department of Electrochemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

One of the most important properties of copper powder is its flowability which depends on the shape and the structure of the powder particles. The flowability of a copper powder depends on the interparticle friction, which is dominated by the surface area and surface roughness of the particles. As the surface area and surface roughness increase, the amount of friction in the powder mass increases and the powder exhibits less efficient flow. The same appears with the shape of particle. The more irregular the particles shape is, the less efficient is the powder flow. Resistance to flow is the main feature of friction, which decreases as the particles approach a smooth spherical shape. The effect of particle size distribution on the powder flowability is also important. A procedure for the determination for a representative powder particle permitting the free flow of copper powder is proposed.

P.S.A.14.

INFLUENCE OF MECHANICAL ACTIVATION AND Ni^{2+} ION ON CHARCTERISTICS OF THE $BaTiO_3$ CAPACITORS

V. Pejović[1], D. Djurović[2], S. Bošković[2]
[1]IRITEL, Belgrade, Serbia and Montenegro,
[2]Institute for Nuclear Sciences "Vinča", Belgrade

Doping of $BaTiO_3$-based ceramics is of great importance in the fabrication of electric and electronic devices (multilayer capacitors, heaters and sensors with positive temperature coefficient of resistivity, piezoelectric transducers, ferroelectrics thin-film memories, etc.). In the present study, the influence of mechanical activation on characteristics of the $BaTiO_3$ capacitors with and without the presence of Ni^{2+} ion was studied. $BaTiO_3$ fine sub micron powders were prepared from mechanically activated $BaCO_3$ and TiO_2 by a solid-state reaction. Phase identification was performed by X-ray diffractometry (XRD). The dielectric properties were measured by a LCZ meter (HP 4276A). Silver paste was applied as electrodes. It was shown that obtained powder in the presence of Ni^{2+} ion possed considerably better electrical properties than undoped one.

P.S.A.15.

MECHANICAL ACTIVATION SYNTHESIS OF $CaTiO_3$ FROM MIXTURE OF CaO AND TiO_2

V.M. Vukotić[1], N. Radojević, Lj. Živković[2], Z. Vuković[3], B.D. Stojanović[1]
[1]Center for Multidisciplinary studies, University of Belgrade, Belgrade, Serbia and Montenegro
[2]Faculty of Electronic Engineering, University of Niš, Niš, Serbia and Montenegro
[3]Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia and Montenegro

Crystalline calcium titanate was prepared by mechanical activation synthesis in a planetary ball mill during 30, 60, 120 and 240 min from the mixture of CaO, obtained by thermal treatment of $CaCO_3$ and TiO_2 in anatase or rutile form. The effect of milling on the solid-state reaction was followed using X-ray diffraction. The change in powder size and morphology due to milling were determinate by SEM, while BET analysis was used to determine specific surface area.

It was pointed out that the formation of calcium titanate was easily achieved by mechanical activation synthesis of the mixture of calcium oxide and rutale modification of titanium oxide comparing to the anatas form.

P.S.A.16.

THE INFLUENCE OF MILLING PARAMETERS ON COMPRESSIBILITY OF MECHANICALLY ACTIVATED ZINC OXIDE POWDERS

K. Vojisavljević[1], J. Filipović[2], T.V. Srećković[1], D. Minić[2], M.M. Ristić[3]
[1]Center for Multidisciplinary Studies of the Belgrade University, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[3]Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

In most applications involving powders good packing characteristics are desired. Also, it is well known that higher packing densities are possible by adjustment of the particle size, shape and size distribution. Whereas mechanical activation by milling is used as a method for the modification of physico-chemical properties of dispersed systems microstructural changes of powder during mechanical activation could be used for better compressibility as well as sintering processes. Regarding that ZnO powder was activated in a planetary ball mill in various ways by changing the ball-to-powder mass ratio, disc rotational speed, and time of activation. Powders obtained in such a way were pressed into cylindrical compacts, with no binder, using various pressures. Experimental results of the dependence of density on pressure were fitted by different functions. It is shown that the process of consolidation can be described by Kunin-Yurchenko′s equation. Relationships between considered milling parameters and compressibility were also established.

P.S.A.17.

COMPUTER SIMULATION OF GRAIN COARSENING DURING LIQUID PHASE SINTERING

Z.S. Nikolić
Faculty of Electronic Engineering, Department of Microelectronics
University of Niš, Niš, Serbia and Montenegro

The microstructure during liquid phase sintering may change either by larger particles growing during the Ostwald ripening process or by shape accommodation. In this study, simulation of liquid phase sintering based on sub-models for solution-precipitation and grain coarsening will be considered. This paper describes the two-dimensional computer-based simulation method for determination of a qualitative and a quantitative effect of a moving grain boundary on the solid/liquid interface during liquid phase sintering of porous structure.

P.S.A.18.

SYNTHESIS OF ZINC STANNATE SPINEL BY REACTIVE SINTERING

N. Nikolić[1], T. Ivetić[1], T.V. Srećković[2], M.M. Ristić[3]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Center for Multidisciplinary Studies, University of Belgrade, Serbia and Montenegro
[3]Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

Spinel-based materials exhibit different useful properties due to the specific structure. Zinc stannate spinel, Zn_2SnO_4, investigated in this work is potentially good gas and humidity sensors. Spinel was synthesized using a mechanothermal treatment, namely mechanical activation of oxide powders mixed in appropriate stoichiometric ratio by grinding in a planetary ball mill followed by reactive sintering. The change of physico-chemical and microstructural characteristics in the ZnO-SnO_2 system after grinding was followed using X-ray powder diffraction and scanning electron microscopy, while thermal behavior was examined by a sensitive dilatometer. Mechanochemical spinel formation was observed after 40 min of grinding, while monophased zinc stannate was synthesized at 1200ºC.

P.S.A.19.

DILATOMETER INVESTIGATIONS OF REACTIVE SINTERING OF ZINC TITANATES CERAMICS

N. Obradović[1], N. Labus[1], T.V. Srećković[2], Lj. Živković[3], M.M. Ristić[4]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Center for Multidisciplinary Studies, University of Belgrade, Serbia and Montenegro
[3]Faculty of Electronic Engineering, University of Nis, Nis, Serbia and Montenegro
[4]Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro

Starting powder mixtures of ZnO and TiO_2, in the molar ratio that is in accordance with stoichiometry of zinc titanate Zn_2TiO_4, were mechanically activated using planetary ball mill during different time intervals from 0 to 90 minutes. X-ray diffraction analysis, scanning electron microscopy and non-isothermal dilatometric measurements were performed in order to investigate zinc titanates formation. Processes that occur during mechanical activation lead to the formation of a specific structure of obtained powders that promoted and accelerated solid-state reactions and densification during reaction sintering. The main conclusion based on analysis is that mechanical activation enables better compaction of activated powders, i.e. possibilities of achieving higher densities of green bodies without binders, but first of all that Zn_2TiO_4 ceramics could be obtained by mechanical activation after certain time with appropriate thermal treatment, i.e. heating rate and sintering time, at temperature lower then in case where no activated mixtures was used.

P.S.A.20.

APPLICATION OF THE MASTER SINTERING CURVE THEORY TO NON-ISOTHERMAL SINTERING OF $BaTiO_3$ CERAMICS

M.V. Nikolić[1], V.P. Pavlović[2], V.B. Pavlović[3], N. Labus[4], B.D. Stojanović[1]
[1]Center for Multidisciplinary Studies of the University of Belgrade, Belgrade, Serbia and Montenegro
[2]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro
[3]Faculty of Agriculture, Belgrade, Serbia and Montenegro
[4]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

In this paper a practical approach to analyzing sintering of $BaTiO_3$ using the concept of a Master Sintering Curve has been presented. Non-isothermal sintering of high-purity non-doped $BaTiO_3$ ceramics was monitored using a sensitive dilatometer at three different heating rates (10, 20 and 30 ^oC/min) up to 1380^oC. Densification of $BaTiO_3$ during sintering was analyzed using the Master Curve Sintering Theory. A MSC was defined characterizing the sintering behaviour of barium-titanate regardless of the heating rate. Construction of the MSC enabled estimation of the process activation energy. Using the defined MSC curve densification behaviour of $BaTiO_3$ ceramics during sintering can be predicted for arbitrary temperature-time excursions and these predictions can be used in controlling and planning the sintering process of this material.

P.S.A.21.

MICROSTRUCTURE EVOLUTION AND CHARACTERIZATION OF CdO AND ZnO

V.P. Pavlović[1], Z.M. Nikolić[2], V.B. Pavlović[3], D.M. Popović[2]
[1]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro
[2]Faculty of Physics, Belgrade, Serbia and Montenegro
[3]Faculty of Agriculture, Zemun, Serbia and Montenegro

In this paper the study of the evolution of microstructure constituents which occurs during sintering of CdO and ZnO has been presented. Microstructure analysis of sintered CdO and ZnO has been performed using SEM and quantitative microstructure analysis. The change of microstructure parameters as a function of sintering regime has been performed using digital pattern recognition method and the concept of grain diameter evolution integral. The investigations included the analysis of the change of the average grain size during sintering as well the change of grain size distribution. Considering these results, prognosis of CdO and ZnO materials properties, according to the correlations synthesis-structure and structure-properties, are based on selection of optimal consolidation conditions (concentration of additive, initial density...) and on obtaining the adequate microstructure.

P.S.A.22.

SINTERING OF NATURAL ALUMOSILICATE

D. Živanović
Institute for Mineral and Other Raw Materials, Belgrade, Serbia and Montenegro

Purpose of this work was to investigate the influence of mechanical activation on the process of sintering. We sintered inactivated and activated samples at temperatures of 800º-1000ºC, always keeping samples at maximal temperatures for one hour. Investigation of sintered material's properties showed that mechanical activation improved activated material's properties, which enabled decreasing of sintering temperature for more than 100ºC and improvement of physical characteristics of examined alumosilicate. Appearance of new anortite compound was also noticed.

P.S.A.23.

COMPARATIVE INVESTIGATION OF METHYL METHACRYLATE POLYMERIZATION UNDER THERMAL AND MICROWAVE ENERGY

J. Jovanović[1] and B. Adnadjević[2]
[1]Institute of Technical Science of SASA, Beograd, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Beograd, Serbia and Montenegro

Application of microwave energy for polymerization presents relatively new, attractive and powerful tool for preparation the different polymer materials. This type of polymerization leads to significant increases the polymerization velocity and improves the properties of the polymerization products. Comparative investigation of methyl methacrylate (MMA) polymerization under thermal and microwave energy was done. The polymerization of MMA was undertaken in bulk with benzoyl peroxide (BPO) as polymerization initiator. The obtained PMMA samples were isolated using standard precipitation methods and were characterized by solution viscometry, GPC and FTIR. It was found that the microwave assisted polymerization leads to significant enhancement of the reaction rate (so far more than ten times), decrease the activation energy (to 2.7 kJ/mol), enables occurring polymerization reaction at low temperatures ($\leq 30^{o}$C) and disappearing the so called gel effect. The molar mass of the PMMA obtained using microwave field was shown to be very high and nearly constant during the reaction (about 10^{6} g/mol) with narrow molar mass distribution.

P.S.A.24.

MELTING BEHAVIOR OF ISOTACTIC POLYPROPYLENE HIGHLY CROSSLINKED BY GAMMA IRRADIATION IN THE ABSENCE OF OXYGEN

Z. Kačarević-Popović, D. Babić, M. Marinović-Cincović
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

Polymer molecules self-assemble during crystallization into the structures that depend on the time-temperature hystory as well as chemical structure in complicated ways. Characterization of these structures is possible through their equilibrium melting. In this work the melting behavior and heat properties of highly crosslinked iPP by gamma irradiation to the 1650 kGy, in the absence of oxygen, are investigated by DSC method. The changes in the supermolecular structure of gel portion of irradiated iPP and bulk material are evaluated and correlated to the heterogeneous distribution of crosslinks in polymer structure caused by specific early excitation process. The change in enthalpy of fusion, peak melting temperature and maximal specific heat capacity with absorbed dose is explained as a consequence of separated crosslinking process, fast on the lamellae surface and slow in the crystall core at double bond site. The role of molecular structure of iPP with the pendant CH_3 group in crosslinking efficiency and on crosslinks density and influence on melting behavior is discussed.

P.S.A.25.

THE COMPOSITION CHANGE OF ORGANIC COATINGS AND THEIR INFLUENCE ON PROPERTIES OF COATINGS

M. Rajković[1], J. Djordjević[1], M.P. Antić[1], C. Lačnjevac[1], Lj. Rašković[2]
[1]Faculty of Agriculture, Belgrade, [2]Pomoravlje-Niš

Organic coatings applied to different bases serve for the protection of the basic material against corrosion and the decorative purposes.The most wiolespread procedure for the protection of metal,wooden or concrete structures against corrosion is the application of spreading coatings based on organic compounds.The variety of spreading coatings is caused by the fact that there are no universal coatings for the corrosion protection.Their properties depend on the basic raw materials used in the production and on the conditions in which the materials are used.

The basic component of the spreading coatings are the binder,solvent and pigment.In addition to these basic components the spreading coatings also contain plastifier,diluent,filler,siccative and aid agents.

The most important component of spreading coating determining the properties of the formed coating is the binder.The most widely used binders for obtaining the organic spreading coatings are on the basis of plant oils,natural and artificial resins and bitumen.

The properties of organic coatings in dependence on the applied combinations of components have been examined in this paper. Namely, it is wellknown that by varying only a few commercial resins with a lot of different oil acids it is possible to obtain an enormous number of coatings of different properties. Several compositions of organic coatings obtained by different combinations of components have been examined.The properties of thus obtained organic coatings have been tested for hardness and wear resistance; stretching and elasticity; adhesion; resilience; corrosion stability.The results gained by these tests showed correlation between the applied combinations of components and the properties of the obtained coatings.

P.S.A.26.

SYNTHESIS OF THE 4-VINILPYRIDINE COPOLYMER WITH METYLACRILAT AND ACRYLONITRILE AND THEIR APPLY FOR THE ADSORPTION OF GOLD FROM DILUTED SOLUTIONS

P. Miletić[1], V. Bojanić[2], S. Jovanović[3], Ž. Topić[2], M. Dragić[4], Ž. Marjanović-Balaban[1]
[1]Faculty of Forestry, Banja Luka, Republic Srpska, Bosnia and Hercegovina, [2]Faculty of Agriculture, Banja Luka, [3]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [4]MUP RS, Dept. For Crimetechnics, Banja Luka

During this work the meshed copolymer on the basis of 4-vinylpyridine have been synthesized with metylacrylate and acrylonitrile and meshing process has been performed by using divinylbenzene: poly-4-vinylpyridine-copolimer-metylacrylate-copolymer-acrylonitrile (poly (4-VP-co-MA-co-AN)), In this work have been showed the results obtained during the study work of synthesized copolymers as ion-exchange resins for adsorption of gold from diluted solutions. Suspension copolymerisation of 4-vinylpyridine and monomers has been made by using suspension substance polyvinyl-alcohol and azobisobutyronitrile serving as initiator, and meshing has been achieved using divinylbenzene. Composed meshed copolymer on the basis of 4-vinylpiridine had a round shape and high percentage of consumption, on the basis of 4-vinylpiridine had a round shape and high percentage of consumption, calculated on the basis of 4-vinylpiridine (approx. 95 mass %). Chemical structure of synthesized copolymer was proved by IR-spectroscopy, which showed the appearance of the characteristic band. Quantity of the adsorpted gold in the copolymer has been proved by using methodes of gravimetry and spectrofotometry. Gold has been separated from its diluted water-sollutions by copolymers.

P.S.A.27.

SINTHESIS OF CYCLIC ACETALS

Z. Sebastijan
Higher Technological School for Non-metals, Aradjelovac, Serbia and Montenegro

The synthesis of tetrahydrofuran- and tetrahydropyran-type cyclic acetals was achieved by electrichemical cyclization of Δ^4-unsaturated carbonyl compounds. The reaction was performed by electrolysis of these substrates and diphenyl diselenide in a saturated solution of KBr in methanol, by using an udivided cell, whereas graphite and Cu were used as an anode and a cathode, respectively.

P.S.B.1.

THE INFLUENCE OF THE SMALL-POLARON INDUCED SHIFT OF PHONON FREQUENCIE ON IR SPECTRA OF HYDROGEN BONDED MOLECULAR CRYSTALS

D. Čevizović, S. Zeković and Z. Ivić
The "Vinča" Institute of Nuclear Sciences, Laboratory of Theoretical and Condensed Matter Physics-020, Belgrade, Serbia and Montenegro

The influence of the localized excitations, analogous to the Holsteins small-polarons, on vibrational spectra of the hydrogen-bonded molecular chains has been investigated by means of the Green function techniques. It was found that small-polaron effect might induce the hardening of phonon modes. The contribution of these excitations to the spectral function was calculated by taking into account so predicted changes of phonon frequencies. Finally, the possibility of a direct experimental verification of the small-polaron existence has been critically assessed on the basis of these results.

P.S.B.2.

HYPERVALENT MOLECULAR CLUSTER: $C_{28}H_4$

M. Veljković[1], O. Nešković[1], A. Djerić[2], S. Veličković[1] and V. Šipka[1]
[1]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

The growing number of recent publications on clesters reflect the tremendous interest in these particles. In this work, the carbon cluser generated by a spark cluster source and detected by single focusing mass spectrometer *in situ*. We examined the effects of cluster source parameters on generation of carbon cluster and report our initial results. In the case when the carbon clusters generated in the plasma arc carried by the Ar and H_2 gases flow downstream through a vacuum chamber to the ion source of mass spectrometer, we obtained small binary carbon cluster $C_{28}H_4$ (hydrogenated fullerene). The empty fullerene is tetravalent and strongly binds four hydrogen atoms which significantly weakens the two different sets of bounds and leads to an open-shell electronic structure. We demonstrated how *in situ* mass spectrometry led to the rapid development of an important branch of synthetic fullerene chemistry that has yielded many new small fullerenes and related derivatives with novel structures and properties.

P.S.B.3.

EVALUATION OF THE TWO-DIMENSIONAL ELECTRON DENSITY IN AlGaAs/GaAs MODFETS

R.M. Šašić[1], D. Čevizović[2] and R.M. Ramović[3]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro
[3]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

A theoretical model, developed in this paper, considers distribution of the carrier concentration and carrier density of 2DEG in MODFET channel by one nonlinear differential equation of the fourth order. This equation is carried out from momentum and Poisson's equations and includes quantum effects. Momentum equation is derived from Wigner Boltzmann's equation. Special attention has been paid to the question of boundary conditions. The model has also enabled us to take thermoelectronic emission at the heterointerface into account, and investigate the concentration of carriers which penetrated through the barrier into undoped spacer-layer.

P.S.B.4.

MODEL FOR PHONONS IN MULTICOMPONENT $A_{1-x-y}B_xC_yD$ TYPE ALLOYS

M. Romčević
Institute of Physics, Belgrade, Serbia and Montenegro

Multicomponent alloys have attracted much attention for applications to optical devices. Model for phonon frequency calculation of $A_{1-x-y}B_xC_yD$ type alloys is presented in this work. With this model it is possible to calculate phonon frequencies for every alloy composition if parameters ω_{TO}, ε_0 and ε_∞ and position of impurity modes of the each binary end member alloy are known. This model was applied on quaternary alloys $A_{1-x-y}B_xC_yD$, where elements A, B and C are in one sublattice and D forms the other ($Cd_{1-x-y}Zn_xMn_yTe$, $Al_{1-x-y}Ga_xIn_yP$ and $Al_{1-x-y}Ga_xIn_yAs$). Agreement between experimental results and this numerical model is very good. On the basis of this model it is possible to predict phonon behavior of alloys and to determine needed alloy composition to obtain required phonon frequencies. This is very important for applications of alloys in optical devices.

P.S.B.5.

SPIN INTERACTIONS IN $Cd_{1-x}Mn_xS$ BULK CRYSTALS

D. Milivojević and B. Babić-Stojić
Vinča Institute of Nuclear Sciences, Belgrade, Sebia and Montenegro

Electron paramagnetic resonance (EPR) linewidth in the samples of $Cd_{1-x}Mn_xS$ bulk crystals with x = 0.25, 0.33 and 0.42 has been studied in the high temperature region. An analysis of the infinite temperature EPR linewidth performed within the exchange narrowing model shows that the contributions of the anisotropic superexchange and magnetic dipolar interaction to the linewidth are nearly the same due to weak spin-orbit coupling. Single ion anisotropy originating from the crystal field of axial symmetry with parameter $D_{single} \approx 0.03$ cm^{-1}, which was observed in some CdS:Mn crystals, gives a contribution to the linewidth comparable to the influence of the anisotropic superexchange and magnetic dipolar interaction. It appears the three anisotropic spin interactions could account for the majority of the experimental infinite temperature EPR linewidth obtained in the extrapolation procedure.

P.S.B.6.

OPTICAL AND MAGNETIC PROPERTIES OF $Hg_{1-x}Mn_xSe$ ALLOYS

Dj. Jovanović[1], D. Milivojević[2], M. Romčević[1], B. Babić-Stojić[2], N. Romčević[1]
[1]Institute of Physics, Belgrade, Serbia and Montenegro
[2]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Semimagnetic semiconductors have attracted a great deal of interest not only for their potential use in spintronics, but also because of the fundamental question of how a magnetic metal can be derived from a paramagnetic insulator. The most common method involves substitution of Mn into the crystal structure of II-VI semiconductors.

In this paper we used X-ray, far-infrared reflectivity and electron paramagnetic resonance measurements to investigate the optical and magnetic properties of $Hg_{1-x}Mn_xSe$ ($x \leq 0.26$) alloys. Also, we used two models to describe magnetic and phonon structure. Agreement between experimental results and models prediction is very good.

P.S.B.7.

PARALLEL ANALYSIS OF IC HOUSING THERMAL PROPERTIES

B. Radojčić[1], R.M. Ramović[2], O. Aleksić[1]
[1]Institute of Security, Belgrade, Serbia and Montenegro
[2]Faculty of Electrical Engineering, Belgrade

Parallel analysis of thermal properties of novel IC housings was done in several aspects: thermal properties of housing materials, types of ICs placed in the housing (digital, analogue and power circuits), level of miniaturization (classical and SMT integrated circuits), construction and miniaturization of interconnections (integration with the substrate). Thermal properties of materials for IC housings are given from the aspect of thermal conductance, mechanical dilatation (temperature dissipation), maximal allowed dissipation and operating temperature of the integrated circuit. The aspect of miniaturization was analyzed from the point of the occupied surface on the substrate, number of pins (interconnections) and technology of the joints made. Construction of multi chip structures in multi-leveled interconnections on silicon and substrate has been separately analyzed. Based on these analyses useful recommendations were derived for design of specific electronic assemblies using on the developed methods of the 2D and 3D type for their thermal analysis (theoretical and experimental methods).

P.S.B.8.

PHOTOTHERMAL MODELING OF MULTILAYER SAMPLES BASED ON GENERALIZED TRANSMISSION-LINE THEORY OF HEAT CONDUCTION

Z. Stojanović, S. Galović
The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Technological development, especially in microelectronic and optoelectronic, requires the development of new and improved methods for measuring the thermal properties of multilayer structures. Previously, photothermal method was developed and shown to provide accurate values of thermal diffusivity and derived thermal conductivity for a broad range of two-, three- and multilayer structures. The great success of the methods is enabled by derivation of various models of photothemal signal for multilayer samples. In this paper, a generalized transmission-line approach to obtain the model of photothermal response for multilayer samples is described. This approach enables inclusion of thermal memory effects of each layer, followed by possibility of determination of sample memory parameters. Based on the suggested model the special cases of three layer structures that could be reduced on one effective layer are discussed.

P.S.B.9.

HEATED AND SELF-HEATED THICK FILM NTC AIR FLOW VOLUME SENSOR

O. Aleksić[1], M. Luković[1], D. Luković[2], S. Savić[2]
[1]Institute of Security, Belgrade, Serbia and Montenegro
[2]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

This paper deals with the analysis and optimization of a new air flow volume sensor based on thick film NTC segmented thermistors. Thick film NTC segmented thermistors, with dimensions of 75 x 12.5 x 0.5 mm, having 8 segments, were screen printed on alumina using 3K3 NTC thermistor paste and PdAg paste (Ei Iritel) and sintered at 850 ^{0}C/10 min in a conveyor furnace. Resistivity of the segmented thermistors vs. ambient temperature was measured in a climatic chamber in the range of 30 to 130 ^{0}C. A pair of segmented thermistors was placed in an air guide made of rolled cardboard, of 1.08m length and 0.1 m diameter, through which room temperature air was flowing. Air flow volume was regulated almost linearly from 0 to 10 l/s by a fan that covered the cross-section of the air guide and that was driven by 0-14 Vdc. In the first version of the sensor, a small heater for indirect heating of thermistors (glowing bulb) was placed between the thermistors on a distance of 1 and 2 cm (first perpendicularly, later parallelly to the air flow). Resistivity of segmented thermistors vs. air flow volume was measured for different powers of the heater (25, 40, 60 W) and two distances from the heater. The best working point was chosen and linearization resistors were calculated and then the Wheatstone bridge was formed with a pair of NTC segmented thermistors in opposite branches. The bridge voltage difference vs. air flow volume was measured for different powers at the distance of 1cm from the heater and for two types of position toward the air flow. In the second version, the self- heating principle of NTC thermistors by constant current of 30-80 mA was used. The pair of NTC thermistors was placed in two chambers, one fully opened to the air flow (active), and the other semi-opened (closed on the side directly exposed to the air flow). The resistivity and voltage on NTC thermistors for different constant currents through them vs. air flow was measured for a working point optimization, and then the voltage difference between the thermistors vs. the air flow volume was measured. In the third version of sensors self-heating of thermistors was used as well, but one of the two NTC segmented thermistors was in the air guide while the other was outside the guide. The same constant current was circulated through NTC thermistors and voltage difference was measured as the function of the air flow. The results obtained were analyzed and compared mutually, as well as to the literature data for disc thermistors.

P.S.B.10.

FAR INFRARED REFLECTIVITY SPECTRA OF LEAD-TELLURIDE DOPED WITH SAMARIUM

D. Luković[1], S. Savić[1], W. König[2], V. Blagojević[3], S. Vujatović[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Max Planck Institut für Festkörperforschung**,** Stuttgart, Germany
[3]Faculty of Electrical Engineering of Belgrade University, Belgrade, Serbia and Montenegro

We present far-infrared reflection spectra of PbTe single crystal doped with Sm in the temperature range between 10 and 300K and results of Hall measurements. The numerical analysis of the far-infrared reflection spectra was made using a fitting procedure based on the plasmon-LO phonon interaction model. The optical parameters were obtained, including local modes of Sm. The intensity of these modes depends on temperature and Sm concentration. The concentration and mobility of the majority free carriers, determined by Hall method, were compared with the results obtained by far-infrared reflectivity measurements.

P.S.B.11.

EXTRACTION OF THE PARAMETERS FROM I-V DATA FOR NONIDEAL PHOTODETECTORS: A COMPERATIVE STUDY

A. Vasić[1], P. Osmokrović[2], B. Lončar[3], S. Stanković[4]
[1]Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro, [2]Faculty of Electrical Engineering, Belgrade, [3]Faculty of Tecnology and Metallurgy, Belgrade, [4]The Vinča Institute of Nuclear Sciences, Belgrade

Parameters that characterize semiconductor devices are often determined with difficulty, and their values very frequently depend on the method used for measurements. Current-voltage method is widely used for such characterization and usually gives good results. However, the extraction of diode parameters from the obtained I-V data could be complicated by their dependence on the voltage and the presence of the series resistance. These difficulties arise from the nonideal behavior of the device, due to the imperfections of the junction, interface states, defects and impurities. Their combined action directly induce the variations of the current mechanism from the ideal case. Therefore, the interpretation of the experimetal I-V data must be very carefully performed. In this paper, some methods for obtaining diode parameters such as saturation current, ideality factor and series resistance are presented. An evaluation of these methods based on their application for the extraction of the relevant parameters of the photodiodes is also performed. Some of the methods that produce reliable and reproducible results are proposed, based on the experimentally obtained results, and in the view of the complexity of the used methods and their limitations.

P.S.B.12.

COMPARATIVE POTENCIODINAMIC STUDY OF Ni AND H UNDERPOTENTIAL DEPOSOTION AT Pt ELECTRODE IN NEUTRAL SOLUTION

M.D. Obradović[1], B.N. Grgur[2], Lj.M. Vračar[2],
[1]ICTM - Institute of Electrochemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

Underpotential deposition, *upd*, of nickel and hydrogen on polycrystalline platinum in phosphate buffer (pH = 7.0), with and without 5.0 10^{-4} mol dm^{-3} Ni^{2+}, was investigated using cyclic voltammetric technique. Potentials between the threshold of hydrogen evolution and initial stage of oxide / hydroxide formation are applied in the range of temperature from 274 to 313 K. The nickel and hydrogen ad-atom coverage were calculated from the voltammetric adsorption and desorption charges. Temkin isotherm is fitted for nickel and hydrogen *upd* and thermodynamic adsorption parameters were calculated for both atoms. Purpose of this work is to study the change of hydrogen thermodynamic adsorption parameters by nickel *upd* and to define the nature of interactions between hydrogen and nickel ad-atoms.

P.S.B.13.

CARBON NANOTUBES AS ASSISTED MATRIX FOR FULLERENES

V. Šipka, O. Nešković, M. Veljković and S. Veličković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Matrix-assisted laser desorption/ionization (MALDI) coupled with reflectron time-of-flight mass spectrometry has been applied to the analysis of fullerenes (C_{60} and C_{70}). This investigation includes the screening of three different compounds regarding their suitability as MALDI matrices. It was found that the performance of α-cyano-4-hydroxycinnamic acid (CHCA) , currently one of the most universally used matrices in the MALDI analyses , is exceeded by some of this materials. In the negative ion-mode, excellent performance has been achieved using the 2-[(2E)-3-(4-*tert*-butylphenyl)-2-methylprop-2-enylidene]malonitrile (DCTB). These matrixes should efficiently absorb at commonly used laser wavelength (typically for a 337-nm nitrogen laser) and form homogeneous microcrystalline solids with analyte molecules. The soft ionization technique affords little to no fragmentation of analyte. Carbon nanotubes, prepared by an arc discharge method, were investigated as the third matrix. It was observed that the carbon nanotube layer as matrix provides high detection sensitivity and mass resolution of fullerenes with eliminating matrix ion interference.

P.S.B.14.

DIELECTRIC, SPECTRAL AND RAMAN SCATTERING STUDIES OF Nd-DOPED $SrTiO_3$ SINGLE CRYSTAL

D.M. Popović[1], N. Romčević[2], S.Spasović[1], J.Dojčilović[1]
[1]Faculty of Physics, Belgrade, Serbia and Montenegro
[2]Institute of Physics, Belgrade, Serbia and Montenegro

Results of dielectric, spectral and Raman scattering studies of $SrTiO_3$:Nd are reported in the paper. Dielectric and Raman investigations were conducted at the temperature range from 25K to room temperature. Analysis of dielectric susceptibility T-dependence for test frequency 1MHz was conducted. Raman shift spectra content broad peak with drastic anomalies at T-dependence of intensity around 105 K, indicating the existence of PT. The band gap studies were conducted by analyzing UV-VIS spectroscopy. The transmission spectra at 300K show a linear fit for direct transition. The experimental results for $SrTiO_3$:Nd are compared with one for nominally pure crystal. The influence of doping by neodium on $SrTiO_3$ single crystal is discussed in detail.

P.S.B.15.

PREPARATION AND PROPERTIES OF $BaTi_{1-x}Sn_xO_3$ MULTILAYERED CERAMICS

S. Marković[1], M. Mitrić[2], N. Cvjetićanin[3], V. Pejović[4], D. Uskoković[1]
[1]Institute of Technical Science of SASA, Belgrade, Serbia and Montenegro
[2]The Vinča Institute of Nuclear Science, Belgrade, [3]Faculty of Physical Chemistry, Belgrade, [4]d.d. IRITEL, Belgrade, Serbia and Montenegro

In this paper, we report the results of preparation and properties of $BaTi_{1-x}Sn_xO_3$ (BTS; x=0, 0.025, 0.05, 0.075, 0.1, 0.125 and 0.15) multilayered ceramics obtained by tape casting method. The BTS powders were prepared using solid state reaction of the commercial powders $BaCO_3$, TiO_2 and SnO_2. After milling in ethanol, starting BTS powders were characterized by XRPD and DSC methods. The BTS multilayered ceramics were prepared by tape casting and were sintered at 1370^{o}C for 1 hour. After sintering, the thickness was 100-500 μm, depending on number of layers. Every species has rectangular shape and different combination of BTS powders. The microstructure of thick films was investigated by SEM and EDX methods. The BTS multilayered ceramics were electroded with Ag and dielectric properties were measured, too.

P.S.B.16.

HIGH TEMPERATURE DEFORMATION AS METHOD INCREASING OF MECHANICAL PROPERTIES AND WAY OF FABRICATION SILICON NITRIDE BASED PRODUCTS

Ya.A. Kryl, I.D. Gnylytsya
Ivano-Frankivsk National Technical University of Oil and Gas, Ivano-Frankivsk, Ukraine

The deformation at direct extrusion and obtained microstructure of Si_3N_4-Al_2O_3-Y_2O_3 systems was investigated. The shaping of the directed structure with elongated grains β-Si_3N_4 is shown. The mechanical properties of deformed material are presented. Possible applications of high temperature deformation method are shown.

One of the methods of the properties improvement for ceramic materials is high temperature deformation which, relative to structure, solves two problems: the first - an improvement of the structure of the material to account of the additional compaction, reduction amount and increasing to uniformities of pores, the second - a shaping the directed structure under influence tense condition during deformation. High probability of disappearance big pores at high temperature deformation allows to hope on significant increasing of the Weibull's modulus in got material and this in turn must bring about expansion of the using sphere of silicon nitride based materials both under low, and especially under high temperature.

High temperature deformation was realized by direct extrusion scheme with degree of press up to 80 % under specific pressure up to 50 MPa within the range of the temperature 1750-1850 ^{0}C for sintered materials of following composition: Si_3N_4-5mass.%Y_2O_3-2mass.%Al_2O_3 and Si_3N_4-5mass.%Y_2O_3-5mass.%Al_2O_3 with initial porosity 5-6 %. The hardness of sintered materials was at a range 15,0-15,5 GPa, the coefficient of fracture toughness $K_{1C}10$ was 5,5 - 6,0 MPa·m$^{1/2}$. The Weibull's modulus of source material was found within 14-16.

After extrusion is received anisotropic material, where big amount of elongated grains β-Si_3N_4 are oriented along direction of deformation (the coefficient of the texture T_{101}=1,34). Under room temperature material in planes perpendicular to direction of extrusion possesses the increased fracture toughness: $K_{1C}10$=11,5-12,0 MPa·m$^{1/2}$. In planes parallel to direction of extrusion importance of the fracture toughness coefficient is within the range 7,5-7,8 MPa·m$^{1/2}$. The hardness of the material in different planes approximately equal and forms order 16 Gpa. The Weibull's modulus of deformed material was found within 22-24.

By using such materials it is possible vastly raise the working parameters and reliability of thermo loaded parts of gas-turbine and diesel engines, pair of friction, cutting tools.

The second important aspect of high temperature deformation is a possibility of the shaping details of the complex form from silicon nitride based technical ceramics as alternative for shliker casting and technologies of the reception product from reaction bonded silicon nitride.

The reception of complex form products without the further mechanical processing or with minimum its level looks as enough important problem, considering expensivity and difficulty of last one and possible connivance of the material after its undertaking.

This method there is especially perspective for symmetrical and small thickness forms products from silicon nitride based ceramics: rings of bearing, matrix for extrusion, gas-turbine disks, valves, cutting tools, detachable disks, blades, surgical instruments.

P.S.B.17.

KINETIC PROPORTIES OF HYDRIDING PROCESS AT $LmNi_{3.55}Co_{0.75}Mn_{0.4}Al_{0.3}$ HYDROGEN STORAGE ALLOY

N. Potkonjak[1], D. Sužnjević[1], B. Simonović[1], S. Mentus[2]
[1]Institute of General and Physical Chemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

The crystal structure of metal hydride (MH) alloy, having composition $LmNi_{3.55}Co_{0.75}Mn_{0.4}Al_{0.3}$ (Lm: lanthanum rich misch metal 50% La, 30% Ce, 15% Pr and 5% Nd), used as a working electrode for the investigation of hydrogen electrode reaction (HER), was examined by X-ray diffraction (XRD). From XRD pattern, all observed diffraction lines were indexed to the hexagonal $CaCu_5$-type structure and lattice cell parameters were calculated. The HER on the MH alloy electrode was investigated in 1M KOH by means of potential sweep method. Different hydrogen content (C_H) within the MH alloy electrode was obtained using delay at the final cathodic potential (-1.1, -1.2 V vs. SCE). Maximum C_H was obtained by charging electrode for 2.5 h at 60 mA g^{-1}. Afterwards, anodic discharging at fixed polarization rate (1 mV s^{-1}) was recorded at different temperatures. From the slope of current-potential (I-E) curve for the negligible overvoltage, charge transfer resistance (R_{ct}) and exange current density (j_0) were calculated. From the anodic peak obtained from I-E curves, the peak current density (j_p) was determined. The electrochemical studies show that R_{ct}, j_0 and j_p increased linearly with an increasing C_H. However, all these parameters tend to reach its constant value at maximum C_H. From the temperature dependence of j_0 either at the low and maximum C_H, by means of an Arrhenius plot, the activation energy (E_a) for charge transfer step of HER was determined. The obtained E_a (≈30 kJ mol^{-1}) don't show a significant change with increasing C_H. These electrochemical properties give possible answers in the fundamental understanding of HER on hydride alloy electrodes. Further basic investigation in the author's laboratory on the chosen alloy electrode is in progress, aiming to be used as negative electrode in Ni-MH batteries.

P.S.B.18.

HYDROGEN ABSORPTION AND DESORPTION EFFECT ON THE COBALT POWDER ELECTRICAL RESISTIVITY

L. Rafailović[1], D. Minić[2], M. Spasojević[1], A. Maričić[3]
[1]Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[3]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro

Investigation has been made on the process of hydrogen absorption and desorption on polycrystal cobalt powder within the temperature interval from room temperature to 600 K. By the electrical resistivity measurement method in isothermal and non-isothermal conditions at temperatures T_1= 413 K, T_2= 443 K, T_3= 473 K, T_4= 553 K and T_5= 573 K, kinetic parameters of the hydrogen absorption and desorption process have been determined. The powder electrical resistivity increase caused by hydrogen absorption significantly depends on temperature and absorption duration. It has been established that maximal hydrogen saturation of the absorbent is reached in the temperature interval 400 to 440 K.

By the analysis of the experimentally obtained time dependence of electrical resistivity it was determined that both hydrogen absorption and desorption processes are performed in two stages. During the first absorption stage, which is a rapid kinetic process, the dependence of lnR on time τ is linear. The duration of this absorption stage is reduced with the absorbent temperature increase. Linear dependence of R on $(\tau)^{1/2}$ is determined in the second absorption stage, being a slow diffusion process.

From the change in the specific electrical resistivity of the absorbent at constant temperature, caused by hydrogen absorption, the ratio of the absorbent atom number to the absorbed hydrogen atoms number M/H at all isothermal hydration temperatures has been established.

P.S.B.19.

STRUCTURAL CHANGES OF THE $Ni_{20}Co_{80}$ AMORPHOUS POWDER WITHIN THE 20°C TO 700°C TEMPERATURE INTERVAL

R. Simeunović[1], M. Spasojević[2], L. Rafailović[2], M.M. Ristić[3]
[1]Technical Faculty, Čačak, University of Kragujevac, Serbia and Montenegro
[2]Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro
[3]Serbian Academy of Science and Arts, Belgrade

Structural changes of the amorphous $Ni_{20}Co_{80}$ alloy powder obtained by electrochemical deposition from ammonium solution of cobalt and nickel sulfates were investigated in this paper. The crystallization process, as determined by the DSC method, occurred in two steps, the first one being within the temperature interval from 400°C to 500°C and the second one within the 500°C to 630°C interval. The temperature dependence of electrical resistivity and magnetic susceptibility in isothermal and non-isothermal conditions within the temperature range of room temperature to 700°C was determined for the powder samples pressed under pressure of 100 MPa. The process of thermal stabilization of defects that occurred during the powder pressing was performed within the temperature interval from 150 to 300˚C.

The X-ray structural examinations results correlate with those of the DSC analysis and the electrical resistivity measuring.

P.S.B.20.

THERMAL COEFFICIENT OF LINEAR EXPANSION OF NON-CRYSTALLINE CHALCOGENIDES IN THE Cu-As-Se SYSTEM

V.B. Petrović[1], S.R. Lukić[1], F. Skuban[1], D.D. Petrović[2]
[1]Department of Physics, Faculty of Sciences, Novi Sad, Serbia and Montenegro
[2]Institute of Energy and Process Engineering, Novi Sad, Serbia and Montenegro

The paper describes the results of a study of glasses of the type $Cu_xAs_{50}Se_{50-x}$ for x=5, 10 and 15 at.% Cu, by the method of thermomechanical analysis. Values of the thermal coefficients of linear expansion in solid (α_g) and visco-plastic (α_ω) phase were determined. On the basis of the results obtained using the mentioned methods it was possible to determine the specific temperature of the beginning of the softening process of the glass (T_g), as well as the temperature of the beginning of the deformation (T_ω). It was shown that the linear coefficients decrease with the increase of Cu content. On the other hand, the increase of Cu content caused the increase of the temperatures. The analytical forms of dependence of four physical parameters α_g, α_ω, T_g, T_ω as a function of the Cu content were fitted.

P.S.B.21.

A COMPARISON BETWEEN PHASE-FIELD AND MOVING MESH MODEL FOR SOLVING SOLID-SOLID PHASE TRANSFORMATIONS IN BINARY ALUMINIUM ALLOYS

I. Kovačević, B. Šarler
Laboratory for Multiphase Processes, Nova Gorica Polytechnic, Nova Gorica, Slovenia

Two numerical models for solving solid-solid phase transformations in binary aluminium alloys are presented. The first one, a phase-field model originates from irreversible thermodynamics. The basic principles of the phase-field model are presented. Driving forces for phase transformations are calculated from the data obtained by the thermodynamic database JMatPro. The integrated concept of the phase-field model with solute diffusion is used. The phase-field model belongs to the one-domain approaches. A great advantage of the one-domain approaches is the use of fixed mesh schemes throughout computation. In the second one, a moving mesh model, thermodynamic equilibrium at the interface boundary is assumed therefore phase transformations are diffusion-controlled. The moving mesh method belongs to the two domain approaches where conservation equations are written separately for the domains occupied by the phases. The phase-change process is taken into account through interface boundary conditions, motion of the interface boundary and changing of the domains occupied by the phases. The Euler explicit time and the central finite difference scheme are used for the time and the spatial discretization of the governing equations. The models are applied for the one-dimensional simulation of the dissolution of the θ (Al_2Cu) phase in the FCC phase during the homogenization in Al-Cu binary alloy. A comparison between the numerical results obtained by the phase-field and the moving mesh model is analyzed. The concentration profiles of Cu and the positions of the interface boundary in time computed by the models are in good agreement.

P.S.B.22.

THE EFFECT OF COPPER CONTENTS ON THE MICROSTRUCTURE AND PROPERTIES OF THE ALUMINIUM-COPPER-MAGNESIUM ALLOYS

B. Zlatičanin[1], B. Radonjić[1], M. Filipović[2], A. Valčić[2], R. Aleksić[2], S. Nikolić[3]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[3]Institute for the Physics, Belgrade, Serbia and Montenegro

The effect of copper content on the microstructure and properties of aluminium-copper-magnesium alloys was examined. The effect of the copper content on the microstructure was monitored quantitatively. Using automatic image analysis we were able to measure the linear intercept grain size, the secondary dendrite arm spacing (DAS), the size of eutectic cells (Le), as well as the size distribution and volume fractions of the -solid solution and the eutectic. In alloys containing more copper the average values of the DAS and grain size were found to decrease. Using X-ray powder diffraction we established that the tetragonal intermetallic compound Al_2Cu and orthorhombic intermetallic compound Al_2CuMg are formed across the whole range of copper additions. Through this method it has been found out that for alloys: AlCu5Mg1, AlCu5Mg3, AlCu5Mg5, AlCu15Mg1, AlCu15Mg3 and AlCu15Mg5 a tetragonal Al_2Cu with parameters of a crystal lattice: a = 6,034 Å, c = 4,869 Å, V = 177, 3 $Å^3$ and orthorhombic intermetallic compound Al_2CuMg with the lattice parameters: a =3,993 Å, b =9,210 Å, c =7,129 Å and V = 262, 16 $Å^3$ are formed. Also, microstructure was investigated in the electron microprobe analyser JCXA-733. The current and the voltage during the analysis for the copper were $1x10^{-8}$ A and 20kV, respectively. Kα-radiation was used. The content of copper in the white phase is low. X-ray analysis showed the presence of magnesium in the eutectic gray phase, while copper is found in the bright phase.

P.S.B.23.

CRACK GROWTH RESISTANCE OF OVERAGED Al-Zn-Mg-Cu ALLOYS

M. Vratnica[1], Z. Cvijović[2], H.P. Degischer[3], G.C. Requena[3], G. Rumplmair[4], M. Rakin[2]
[1]Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[3]Institute of Materials Science and Testing, Vienna, Austria
[4]USTEM, Technical University of Vienna, Vienna, Austria

The crack growth resistance of the Al-Zn-Mg-Cu alloy forgings in overaged condition was investigated with three industrially produced alloys, which showed differences in the microstructures governed by compositional variations. Fatigue-crack propagation experiments were conducted at ambient temperature and variations in crack growth rates (*da/dN*) as a function of the applied stress intensity range (*ΔK*) were related to characteristics of microstructural features, including coarse intermetallic (IM) particles and precipitates. In this way the contribution of the individual microstructural parameters to the crack growth resistance were estimated for each alloy. It appears that the crack growth rate increases systematically with an increase of the impurity level, which in turn increases the amount and size of large Fe- and Si-containing IM particles while decreases their spacing. That a degradation in resistance to crack growth was attributed to acceleration of the crack initiation and propagation by the damaged IM particles was confirmed by *in-situ* tensile tests performed inside a scanning electron microscope (SEM) combined with one-to-one observations of fracture surfaces and a method for calculation of the surface strain field. It was found that the presence of isolated coarser particles reduces the local deformation of the matrix until the accompanied stress concentration leads to fracture of such particles.

P.S.B.24.

EXAMINATION OF STRUCTURAL CHANGES IN THE CONSTRUCTIVE PARTS MADE OF MORE ALUMINIUM ALLOYS BY APPLYING THE MODERN OPTICAL METHOD

R. Radovanović[1], A. Milosavljević[2], M. Srećković[3], A. Milovanović[1], M. Kutin[1]
[1]Institute Goša d.o.o, Belgrade, Serbia and Montenegro, [2]Faculty of Mechanical Engineering, Belgrade, [3]Faculty of Electrical Engineering, Belgrade

This paper considers using the optical method by examining the model of different constructive parts made of more component aluminium alloy AlYnMg-Cu l. By the experiment it is obtain holographic records, interpherograms in the zone without defect, in the zones with cracks of different lengths and for conditions of defined internal pressure.

Deciphering cipher of the hologram is made by the method of analysis absolute numerology of interpherensy lines. Getting the components of vector translation of points considered surface, enabled the calculation of strain state in the constructive part.

P.S.B.25.

THE INFLUENCE OF THE HEAT AND HEAT-MECHANICAL TREATMENTS REGIME ON MECHANICAL AND EXPLOITATION PROPERTIES OF ALLOY 8090

S. Drecun Nešić[1], Z. Burzić[2], A. Milosavljević[3], R. Prokić-Cvetković[3]
[1]Jugoinspekt Beograd, Belgrade, Serbia and Montenegro,
[2]Military Technical Institute, Belgrade,
[3]Faculty of Mechanical Engineering, Belgrade

Successful application of new alloy Al-Li depends on possibility of realization requested level of exploitation safety, which estimation is based on micro-mechanical aspect. Research is focused on development of new alloy, composition and heat and heat-mechanical treatments have vital importance for achievement of requested properties. Ageing regimes: natural, artificial, single-stage, two-stage and after applied deformation during heat-mechanical treatment have special influence on mechanical and structural properties of this alloy. For this reason in this work mechanical and structural properties of alloy Al-Li are examined in detail in two most interesting stages of heat treatment UA (under-aged stage of alloy) and PA (stage of alloy in maximized hardness- peak-aged).

Influence of heat and heat-mechanical treatments regime on dynamical properties is evaluated based on several aspects which in full describe state of alloy 8090 in presence of stress concentrator of type V-notch and crack flaw consisting: total impact energy of specimens with notch and calculating percentage of components, energy of making a crack, E_{inic}, and energy of increase of a crack, $E_{crack,}$ in a total energy of impact, influence of length of fatigue crack in Charpy specimen on total impact energy and crack susceptibility of alloy 8090, influence of variable load on state of specimen with a notch in correlation of Veler (S-N) curve, and acquisition a data about influence of variable load as a important attribute of a fatigue process, as well as determination of a critical dynamical factor of stress intensity, $K_{Id,}$ as an important parameter of analysis of a dynamical load influence.

P.S.B.26.

STRUCTURAL DEGRADATION OF COMBUSTION CHAMBER LINER DURING LONG EXPOSURE MADE OF Ni-BASE SUPERALLOY HASTELLOY X

E. Počuča[1], A. Milosavljević[2], M. Srećković, R. Prokić-Cvetković[3]
[1]Engine Maintenance Dept., Engineering&Maintenance Division, JAT Airways, Belgrade, Serbia and Montenegro, [2]Mechanical Faculty, Belgrade, Serbia and Montenegro, [3]Electrical Faculty, Belgrade, Serbia and Montenegro

Nickel-base superalloys among all other metallic materials possess the most complex structure which is formed through advanced melting and refining technology, strengthening face-centered cubic (fcc) nickel matrix by dozen alloying elements and post-heat treating. After solid-solution strengthening has been finished, saturated solution starts to form, and after adequate heat treatments, γ' copound as well as various secondary phases: carbides, nitrides, borides, carbonitrides, oxides and topologically close-packed TCP unwanted phases, start to precipitate. In this paper it has been presented thorough analysis of microstructure of one of the most famous Ni-base superalloy HASTELLOY X, from aspects of operating conditions. Inspite of the fact that this alloy does not posses great strength at elevated temperatures, HASTELLOY X are widely used for manufacturing combustion chamber liners, mostly due to its extraordinaire great hot temperature corrosion resistance, containig 22%Cr and 6%Mo as principal components for corrosion resistance. It has been proved that carbides precipitation during long time exposure to elevated temperatures has the greatest influence on strenthening mechanism.

P.S.B.27.

SCANNING ELECTRON MICROSCOPY OF SHAPE AND SIZE OF PARTICLES IN DIFFERENT AMALGAM ALLOYS

J. Gašić[1], G. Radićević[1], M. Miljković[2], M. Spasić[3]
[1]Faculty of Medicine, Niš, Clinic of Stomatology, Department of Dental Pathology, Serbia and Montenegro, [2]Faculty of Medicine, Niš, Institute of Biochemical Research, [3]Student of Stomatology

The research goal of the authors is to investigate the size and shape of particles in different amalgam alloys using scanning electron microscopy (SEM). Six types of capsulated amalgams made by different manufacturers: Dentam TM, Amalcap S.A.S., Extracap D, Cavex non-gamma 2, Cavex Avalloy and Cavex Octight, have been used. It has been found that Extracap D and Cavex Avalloy alloys are composed of lathe-cut particles only, where both of the alloys show a great difference in particle size. This difference is emphasized in the case of Cavex Avalloy alloy. The Dentam TM, Amalcap S. A. S. and Cavex non-gamma 2 are admixed alloys with lathe-cut and spherical particles. Regarding spherical-to-lathe-cut particles relation, the Dentam TM alloy contains the greatest number of spherical particles as compared to the remaining two alloys. The Cavex Octight alloy contains regular shaped spherical particles only.

P.S.B.28.

THERMOGRAVIMETRIC ANALYSIS OF SUPERABSORBING POLYACRILIC HYDROGEL

B. Janković[1], B. Adnadjević[1], J. Jovanović[2], D. Minić[1] and Lj. Kolar-Anić[1]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro
[2]Institute of Technical Science of SASA, Belgrade, Serbia and Montenegro

The thermogravimetric analyzes of the superapsorbing polyacrilic hydrogel dehidratation, performed under non-isothermal conditions at different heating rates is discussed. Particularly, the influence of heating rate on the obtained results is given in details. For this purpose the Weibull distribution function is applied. The evaluated termogravimetric curve at heating rate equal to zero is examined as the dehidratation curve under isothermal conditions. The results are compared by the corresponding ones calculated from the curves obtained under non-isothermal conditions.

P.S.B.29.

ELECTROCHEMICAL POLYMERIZATION OF ANILINIUM 5-SULPHOSALICYLATE

G. Ćirić-Marjanović[1], B. Marjanović[2]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[2]"Centrohem", Stara Pazova, Serbia and Montenegro

Anilinium 5-sulphosalicylate was synthesized and characterized by IR and UV-Vis spectroscopy. Then, it was polymerized electrochemically. The electropolymerization was carried out in two successive steps: first, holding the working platinum electrode under a constant anodic potential, and second, the voltammetric cycle. These steps were continously repeated. During this procedure poly (anilinium 5-sulphosalicylate) film was formed on the working electrode. This film shows pronounced electrochromic behaviour. Growth of the polymeric film was followed by progressive increase of the currents of two well-defined redox pairs with the formal potentials at 0.50 V and 0.84 V vs. SCE. The structure of poly (anilinium 5-sulphosalicylate) was investigated by IR spectroscopy.

P.S.B.30.

STRUCTURAL CHARACTERIZATION OF POLY (o -TOLIDINE)

G.Ćirić-Marjanović[1], B. Marjanović[2], M. Trchová[3] and P. Holler[3]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[2]"Centrohem", Stara Pazova, Serbia and Montenegro
[3]Institute of Macromolecular Chemistry, Prague, Czech Republic

o-Tolidine was polymerized chemically and electrochemically. Comparative study of the structure of poly (o-tolidine)s obtained by different preparative procedures was carried out, based on the results of IR spectroscopy and gel permeation chromatography (GPC) measurements. GPC of the polymeric products obtained by chemical polymerization of o-tolidine, with $(NH_4)_2S_2O_8$ as the oxidant, evidenced the chains of molar masses in the range of 1000-12600 g/mol. Coupling pathways during polymerization are revealed by IR spectroscopical analysis. Mechanism of o-tolidine polymerization is proposed.

P.S.B.31.

GEL PRODUCTION, OXIDATIVE DEGRADATION AND DIELECTRIC PROPERTIES OF GAMMA IRRADIATED UNIAXIALLY ORIENTED IPP

D. Miličević, S. Galović, Z. Kačarević-Popović, Z. Stojanović, E. Suljovrujić
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Owing to their many applications, oriented polyolefins, especially oriented polyethylene and polypropylene, are widely studied. The radiation processing of such polymeric materials is a major step in certain modern technologies. Two main effects, cross-linking and oxidation, result when a polyolefine is subjected to ionizing radiation in the presence of air. Cross-linking of the amorphous phase stops the viscous flow and changes the viscoelastic characteristics. This is one of the main reasons why oriented polyolefins are being irradiated. The aim of this work is to study the influence of radiation processing on orientated iPP. Oriented iPP films of varying draw ratio (1, 3, 7, 12 and 18) were gamma irradiated to various absorbed doses (100, 200, 300 400, 500, 600 and 700 KGy) of gamma radiation in a ^{60}Co radiation facility, in air at room temperature, at a dose rate of 9 KGy/h. Conclusions derived according to the dielectric relaxation analyses (DRA), infrared (IR) spectroscopy and gel measurements are compared. The results indicate that changes in the structure of pristine iPP due to orientation also significantly affect the radiation induced changes in oxidative degradation, in gel production and especially in dielectric properties.

P.S.B.32.

SYNTHESIS AND THERMAL PROPERTIES OF POLY(ESTER-ETHER-SILOXANE) ELASTOMERS

J. Petrović, M.V. Vučković[1], V.V. Antić[1], M.N. Govedarica[1], J. Djonlagić[2]
Polymer Department, [1]Centre of Chemistry, Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

In the present work, a series of thermoplastic poly(ester-ether-siloxane)s derived from dimethylterephthalate, 1,4-butandiol and dihydroxil-poly(ethyleneoxide-dimethylsiloxane-ethyleneoxide) ($\overline{M}_n$ = 3500 - 4500 g/mol), was synthesized in a two stage process, involving transestrification and polycondensation in the melt. The mass ratio of hard (poly(butyleneterephthalate)) and soft (poly(ethyleneoxide-dimethylsiloxane-ethyleneoxide))segments was varied from 60/40 to 40/60. Tetra-n-butyl-titanate was used as the catalyst, while N,N'-diphenyl-*p*-phenylenediamine was used as the thermal stabilizer. The sinthesized poly(ester-ether-siloxane)s were characterized by ^{1}H NMR and ^{13}C NMR spectroscopy and thermal properties were investigated by DSC analysis,…

P.S.B.33.

CHARACTERIZATION AND CATALYTIC ACTIVITY OF POLY(4-VINYLPYRIDINE-co-DIVINYLBENZENE)-Co^{2+} COMPLEX

D. Lončarević, Ž. Čupić
Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

The poly(4-vinylpyridine-co-divinylbenzene)-Co^{2+} was characterized using infrared spectroscopy (IR), thermogravimetric analysis (TGA), N_2-physisorption and polarography. The effect of pyridine ring-Co^{2+} interaction on the motion and dipole moments of the P4VP-DVB-Co^{2+} complexes was estimated through the FTIR spectra. The pyridine ring motion decreased with increasing Co^{2+} ions content, whereas the dipole moments of the in-plane and out-of-plane ring C-H bending increased. At the molecular level, FTIR of P4VP-DVB-Co^{2+} reveals that the pyridine nitrogen lone pair coordinates to the metal center in the polymeric complex. Thermal analysis suggests that the stability of the complex depends on Co^{2+} content. The obtained P4VP-DVB-Co^{2+} performed catalytic activity in reaction of the cyclohexane oxidation with air, indicating that complex activity lowers the initiation temperature and raise the decomposition of cyclohexylhydroperoxide intermedier.

P.S.B.34.

CURING CHARACTERISTICS AND DYNAMIC MECHANICAL BEHAVIOR OF REINFORCED ACRYLONITRILE-BUTADIENE / CHLOROSULPHONATED POLYETHYLENE RUBBER BLENDS

G. Marković[1], M. Marinović-Cincović[2], H. Valentova[3], M. Ilavsky[3], B. Radovanović[4], J. Budinski-Simendić[5]
[1]Tigar, Pirot, Serbia and Montenegro
[2]Institute of Nuclear Science Vinča, Belgrade, Serbia and Montenegro
[3]Sant Charles University, Macromolecular Physics Department, Prague,
[4]Faculty of Science, Niš, Serbia and Montenegro
[5]Faculty of Technology, Novi Sad, Serbia and Montenegro

Polymer blends offer versatile industrial applications through property enhancement and economic benefits. Among many the rubber-rubber blends, only few are miscible because of different physicochemical parameters, including the high-molecular-weight nature of the rubbers. The versatility in the adjustment of any property by a mere change in the blend ratio, the incorporation of fillers, and the processing conditions make this class of materials more cost-effective. Cross-linked materials based on chlorosuphonated polyethylene rubber (CSM) have good balance of properties like good resistance to oils, chemicals, ozone and weather, good thermal and color stability, good resistance to inherent flame, and well adherence to substrates. This unique balance of properties makes this kind of elastomeric material ideal for cars and rubber/metal product applications. On the other side elastomeres based on acrylonitrile-butadiene rubber (NBR) has excellent oil and ozone resistance and good flexibility at high temperatures. The aim of this work was to study the thermal properties and dynamic-mechanical behaviour of NBR/CSM rubber blend reinforced by active precipitated silica (mean particle size 15nm). The rheographs of pure and filled blends and its curing characteristics were obtained using a Monsanto rheometer. Cross-linking has been performed at 160^{o}C up to optimum cure time. The mechanical properties were measured on an Instron tensile test machine. The samples after heat aging were also investigated. Values for glass transition temperatures were determinated by DSC method. Temperature dependence of storage modulus (E') and loss tangent (tanδ) were determinated from -50°C to 150°C in the frequency range from 0.31 Hz to 31 Hz by Rheometrix System 4. From dynamic mechanical thermal analysis we concluded that the filler altered the height and half-width of the damping peak at the glass-transition temperatures.

P.S.B.35.

CALCIUM TITANATE

V. Petrović
The Advanced School of Electrical Engineering, Belgrade, Serbia and Montenegro

Ceramic materials have been in use in many different areas of human wellbeing for a very long time. Important domains in ceramic materials are those materials that are applied in electronics. Our research is focused on calcium-titanate ($CaTiO_3$). Most common way of obtaining this material is by using the process of sintering.

Starting powders of calcium carbonate $CaCO_3$ and titanium dioxide TiO_3 with a rutile crystal modification were measured to attain the molar ratio of $CaCO_3$:TiO_2 = 1:1. Mechanical activation of the starting mixture was performed by grinding in a high energy vibro mill in duration of 60 minutes. Depending on the grinding time, four mixtures were used in our work (a non-activated mixture and three differently activated mixtures: 15, 30 and 60 minutes). Calcination for 2 hours at 900°C after what samples were pressed and than sintered at temperatures of 1200°C and 1300°C for 180 minutes. X-ray diffraction is used for observing the evolution of calcium-titanate phase during research. Differential thermal analysis was performed with the purpose of determining characteristic temperatures on which solid-state processes occur.

Based on analysis of all given results it can be concluded that mechanical activation of a mixture of calcium carbonate and titanium-dioxide powders leads to reduction of the size of the material, deformation of the crystal structure of the dispersed material and generation of point and line defects. We noticed temperature drop and time reduction needed for $CaTiO_3$ sintering when duration of mechanical activation is longer.

P.S.B.36.

RED MUD AS A RAW MATERIAL BASE FOR THE BRICK PRODUCTION

M.M. Krgović[1], N.Z. Blagojević[1], M.A. Vukčević[1], R. Zejak[2]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro, [2]University of Montenegro, Faculty of Civil Engineering, Podgorica

This paper presents the red mud utilisation as a raw material component for the brick production. Red mud composition and the actual available quantity from the alumina production in Montenegro point out on the possible cheap raw material for the construction and ceramic utilisation. The raw material components are red mud (30 % wt) clay of ilit-kaolinit type quartzite and limestone in variable weight percentage. Raw material mixture was exposed to the standard procedure divided in three phases: 1. Homogenisation of raw material mixture each component was exposed to the chemical and X-ray difraction characterisation; 2. Shaping, drying, and sintering with variable drying atmosphere and sintering conditions (temperature and exposal time); 3. Characterisation of sintered product, porosity, shrinkage and compressive strength. Based on the results analysis the conclusion of potential red mud utilisation in ceramic industry can be reached.

P.S.B.37.

KINETICS OF INTERACTION BETWEEN FULLEROLE $C_{60}(OH)_{24}$ AND POLYACRYLIC HYDROGELS

L. Matija[1], J. Jovanović[1], B. Adnadjević[2], Dj. Koruga[3]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, [3]Faculty of Mechanical Engineering, Belgrade

Fullerole $C_{60}(OH)_{24}$ is water-soluble molecule, very convenient for medical and pharmaceutical applications. This compound already found application as a drug delivery system, because its diameter is about 1.2 nm, or it is ten times smaller than existing lyposomes. Bearing in mind its properties this compound is very promising member of biomaterial family.

In other hand, hydrogels based on cross-linked polyacrylic acid exhibits properties such as pH- and temperature-dependant swelling, outstanding mucoadhesive characteristics and the ability to protect proteins and peptides from proteolytic degradation, all of which are desirable for drug delivery.

We made an intermolecular complex of swollen polyacrilyc acid and fullerole, unknown in literature, which should remain basic properties of PAA and fullerole and gives some new result.

In this work kinetics of interaction between fullerole and polyacrylic hydrogels, on 298K, 308K and 318K temperatures ware investigated. Fullerole $C_{60}(OH)_{24}$ was in Millipore water (18MΩ) prepared. A quantity of absorbed fullerole is determined, based on variation of concentration in solution, using IR spectroscopy and UV-Vis spectrofotometry. Absorbing process of fullerole is controlled by diffusion. Both kinetics parameters and activation energy are defined. Activation energy is about 840 J/mol. A theoretic model that describing kinetics curves of absorbing process of fullerole is presented.

P.S.C.1.

AB INITIO CALCULATIONS OF THE ELECTRONIC STRUCTURE OF NANO-CRYSTALS

N. Kulagin, S. Protasenja
Kharkiv National University for Radioelectronics, Kharkiv, Ukraine

Relations of electronic structures and properties of nano- crystals and ceramics are considering on the bases of the ab initio method of calculation [1, 2]. Similar approach permits to consider and predict the main spectral, magnetic and electrical properties of the nano-crystals and clusters.

The following questions are discussed at the communication:

- foundations of the theoretical approach;
- mathematical procedure;
- calculations and results for electronic structure and properties of $Me^{+n}:[L]_k$ clusters and oxides, fluorides and chlorides nano-crystals.

Results of the theoretical calculation are compared to experiments: the best agreement

P.S.C.2.

INTERSUBLEVEL ABSORPTION IN STACKED N-TYPE DOPED SELF-ASSEMBLED QUANTUM DOTS

D. Veljković, M. Tadić, D. Raković
Faculty of Electrical Engineering, University of Belgrade, Serbia and Montenegro

The intersublevel absorption in the conduction band of vertically coupled InAs/GaAs self-assembled quantum dots is studied. The strain distributions are extracted from the continuum mechanical model, while the nonparabolicity is taken into account when computing the intersublevel absorption in the stacks of two and three quantum dots. The influence of the electron coupling on the transition matrix elements and the intersublevel absorption is explored. For this purpose, the spacer thickness is varied in the range from 0 to 20 nm. The selection rules for the intersublevel transitions are determined for both TE and TM light polarizations, and the sensitivity of the effective cross section for absorption on light polarization is analyzed. The interdot coupling is found to bring a few benefits to the intersublevel absorption in flat self-assembled quantum dots.

P.S.C.3.

INTERBAND AND INTRABAND TUNELLING PROPERTIES OF BROKEN-GAP TYPE-II DOUBLE BARRIER QUANTUM WELL STRUCTURES

D. Čerkez[1], M. Tadić[2]
[1]VF Holding, Zemun, Serbia and Montenegro
[2]Faculty of Electrical Engineering, University of Belgrade, Serbia and Montenegro

Continuum states of electrons and holes in broken-gap type-II double-barrier structures are studied. The 8-band **k**.**p** theory is employed, and the envelope functions are discretized by the first-order finite elements onto a nonuniform mesh. The method is adopted to analyze tunneling in InAs/GaSb structure, which is a perspective system to fabricate quantum-cascade lasers and spin filters. For the electron and hole energy calculation, both the full-symmetry multiband Hamiltonian and the axially symmetric Hamiltonian are employed, and the two are compared. The current-voltage characteristic is extracted from a dependence of the electron and hole transmission coefficients on energy. Strong influence of band mixing and the change of character of a single-particle state at the well-barrier interface is found.

P.S.C.4.

ELECTRONIC STRUCTURE OF SEMICONDUCTOR QUANTUM DOT CALCULATED BY THE FINITE ELEMENT METHOD

R. Gospavić[1], G. Todorović[1], V. Popov[2], M. Srećković[3]
[1]Faculty of Civil Engineering, Belgrade, Serbia and Montenegro
[2]Wessex Institute of Technology, Ashust Lodge, Southampton, UK
[3]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

In this paper, electronic structure of an spherically symmetric semiconductor quantum dot using Finite Element Method (FEM) has been calculated. Accuracy of the method in a case of analytical Kratzer potential with known eigenenergies has been tested. The method starts with construction of an action integral for conductor band electrons with proper boundaries conditions included. To find the last action the FEM has been used and eigenenergies and appropriate wave functions in both bound and continuum part of spectrum has been calculated. In calculation, spatial electron effective mass variation in the model has been included. By comparing our numerical results for Kratzer potential with those obtained using other numerical techniques we found FEM very accurate and appropriate for semiconductor band calculations.

P.S.C.5.

EXCITON DISPERZION LAW AND STATES OF BIMOLECULAR THIN FILMS

J.P. Šetrajčić[1], S.M. Vučenović[2], D.Lj. Mirjanić[2],
V.D. Sajfert[3], S.K. Jaćimovski[4]
[1]Department of Physics, Faculty of Sciences, University of Novi Sad, Serbia and Montenegro, [2]Faculty of Medicine, University of Banja Luka, Republic of Srpska – BiH, [3]Technical Faculty "M. Pupin" Zrenjanin, University of Novi Sad, Serbia and Montenegro, [4]High School "D. Obradović" of Novi Kneževac, Serbia and Montenegro

Dispersion laws and states of Frankel's excitons in ultra-thin molecular films are found using method of Green's functions. Space boundaries and disturbing of energetic parameters on boundaries are considered as perturbations. The cubic crystalline system with complex cell (i.e. bimolecular film) was analyzed in harmonic approximation, and then compared with results of simple cubic cell systems (i.e. monomolecular film). In both cases the energy spectra shows sharp discrete levels, although bimolecular films energy spectra compound of two zones with discrete levels. Probability of finding exciton in the mono- or bimolecular ultra-thin films shows a great contribution of perturbation and the fact which molecule (*a* or *b*) is actually "stronger" (in energy scale). Found conditions of existence of localized exciton states at boundaries are of special interest.

P.S.C.6.

PHOTOLUMINESCENCE CHARACTERISTICS OF EUROPIUM DOPED SILICA SOLS AND NANOPOWDERS

Ž. Andrić[1], V. Jokanović[2], M.D. Dramićanin[1]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro
[2]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

Preparation and room temperature photoluminescence (PL) of europium-doped silica sol are described. The fluorescence properties were investigated, in one hand, as a function of concentration of silica sol and, in the other, as a function of atomic % of doped Eu^{3+} ions, and compared with intrinsic silica sols. Both, intrinsic silica sols and europium-doped sols, were acid stabilized with pH=1. It was found that Eu^{3+} ions in europium-doped silica sol show intensive emission bands at 617 nm and 593 nm under excitation of 394 nm. Europium doped silica sol is then used for production of luminescent nanopowder and consequently its properties are investigated.

P.S.C.7.

THE PREPARATION AND CHARACTERIZATION OF POLYSTYRENE/HYDROXYAPATITE NANOCOMPOSITES

O. Veljković[1], L. Katsikas[1], M. Miljković[2], J. Jovanović[3], D. Uskoković[3], I. Popović[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Faculty of Medicine, University of Niš, Niš, Serbia and Montenegro
[3]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

Nano-sized filler added to a polymer can significantly change the properties of the material. Different amounts of nano-sized calcium hydroxyapatite (HAp) were added to radically-polymerized polystyrene (PS). Various procedures of filler deagglomeration were employed. The obtained composites were characterized by thermogravimetry (TG) and scanning electron microscopy (SEM). The values of the overall thermal degradation activation energy were determined from the TG data by the Flynn-Wall method and were utilized as a measure of the degree of polymer-filler interaction. The thermal stability of the PS/HAp composites increased with increasing amount of nanofiller. On the basis of the obtained results it was possible to establish the maximum filler load at which the material displayed nanocomposite properties.

P.S.C.8.

PHOTOCATALYTIC REDUCTION OF CADMIUM ON TiO_2 NANOPARTICLES MODIFIED WITH HISTIDINE

I.A. Ruvarac, Z.V. Šaponjić
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

The photocatalytic reduction of cadmium ions was investigated using TiO_2 nanoparticles (40 - 60 Å in diameter) surface-modified with histidine (His). The X-ray diffraction measurements indicated that illumination of suspensions consisting of His-modified TiO_2 nanoparticles in the presence of cadmium ions under an anoxic atmosphere lead to the formation of metallic cadmium. The surface structure of His-modified TiO_2 nanoparticles was investigated by IR spectroscopy and proposed based on the changes in the vibration spectrum of His after adsorption on TiO_2 and after addition of cadmium ions. The cyclic voltammetry measurements indicated that the position of the TiO_2 Fermi level upon surface modification with His must be shifted towards negative potentials at least 400 mV.

P.S.C.9.

MAGNETOTRANSPORT PROPERTIES OF IRON-BASED SOFT-MAGNETIC AMORPHOUS AND NANOCRYSTALLINE ALLOYS

N. Mitrović, S. Djukić, A. Ranković, R. Simeunović, A. Maričić, A. Kalezić-Glišović and B. Jordović
Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty, Čačak, Serbia and Montenegro

During the last decade, extensive studies on magnetotransport properties in soft-magnetic amorphous and nanocrystalline alloys have been conducted, aiming the optimization of the alloy microstructure for sensing application.

In this paper, comparison of magnetoimpedance and magnetoresistance in Fe-Cu-(Nb,V)-Si-B Finemet type and FeAlGaPCB alloys samples in ribbon or wire shape was made. Thermal treatments were performed by furnace annealing and dc Joule heating with successive increase of a maximum heating power. The influence of structural transformation and nanocrystallization process on magnetization process and hence on magnetotransport properties was discussed from the point of appropriate magnetic domain structure models.

P.S.C.10.

THE INFLUENCE OF THE LOW-TEMPERATURE STRUCTURAL RELAXATION ON THE MAGNETIC ALTERATION OF THE SYNTHETISED NANOCRYSTALLINE MAGNETITE POWDERS HEATED UNDER ISOTHERMAL CONDITIONS

Lj. Vulićević, S. Vardić, A. Maričić, Lj. Novaković
Technical Faculty, Čačak, Serbia and Montenegro

Preliminary experiments were shown that ultrafine magnetite (Fe_3O_4 powders can be electrochemically synthesized in a liquid medium (sodium chloride/deionized water solution) at various conditions of temperatures, pH, and current density e.t.c. As an optimal condition for the electrochemical synthesis the following conditions were chosen: The pair of electrodes of the low-carbon steel was submerged within the electrolytic solutions in the glass bottle, with about 3 cm distances between the electrodes. The electrolytic solution includes deionized water and sodium chloride. During the electrochemical synthesis of magnetite powders, values for the temperature of solutions (T) and current density (I) were kept at constant values, 360K and 1000mA/dm^2, respectively. The process was followed during time enough to produce sufficient amount of magnetite powders without significantly changing in pH of the starting electrolyte. As obtained green filter cake was washed with deionised water until the conductivity of the filtrate falls bellow 10μS/cm. On this way further aging of the staring powders was avoided. After drying at room temperature powders (each sample with mass 10^{-5} kg) of about was two-side uniaxially pressed in the form of the disks with diameter of 8mm at the pressure of 400MPa. Temperature dependence of magnetic susceptibility at isothermal conditions was measured by using modified Faradys methode, in air atmosphere. Experimental data obtained at isothermal processes at 413K, 433K, 453K and 483K were used to detreminate kinetic parameters of considered processes. The increasing of magnetic susceptibility caused by structural relaxation processes significantly depends from the temperatures of isothermal heating. In all cases dependence lnk (k- constant of heating rate) from the reciprocical values of the heating temperature (1/T) at izothermal heating conditions follows linear dependences. The increasing of of the magnetic susceptibility can be explained ba the change of the number of free quant states in the 3d orbitales at the iron atoms. Consequently, mentioned process follows to increasing of the number of noncoupled spins in the 3d traces in the considered samples of the magnetite powders. The increasing of the of the number of the electrons with noncoupled spins, connected with unavoidable change of the integral of interaction exchange during structural relaxastion, cause responsive variations of the magnetic properties of the electrochemically synthetised magnetite powders.

P.S.C.11.

THE INFLUENCE OF THE TEMPERATURE ON THE ELECTRICAL AND MAGNETIC PROPERTIES OF THE SYNTHESIZED NANOSTRUCTURED MAGNETITE POWDER

S. Vardić, Lj. Vulićević, A. Maričić
Technical Faculty, Čačak, Serbia and Montenegro

It is known that acicular goethite (α-FeOOH) can be served as an intermediate product during the process for the obtaining of the γ-Fe_2O_3 powders with submicron-size particles and with relatively high values for the coercitive force, H_c. Some modifications in this process allow to produce Fe_3O_4 phase (magnetite). Acicular goethite (goethite with particular, elongated particles) can be sythesized from aqueous solutions of varrious ferrous salts at different of concentrations of used salts, at pH from 4,5 to 12, various conditions of temperature and atmosphere (argon, oxigen, air, various vapours etc.). Subsequent (hydro)thermall treatment can significantly modify crystallochemical, electric and magnetic properties of the starting materials. The aim of this work is to search conditions for the obtaining of magnetite powders via electrochemical procedure. Mentioned experimental procedure is relatively simply and connected with and easynes in changing of experimental conditions of the synthesis of powders.

This way, by using preliminary experiments, optimal conditions of experimental procedure is choosen. As the pair of electrodes, the two plate of low-carbon stteel are used, each of them with the same area size ($1dm^2$) and thickness (about 2mm). Electrodes are submerged within the electrolytic solutions (about $1dm^3$) in the glass bottle, with about 3cm distance between the electrodes. The electrolytic solution includes deionized water and sodium chloride, where the ionic content of the solution was approximately 0.04 molar NaCl to facilitate conductivity between the electrodes. A d.c. power supply is also provided to apply a voltage to the electrodes for a period of time sufficient to produce the magnetite particles. The temperature of the sodium chloride solution was adjusted at 360K, and current density at $1000mA/dm^2$. The process was followed during time enough to produce sufficient amount of magnetite powders without significantly changing in pH of the starting electrolyte. As obtained green filter cake was washed with deionised water until the conductivity of the filtrate falls bellow 10.μS/cm. On this way further aging of the staring powders was avoided. After drying at room temperature powders (each sample with mass 10^{-5} kg) of about was two-side uniaxially pressed in the form of the disks with diameter of 8mm at the pressure of 400MPa. Temperature dependence of magnetic susceptibility at nonisothermal (heating rate of 20K/min in the temperature range from 300K to 900K) and isothermal conditions was measured by using modified Faradys methode, in air and atmosphere. Experimental data obtained at isothermal processes were used to detreminate kinetic parameters of considered processes.

P.S.C.12.

THE INFLUENCE OF ACID TREATMENT ON NANOSTRUCTURE AND TEXTURAL PROPERTIES OF BENTONITE CLAYS

Z. Vuković, A. Milutinović-Nikolić, J. Krstić, A. Abu-Rabi, T. Novaković, D. Jovanović
Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

Heterogeneous catalysis is one of oldest nanosciences. Clay minerals are nanostructured porous materials with confined interlamellar spaces which cover unlimited fields of investigations. Acid-activated bentonites can be used to catalyze a wide range of important industrial processes. This paper was focused on the investigation of nanostructure and porosity of acid-activated bentonite clays from coal mine "Bogovina". The acid activation was performed with HCl in concentration range 1.5-7.5 M. The atomic force microscopy followed by image analysis was used in order to establish the influence of acid treatment on size of bentonite particles. Nitrogen adsorption-desorption isotherms at -196 °C were used to estimate the specific surface area, and pore volume. The acid treatment reduces the size of bentonite particles and increases the specific surface area and pore volume of the investigated bentonites. With the increase of acid concentration these effects are improved up to 4.5 M HCl. Further increase of acid concentration doesn't result in new development of porous structure.

P.S.D.1.

SCALING OF NETWORK SEGMENT DIMENSIONS IN HYPERELASTIC COMPOSITES

M.B. Plavšić[1], I. Pajić-Lijaković[1], N.L. Lazić[2]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Institute of General and Physical Chemistry, Belgrade

The main parameter of the constrained chain model for rubber elasticity, of van der Hoff, Crossland and Bauer, is the ratio of contour length and end - to - end distance of the network segment in unstrained state. Its value can be extracted according to Crossland and van der Hoff from the minimum of Mooney - Rivlin curves for gum rubbers. Bauer suggested that the same parameter can be extended to filled rubber behavior, incorporating in that way the influence of active fillers upon polymer network flexibility.

We investigate in this paper experimentally and theoretically the relevance of that parameter in context of present equations of state for rubber elasticity, and possibilities of its practical use in correlation equations for design of hyper elastic composites. Starting from position that minimum of Mooney - Rivlin curve is transition from Gaussian to Langevin statistics of polymer chains, we extend our analyses and formulate the new characteristics parameters based on scaling of hyper elastic behavior of polymer networks and polymer composites with active fillers in the vicinity of that characteristic point.

P.S.D.2.

THE STRUCTURING OF NANOCOMPOSITES BASED ON POLYURETHANE NETWORK AND TITANIA

T. Dikić, V.V. Srdić, R. Djenadić, J. Budinski-Simendić
Faculty of Technology, Novi Sad, Serbia and Montenegro

The incorporation of nano-particles into cross linked macromolecules imparts many interesting and useful properties to the filled composite material. Scattering of light by materials containing inorganic particles of dimensions in the nanometer range embedded in a polymer matrix (nanocomposites) is markedly reduced compared to related composites comprising particles of larger size (>50–100 nm). This characteristic renders nanocomposites particularly attractive for optical applications. It is well known that the properties of nano-filled polymer networks are mainly dependant on the dispersion condition of filler particles and their relevant properties: particle size, surface area, aggregate structure, surface activity and on polymer-filler interphase interaction is paramount in determining the overall properties of the final composite materials. Different ways of increasing the dispersion of the inorganic particles in the resulting nanocomposite materials have been widely investigated. The main goals of this work was to synthesize the covalent polyurethane networks filled with nano-sized titania, and to increase the dispersion of titania powder (consisted of anatase and small portion of rutile phases and the average crystallite size of ~25 nm) using ultrasound mixing during polymer network preparation. Network has been obtained by reaction of tris(4-isocynatophenyl) thiophosphate with α,ω-dihydroxypoly(propylene oxide) of nominal molecular weight 425 in bulk. Composite materials with 5 % and 0,6 % of titania has been characterized by using X-ray diffraction (XRD) and infra red spectroscopy (IR). Scanning electron microscopy (SEM) was used in order to determine size of titania particles and their distribution in material. The fractured surfaces of cryogenic quenched samples were analyzed. It was estimated that the distribution of titania particles is relatively uniformed (average particle size is in the range of ~50 nm). However, presence of bubbles in the material with larger agglomerates inside of them was also observed.

P.S.D.3.

STRUCTURAL ANALYSIS OF BORON DOPED GLASSY CARBONS

A. Devečerski[1], N. Petranović[2]
[1]Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

Glassy carbons doped with various heteroatoms are of great interest in such applications like carbon/carbon composites or electrode materials. Boron doped specimens were obtained by introducing boron into the resol type phenol-formaldehyde resin prior to process of polymerization and carbonization. Boron is added either as metal powder or via boric acid, in order to obtain glassy carbons with 0.4, 1 and 4 wt% of boron. Structural analysis was carried out by a X-ray powder diffractometer. Special attention was given to polymerized specimens, as they were much less studied in the literature. Observed changes in diffraction patterns of doped specimens are discussed and posible explanations for such a behavior are given.

P.S.D.4.

LOW ENERGY IMPACT DAMAGE DETECTION IN LAMINAR TERMOPLASTIC COMPOSITE MATERIALS BY MEANS OF EMBEDDED OPTICAL FIBERS

A. Kojović[1], I. Živković[2], Lj. Brajović[3], D. Mitraković[1], R. Aleksić[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Institute of Security, Belgrade, Serbia and Montenegro
[3]Civil Engineering Faculty, Belgrade, Serbia and Montenegro

This article investigates the possibility of applying optical fibers as sensors for investigation of low energy impact damage in laminar thermoplastic composite materials, in real time. For that purpose intensity based optical fibers were built in specimens of composite materials. As reinforcement Kevlar 129 (DuPont's registered trade-mark for poly(p-phenylene terephthalamide)) woven fabric was used. Impact toughness testing by Charpy impact pendulum was conducted in order to investigation of low energy impacts. Transient intensity of optical signal during the impact, were compared with material crack initiation energy and crack propagation energy. Based on this, development of damage in material was detected. Obtained results show that intensity based optical fibers could be used as detectors for appearance of damage in material, as well as, level of its degradation caused by low energy impacts.

P.S.D.5.

NON-HOOKEAN ELASTIC BEHAVIOR OF UNIDIRECTIONAL EPOXY MATRIX COMPOSITES WITH CARBON FIBRES OF DIFFERENT BREAKING STRAIN

M.M. Stevanović, I.M. Djordjević, D.R. Sekulić
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

Unidirectional carbon /epoxy composites with two groups, differing in breaking strain, of PAN based carbon fibres have been studied. Non-hookean behavior was investigated by computing tangent tensile and compression moduli as function of strain, from axial stress-strain response obtained in standard tensile and compression, as well as, in modified flexural tests.Analytical expressions for tensile modulus-tensile strain and compression modulus-compression strain dependences, in performed tests, were deduced for composites with two tested groups of carbon fibres. The orientation of crystallites in carbon fibres of composites was assessed by X-Ray diffraction and it was correlated with established modulus-strain dependences.

P.S.D.6.

SOME PERFORMANCE OF EXPANDED SINGLE-MODE FIBER

S. Pantelić[1], M. Srećković[2]
[1]Institute of Security, Belgrade, Serbia and Montenegro
[2]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro

Optical materials**,** such as optical fibers, are increasingly popular nowadays, especially in the field of telecommunications and computer nets. Single-mode fiber (SMF) is a big support for the current and future optical networks, which increasingly necessitate optical parallel data transmission. Because of the unfavorably small diameter of SMF, and the low alignment tolerance on single-mode fiber junctions, we researched the principle and process of manufacturing of the expanded SMF. This technique consists of splicing fibers with various lengths and characteristics, and of various fiber optical materials and fiber types. The splicing procedure uses the electric arc (fusion splices). The coupling properties to expand the mode field diametar (MFD) of the SMF and their junctions were determined before and after the junctions. The losses of such expanded SMF were measured as well. Results of the measured coupling losses are presented as a function of the length of the expanded fiber.

P.S.D.7.

INFLUENCE OF COMPOSITION AND NUMBER OF LAYERS ON PHYSICAL-MECHANICAL PROPERTIES OF TEXTILE/PUR/PES (MEMBRANE) LAMINATE COMPOSITES

R.S. Popović[1], R. Karkalić[1], M.B. Plavšić[2] and R.G. Popović[3]
[1]Technical Experimental Centre, Belgrade, Serbia and Monternegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Monternegro
[3]Military Technical Institute, Belgrade, Serbia and Monternegro

In this paper we investigated and tested new textile/polymer composite materials of different compositions. The composition of these materials included textile (PA, PES, PAN), polymer (PUR) and specially PES membrane. Main characteristics of these materials are: air permeability, waterproof, high softening and melting points, good mechanical properties and others, which allowed composites to be attractive in different applications. The properties of this laminate composite have been tested for water absorption, water permeability, influence of climate conditions (temperature, relative humidity), mechanical properties (tensile strength, elongation at break, tearing), wear resistance etc. The results gained by these tests showed the differences between materials, depends of the composite compositions. Compared laminate composites with convenient leather and plastic materials gives some advantages to these new materials and indicate the markets, may be classified as follows: replacement of leather and plastic in products and new apllications, especially in the shoe and textile industry.

P.S.D.8.

COMPLEX PERFOMANCES OF THE CONTEMPORARY TEXTILE MATERIALS COVERED WITH ACTIVE CHARCOAL

R. Karkalić[1], R.S. Popović[1], B. Derbogosijan[1], M.B. Plavšić[2], R.G. Popović[3]
[1]Technical Experimental Centre, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade
[3]Military Technical Institute, Belgrade, Serbia and Monternegro

In this paper we investigated and tested new textile materials covered with active charcoal. As the need for nuclear, biological and chemical protection within the emergency services has been recognized, to endeavour first responders to perform effectively in the hazardous situations, many of overgarments can offer protection against all known bio-chem agents. This light, strong and completely waterproof material forms the basis for a range of inexpensive disposable garments.

The inner fabric is based on activated charcoal as a means of protection against toxic gases and vapours. Since this material alone is not sufficiently strong, it is bonded to a non-woven fabric, which is flame retardant. A fluorocarbon finish is applied as an oil repellent, thus acting as a further barrier to toxic liquids. This combination of repellents represents a chemical barrier which is highly efficient, yet air permeable and thus imposes low heat stress. This liquid control system formed by a wicking layer over an oil-repellent layer permits the incorporation of less charcoal than in other systems, which in turn results in a fighter garment and smaller package size.

The properties of these composite materials have been tested for influence of climate conditions, water permeability, water absorption, water resistance and mechanical properties. The final results showed that composite textile materials with active charcoal had better properties compared to composite textile materials with PUR foam.

P.S.D.9.

PROCESSIBILITY, MECHANICAL AND THERMAL CHARACTERISTICS OF MVQ/PP ELASTOMER/PLASTIC COMPOSITES

R.S. Popović[1], R. Karkalić[1], M.B. Plavšić[2], R.G. Popović[3], J. Budinski-Simendić[4]
[1]Technical Experimental Centre, Belgrade, Serbia and Monternegro
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia and Monternegro
[3]Military Technical Institute, Belgrade, Serbia and Monternegro
[4]Faculty of Technology, Novi Sad, Serbia and Monternegro

Mixing and processing characteristics, mechanical and thermal characteristics of MVQ/PP composites were investigated. Both initial and total torque of these materials are increases with increase in the PP concentration of the blend composite. The area under the torque-time curve represents the mechanical energy cosumed during blending. The energy required for blending decreases with increase in MVQ concentration. A lower value for final torque (viscosity) implies better processibility with lower energy consumption during mixing and further processing such as extrusion, calandering and moulding. Also, with the increased PP in blends, some properties such as, hardness, tensile strength and impact strength are increased in blend materials compared to silicone rubber vulcanizate. The heterogenity of MVQ/PP composites was determined by thermomechanical analysis. MVQ and PP show separate Tgs, which indicate that they are not compatible.

These characteristic properties (high softening point, high impact strength, easy and low cost processability) indicate that these composites might replace some vulcanized rubbers and some rigid plastics in applications, especially in the automative industry.

P.S.D.10.

THE CURING CHARACTERISTICS, MECHANICAL PROPERTIES AND SWELLING BEHAVIOR OF STYRENE BUTADIENE RUBBER/ CHLOROSULPHONATED POLYETHYLENE RUBBER BLENDS

G. Marković[1], B. Radovanović[2], M. Marinović-Cincović[3] and J. Budinski-Simendić[4]
[1]Tigar, Pirot, Serbia and Montenegro, [2]Faculty of Science, Niš, Serbia and Montenegro, [3]Institute of Nuclear Sciences VINČA, Belgrade, Serbia and Montenegro, [4]Faculty of Technology, Novi Sad, Serbia and Montenegro

Polymer blends have been reported since the development of polymeric materials. A blend can offer a set of properties that may give it the potential of entering application areas not possible with either of the polymer comprising the blend. In this work chlorosulphonated polyethylene rubber (CSM) used was Hypalon-40 obtained from the Du Pont, USA (chlorine content = 35%, sulphur content = 1-1,5% by weight as -SO_2Cl unit). The styrene butadiene rubber (SBR) used was HYPREN EM 1502 STP with a 25% styrene content (made by the emulsion process) supplied by Serbia and Montenegro. Sulphur, magnesium oxide, tetramethylthyuram disulfide (TMTD), N-cyklohecsil-2-benzothyazol sulfenamide (CBS) was used as a vulkanising agent and accelerator respectively throughout this study. The rheograph of the mixes and their cure characteristics were obtained using a Monsanto rheometer model R-100. The mechanical properties of compounds were measured on an Instron tensile test machine at a crosshead speed of 500mm min^{-1}. Network characterisation of the vulcanisates was carried out by the estimation of crosslink density and relative properties of crosslinks. The cure characteristics, mechanical properties and crosslink density of the vulcanisates improved upon adition of CSM. Based on these studies of SBR/CSM rubber blends new material can be development in rubber industry by the process of blending.

P.S.D.11.

PROPERTIES OF DISPERSION STRENGTHENED COPPER MADE BY INTERNAL OXIDATION OF PREALLOYED COPPER POWDER CONTAINING 2.5WT.%Al

V. Rajkovic[1], D. Božić[1], D. Vračarić[2], E. Romhanji[3]
[1]Institute for Nuclear Sciences "Vinča", Laboratory for Materials, Belgrade, Serbia and Montenegro, [2]Military Technical Institute, Belgrade, [3]Faculty of Technology and Metallurgy, Belgrade

Prealloyed copper powder containing 2,5wt.%Al was processed in planetary ball mill to evaluate matrix strengthening due to formation of Al_2O_3 particles *in situ* by internal oxidation. After milling the powder was heat treated in hydrogen in order to reduce copper oxide formed on particle surfaces during milling. The compacts were made by hot pressing. The examination shows that the compacts possess a good combination of high strength and high electrical conductivities. The copper matrix strengthening was estimated by means of microhardness measurements. After 5h milling the microhardness of compacts was 3,5 times higher than that of the as-received electrolytic copper compacted under the same condition. Much of the microhardness is retained after exposure to high temperature in inert atmospheres.

P.S.D.12.

MECHANICAL AND FRACTURE BEHAVIOUR OF A SiC-PARTICLE-REINFORCED ALUMINIUM ALLOY AT HIGH TEMPERATURE

D. Božić, B. Dimčić, V. Rajković, M. Vilotijević, Ž. Gnjidić
Institute of Nuclear Sciences "Vinča", Material Science Laboratory,
Belgrade, Serbia and Montenegro

The compressive characteristics and fracture behavior of CW67 alloy and of a composite based on CW67 aluminum alloy were studied under unaxial loading in the temperature range 25-400°C at a constant strain rate. The values of the yield strength were higher than those of the monolithic alloy at all temperatures. The ultimate strength values of the composite were lower at room temperature, but higher at high temperatures compared with the monolithic alloy. The composite exhibited lower ductility values in the temperature range 25-400°C. Although the presence of the SiC particles in the matrix of the CW67 alloy influence the compression characteristics of the composite, on high temperatures it behaves like typical precipitation hardened alloy, which shows that with the increase of the temperature, a crucial effect on the characteristics of this material induces it's matrix. It was found that with increasing temperature, the fracture process changes from particle cracking and particle agglomerate decohesion (at room temperature) to particle matrix debonding (at high temperature).

P.S.E.1.

SCALING OF ENZYME CONFORMATIONAL DYNAMICS AND DEGRADATION OF BIOMATERIALS

M.B. Plavšić[1], M.M. Plavšić[1], P. Putanov[2]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Serbian Academy of Sciences and Arts, Belgrade

Present smart polymer biomaterials able to adapt to body conditions and degrade in predictable manner, expose such properties basically due to cooperation with active biopolymers in organism, as the first with enzymes. In that since, the main challenges for basic progress of the field is incorporation of coupling modes. The biodegradation of organic, water insoluble polymers is a heterogeneous reaction. The size, shape, surface area and surface texture greatly affect the rate of degradation. Unfortunately, there has not been enough systematic study in this area to form any general conclusion. It is known that microorganisms produce exo-enzymes degrading polymers from terminal groups and endo-enzymes degrading polymers randomly along the chain. Some times there are not substantial differences in constitution between end and middle segments, indicating that some other factors must be of influence. In this contribution, we investigate conformational dynamics of enzymes as a possible factor of fundamental importance to resolve the problem. The conformational dynamical adaptability is here pronounced in terms of scaling of dynamical spectra for some enzymes and peptides in general. The analysis is extended to same theoretical considerations of conformational scaling factors and fracton movements as fundament for understanding enzyme catalyzes mechanisms in general.

P.S.E.2.

IMMOBILIZED FISH CELL TISSUE AS A BIOSENSOR

Lj. Mojović[1], B. Bugarski[1] and G. Jovanović[2]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Department of Chemical Engineering, Oregon State University, Corvallis, OR, U.S.A.

Chromatophores isolated from the Siamese fighting fish, *Betta splendens*, represent a class of living cells that provide a vivid color response to biologically active agences such as microbial pathogens and environmental toxins. This property is a very promising base for a real-time, optical biosensor for biomedical and pharmaceutical and/or environmental purposes. The selection of the most appropriate microcarier and the development of the optimal technique for the fish cell immobilization that would preserve the cell survival and its functionality were studied. Microcarriers derived from glass, polystyrene, and gelatin (collagen) were tested as substrates for chromatophore attachment. Gelatin microcarriers were found the most suitable, due to high attachment efficiency (95 % of attached cells), preservation of the cell viability, and enhanced cell sensitivity. The optimum conditions for fish cell immobilization on the collagen microcarriers were determined based on the cell-to-microcarrier bead ratio, and pH of the solution. The rate of cell attachment to gelatin microcarrier followed first-order kinetics. A pretreatment of the gelatin beads with fibronectin, known as cell attachment-promoting agent, resulted in 10% higher attachment rate constant (k).

P.S.E.3.

ALGINATE MICROBEADS AS POTENTIAL SUPPORT FOR CULTIVATION OF BONE MARROW STROMAL CELLS

D. Bugarski[1], B. Obradović[2], M. Petakov[1], G. Jovčić[1], N. Stojanović[1], B. Bugarski[2]
[1]Institute for Medical Research, Belgrade, Serbia and Montenegro,
[2]Chemical Engineering Department, Faculty of Technology and Metallurgy, Belgrade,

Alginate is currently being employed and explored for a broad range of biomedical and biotechnology applications, due to its biodegradability and simple procedure for cell immobilization. However, cell immobilization was mostly aimed for immunoisolatory and biochemical processing applications and far less is known about potentials of alginate as a substrate for tissue formation. In the present work, isolation, immobilization and cultivation procedures of murine bone marrow stromal cells (BMSC) were studied and standardized in order to establish the alginate-bioreactor culture system for chondrogenic and/or hematopoiesis-supportive tissue progression. Culture expanded BMSCs were encapsulated in alginate microbeads produced by electrostatic droplet generation and cultivated for up to 30 days. Microbead properties and cell viability and differentiation were analyzed.

P.S.E.4.

CHARACTERIZATION OF NOVEL BIOACTIVE COMPOUNDS OF 12-TUNGSTOPHOSPHORIC ACID WITH GLYCINE AND ALANINE

S. Uskoković-Marković[1], M.R. Todorović[2], U.B. Mioč[3], I. Holclajtner-Antunović[3]
[1]Faculty of Pharmacy, Belgrade, Serbia and Montenegro
[2]Faculty of Chemistry, Belgrade, Serbia and Montenegro
[3]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

In recent years, several classes of polyoxometalates (POMs) have been documented to exibit bioactive properties. As a part of our continual research of POMs of Keggin type, we synthesized novel compounds of 12-tungstophosphoric acid (WPA) with amino acids Glycine and Alanyne. A novel compunds were characterized by elemental microanalysis, IR and Raman spectroscopy and thermal analysis. According the elemental analysis four molecules of amino acids make a molecular complex with one Keggin anion, what is in agreement with T_d symmetry of Keggin anion. Based on the results of IR spectra where the strong hydrogen bonds were evident it could be supposed that these complexes are formed throught hydrogen bonding. We examined and proved the bioactivity of these compounds.

P.S.E.5.

SYNTHESIS AND CHARACTERIZATION OF AMMONIUM DECAVANADATE(V)

M.R. Todorović[1], U.B. Mioč[2], I. Holclajtner-Antunović[2] and D. Šegan[1]
[1]Faculty of Chemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro

It is known that various polyoxovanadates interact specifically with enzymes, which is the main way of their biochemical activity. Therefore we have synthesized ammonium decavanadate(V), $(NH_4)_6V_{10}O_{28}$. The novel compound was characterized by thermal analysis, IR and Raman spectroscopy. Its conductive properties have been studied too. The spectroscopic analysis has shown the presence of hydrogen bonds of different strengths.

In order to improve the biochemical activity of this compound and having in mind the presence of strong hydrogen bonds, we essayed the synthesis of different complexes of decavanadate with aminoacids.

P.S.E.6.

SYNTHESIS AND CHARACTERIZATION OF Co(III) COMPLEX WITH (*E*)-2-[N'-(1-PYRIDIN-2-YL-ETHYLIDENE)HYDRAZINO] ACETATE

K. Andjelković[1], A. Bacchi[2], G. Pelizzi[2], D. Jeremić[1], D. Mitić[3] and R. Marković[1]
[1]Faculty of Chemistry, Belgrade, Serbia and Montenegro
[2]Dipartimento di Chimica Generale ed Inorganica, Chimica Analitica, Chimica Fisica, University of Parma, Parma, Italy
[3]Faculty of Stomatology, Belgrade, Serbia and Montenegro

As it is well known hydrazones are biologically active compounds the activity which is often increased upon complexation with transition metals (especially with bioelements). In the present paper, the new complex of Co(III) with (*E*)-2-[N'-(1-pyridin-2-yl-ethylidene)hydrazino] acetate was synthesized. The template synthesis consisted in the reaction of cobalt(II)perchlorate hexa hydrate, ethyl hydrazinoacetate hydrochloride (etha) and 2-acetylpyridine (ap) (1:1:1) in the presence of several drops of 10% ammonia. After refluxing the reaction mixture for 20 min, into the cooled solution tetrabutylammonium tetrafluoroborate was added, after which monocrystals of the Co(III) complex separated in 61% yield. X-ray diffractometric analysis showed that the compound crystallizes in the acentric $P2_12_12_1$ orthorhombic space group, and the Co(III) ion is coordinated to a pair of monodeprotonated NNO tridentate ligands, in a chiral octahedral geometry. Deprotonation occurs on the carboxylic terminal, and the complex is monocationic, with a BF_4^- anion completing the stoichiometry. The chelation of both ligands generates one planar five-membered ring and one puckered six-membered ring, with approximate half-boat conformation (apex at CH_2). The crystal packing is based on –NH…O hydrogen bonds between the hydrazonic NH of one ligand and the carboxylic oxygen of the second ligand (N5…O2=2.941(7)Å, N-H…O=156(5)°), whilst the remaining NH donor makes a hydrogen bond to the tetrafluoborate anion (N3…F2=2.967(8)Å, N-H…F=149(5)°). A helical supramolecular motif generated by a two-fld screw axis along ***c*** results.

P.S.E.7.

THERMAL DEGRADATION OF Zn(II), Pt(II) AND Pd(II) COMPLEXES WITH (*E*)-2-OXO-2-[N'-(1-PYRIDIN-2-YL-ETHYLIDENE)HYDRAZINO] ACETAMIDE

T. Todorović[1], K. Andjelković[1], D. Sladić[1], N. Obradović[3], D. Minić[2]
[1]Faculty of Chemistry, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro
[3]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

Thermal stability of a new ligand (*E*)-2-oxo-2-[N'-(1-pyridin-2-yl-ethylidene)hydrazino] acetamide (Hapsox) and its complexes with Zn(II), Pd(II) and Pt(II) was investigated. The geometry of the $[Zn(apsox)_2]\cdot 3H_2O$ is octahedral, while [Pd(apsox)Cl] and [Pt(apsox)Cl] have square planar geometry, which influences their thermal stabilty. The most stable complex was the dehydrated form of Zn(II) complex, the decomposition of which starts above 320^0C. DSC and TG diagrams of $[Zn(apsox)_2]\cdot 3H_2O$ show several endothermal processes caused by crystal water loss (80^0-120^0C), followed by further decomposition of complex above 320^0C. In the TG diagram there is no water loss between 120^0C and 320^0C. The intermediate formed by dehydration undergoes exothermal structure stabilization at 200^0C. From the dependance of peak positions on heating rate, activation energies of these processes were determined: *E*a=26.8kJ/mol (for structural stabilization), *E*a=78.41kJ/mol (for degradation).

P.S.E.8.

CRYSTALLIZATION KINETICS OF LEUCITE PHASE IN ALUMINOSILICATE GLASS

M.B. Tošić[1], V.D. Živanović[1], N.S. Blagojević[2], J.D. Nikolić[1]
[1]Institute for Technology of Nuclear and other Mineral Raw Materials, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade

Leucite ($KalSi_2O_6$) is a framework pseudotetragonal aluminoslilcate. Its structure consists of cornerlinked $(Al,Si)O_4$ tetrahedral filled with K^+ cations. At room temperature the leucite has a tetragonal symmetry and at high temperatures the structure becomes cubic. Its presence enables good mechanical, chemical and other properties suitable for applications as biomaterials. Due to that, kinetics and mechanism of its crystallization are the subject of constant interest. The phase formation of leucite in ternary system SiO_2-Al_2O_3-K_2O is very complex. However, the majority of this glasses crystallize by surface mechanism.

In this paper the results of the kinetics crystallization study of leucite in glass from the system SiO_2-Al_2O_3-CaO-MgO-K_2O, which contained 2 mol% of F^- anions, are presented. Fluorides as nucleation agents support phase separation, which indirectly affects the creation of nuclei and the change of the glass crystallization mechanism. The investigation was performed at non-isothermal conditions in a Netzch STA 409 EP device. Establishment of the crystallization kinetic parameters was carried out on the glass granulation of <0.038 mm at the following heating rates: 2.5; 4; 5; 6; 8 and 10 ^oC/min. The shift of crystallization peak with different heating rates was used for data analysis. Calculation of kinetic parameters was performed by the Kissinger equation. Since the sample with the smallest granulation was used the surface crystallization was dominated and the condition of constant number of nuclei formed during the DTA experiment was ensured. The results of XRD analysis have shown that leucite as the main phase and diposide and phlogopite as the secondary phases were formed. SEM investigations have shown that leucite crystals appeared as two-dimensional dendrites. On the basis of these results, the value of the Avrami parameter is n=0.5 and the calculated value of the activation energy of leucite crystal growth is E_a=412 ± 18 kJ/mol. Such results are an indication of the diffusion controlled growth take place on the atomically smooth faceted crystal/glass interface.

P.S.E.9.

SYNTHESIS AND CHARACTERIZATION OF THE COMPOSITE MATERIAL BIPHASIC CALCIUM PHOSPHATE/POLY-(DL-LACTIDE-CO-GLYCOLIDE)

M. Radić[1], N. Ignjatović[1], Z.P. Nedić[2], M. Mitrić[3], M. Miljković[4], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro; [2]Faculty of Physical Chemistry, Belgrade; [3]The Vinča Institute of Nuclear Sciences, Laboratory for Theoretical and Condensed Matter Physics, Belgrade; [4]Faculty of Medicine, Laboratory for Electron Microscopy, Nis

Natural bone represents composite based on ceramic and polymer. The main component of the natural bony tissue is hydroxyapatite (HAp). In this paper we show the results of the investigation of synthesis of the composite biomaterial based on biphasic calcium phosphate and polymer poly-(DL-lactide-co-glycolide) by a new method. Besides, we investigated the influence of new synthesis method on structure and characteristics of the composite. Commercial granules 50/50 poly-(DL-lactide-co-glycolide) are dissolved in the solvent mixture consisting solution acetone and methanol, then polymer solution was added into aqueous PVA solution while continuously stirring at 1200 rpm by a stirrer. After 24h solution is centrifuged and decanted. Thus obtained powder of the PLGA is homogenised in the appropriate ratio with suspension of the biphasic calcium phosphate. The synthesis of biphasic calcium phosphate is performed with precipitancy technique from $Ca(NO_3)_2$ x $4H_2O$ and $(NH_4)_3$ PO_4 in the alkali environment. All samples are characterized by X-Ray, IR, DSC, SEM and TEM methods.

P.S.E.10.

THE STUDY OF 2-HYDROXYETHYL METHACRYLATE BASED HYDROGELS OBTAINED BY GAMMA IRRADIATION

S.Lj. Tomić[1], M. Mićić[2], J. Filipović[1], E. Suljovrujić[2]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Hydrogels are two- (or multi-) component systems consisting of three-dimensional polymer networks with adsorbed water. Depending on the properties of the (hydrophilicity) used polymer, as well as on the nature and density of the crosslinks, such structures can contain various amounts of water at equilibrium. Poly(2-hydroxyethyl methacrylate) (PHEMA) hydrogels are in use for a variety of pharmaceutical and biomedical applications. Structure of these hydrogels permits water contents similar to those in living tissues. Furthermore, they are inert to biological processes, show resistance to degradation, permeable to metabolites, not adsorbed by the body, withstands heat sterilization without damage, and can be prepared in a variety of shapes and forms. Hydrogels of importance in pharmaceutical applications include various copolymers of acrylic acid or methacrylic acid. In this study, four types of hydrogels based on 2-hydroxyethyl methacrylate and different types of poly(alkylene glycol) acrylates and methacrylates, with small percent of itaconic acid, have been prepared by solution copolymerization using gamma irradiation. The swelling behavior and network parameters of these hydrogels as a function of poly(alkylene glycol) acrylate type are reported for the first time in this study. All samples were also characterized by thermal analysis.

P.S.E.11.

RADIOPROTECTIVE EFFICIENCY OF FULLERENOL IN IRRADIATED MICE

S. Trajković[1], S. Dobrić[1], A. Djordjević[2], V. Dragojević-Simić[1]
[1]Center for Poisoning Control, Military Medical Academy, Belgrade, Serbia and Montenegro
[2]Faculty of Science, Department of Chemistry, Unuversity of Novi Sad, Novi Sad

In vitro studies have demonstrated that fullerenol, polyhydroxilated derivative of fullerene ($C_{60}(OH)_n$ n = 12-26), have high antioxidative potential. Since the radiation injury is mainly a consequence of the action of free radical species, the aim of this study was to examine radioprotective efficiency of fullerenol in whole body irradiated mice.

The experiment was performed on male, adult, white mice, whole body irradiated with doses of 6 Gy to 9 Gy (linear accelerator SL 75-20 Philips, X-ray energy of 8 MV). Fullerenol $C_{60}(OH)_{22}$ was given in doses of 10 mg/kg and 100 mg/kg i.p. The experimental groups were consisted of 25-30 animals each. The survival rate of irradiated animals and body mass gain were monitored during 30 days after irradiation. The mean lethal times (LT_{50}) of irradiated animals were calculated for each radiation dose used and mutually compared.

The results showed that fullerenol, only in a dose of 100 mg/kg i.p. produced radioprotective effect. This effect was especially expressed in mice irradiated with 7 Gy and 8 Gy of X-rays. It was seemed that this effect was more pronounced in mice irradiated by higher doses of X-rays.

P.S.E.12.

EFFECT OF FULLERENOL $C_{60}(OH)_{22}$ ON CYTOTOXICITY INDUCED BY ANTITUMOR DRUGS ON HUMAN BREAST CARCINOMA CELL LINES

V. Kojić[1], D. Jakimov[1], G. Bogdanović[1], A. Djordjević[2]
[1]Institute of Oncology Sremska Kamenica, Experimental Oncology Department, Sremska Kamenica, Serbia and Montenegro
[2]Department of Chemistry, Faculty of Science, University of Novi Sad, Novi Sad, Serbia and Montenegro

Aim of this paper was to investigate activity of water-soluble fullerene [C_{60}] derivative - fullerenol $C_{60}(OH)_{22}$ on two human breast cancer cell lines, and its modulating effect on adriamycin, cisplatin, taxol, and tiazofurin -induced cytotoxicity. Cell lines were treated with fullerenol at concentrations 0.9 - 3.9 μg/cm^3, alone and in combination with other drugs at their IC_{50} concentrations, during 2 hours. Growth inhibition was evaluated after 24, 48 and 96h by colorimetric SRB assay. We also perform the genotoxic examination of fullerenol on cell lines, conducting sister chromatid exchanges test and micronucleus assay, using concentrations of 1 - 5 μg/cm^3. The fullerenol alone, mildly inhibits growth of both cell lines (3 - 40%). Combination of fullerenol and drugs resulted in growth inhibitions, depending on fullerenol concentration, type of antitumor drug, and cell line. Protection against adriamycine and cisplatin was more pronounced then against taxol and tiazofurin. Fullerenol was not found to be genotoxic to investigated cell lines.

P.S.E.13.

BIOACTIVE GLASS COATINGS WITH HYDROXYAPATITE PARTICLES ON TITANIUM IMPLANTS

D. Stojanović[1], Ž. Mladičević, B. Jokić[2], Dj.Veljović[2], R.Petrović[2], Dj.Janaćković[2]
[1]Medical Center Vračar, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, Belgrade

Ti and Ti-based alloys are widely used in several fields of bone substitution due to their high corrosion resistance, good mechanical properties and bioinertion. It is well known that, when implanted, titanium alloys do not bond with the bone by a chemical or biological interaction, but simply by morphological connection to the bone.

In order to solve this problem, the metal implant could be coated with bioactive materials with good adhesion to metal and which could be bonded interfacially to the bone.

Several bioactive materials are able to induce a biological bonding with both soft and hard tissues. Among them, bioactive glasses and hydroxyapatite particles have been widely studied, because of their controlled surface reactivity and good bone bonding ability.

The aim of this work is to investigate the synthesis of glass coating that can improve bone-implant bonding on Ti6Al4V alloys by the spray technique and electroforetic deposition. In order to enhance bioactivity of the coating, hydroxyapatite particles were embedded on the coating. The influence of the synthesis condition on the formation of coating was investigated. As starting materials, the bioactive glass in the SiO_2-CaO-MgO-Na_2O-K_2O-P_2O_5 system, melted at 1500^oC for 4 hours was used. The glass is previously pulverized in the planetary mill for 1 hour. The coatings are synthetised by spraying the glass and apatite powders on titanium Ti6Al4V alloy substrate. The optimum firing temperatures in dental furnace for glass/HA coating ranged between 850 and 880 ^0C in vacuum (increasing with SiO_2 content). Coating is characterized by FTIR and SEM analyses.

It was found that the particle size, thick of coating, and thermal treating make an important role on the formation and adhesion of coating to titanium substrate. Incorporation of hydroxyapatite particles into the coating enhances bioactivity of synthetised implants materials.

P.S.E.14.

COMPARATIVE ANALYSIS OF HYDROTHERMALY SYNTHESIZED HYDROXYAPATITE AND MATERIALS FOR ENDODONTIC OBTURATION-A CYTOTOXICITY TESTING

D. Marković[1], V. Jokanović[2], V. Živojinović[1], O. Popović[3], V. Koković[4]
[1]Clinic of Preventive and Paediatric dentistry, Faculty of Stomatology, Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of SASA, Belgrade, [3]Institute for Immunology and Virusology-Torlak, Belgrade, [4]Clinic of Oral Surgery, Faculty of Stomatology, Belgrade

Basic biocompatibility evaluation of new materials for endodontic obturation is a prerequisit for their implementation in further experimental and clinical researches. The aim of this study was to assess cytotoxicity of hydrothermaly synthesized hydroxyapatite in comparison with commercially available blends for endodontic obturation of root canal. Biocompatibility is evaluated through comparison of induced biological reply. Materials used in this study, beside hydrothermaly synthesized hydroxyapatite, were Mineral Trioxide Aggregate (MTA, Tulsa, Dentsply), Roeco Seal Automix (RSA, Roeco, Germany), and Apexit (Vivadent, Leicht.). Research was conducted according to the ISO TR-7405 and ISO 10993 examination of general cytotoxicity. Evaluation of cytotoxicity was based on analysis of fibroblast cell culture confluence. Morphological characteristics of cells during the observation period were analyzed by Scanning Electron Microscopy and Atomic Force Microscopy. Among experimental materials hydroxyapatite exhibited the best biological acceptance according to all evaluation criteria.

P.S.E.15.

VASCULARISATION OF SYNTHETIC CALCIUMHIDROXYAPATITE: EXPERIMENTAL STUDY

V. Koković[1], V. Jokanović[2], V. Živojinović[3], D. Marković[3], A. Marković[1]
[1]Clinic for Oral Surgery, Faculty of Stomatology, Belgrade, Serbia and Montenegro
[2]Institute of Technical Sciences of SASA, Belgrade,
[3]Clinic for Children and Preventive Stomatology, Faculty of Stomatology, Belgrade

Attributes of synthetic calciumhyproxyapatite as a bone substitute materials are good density in the implanted region and slowly biology resorption. Proliferation of new vascular tissue is insufficient through the structure of hydroxyapatite. The aim of this study was to test hystological analyzes of defects in dogs low jaw bone treated with investigate material. The verification of given hypotheses was performed by the experimental work. The experiment treated the work at ten experimental dogs, the race German sheepdog female by the average age 2,5 years in the four phases. During pathohystological analyze the degree of vascularisation of implanted area was analyzed. Vascularisation of bone tissue was differenced in three degrees:

I – bone tissue rich by blood vessels;
II - middle vascularised bone tissue and
III – avascularised bone tissue

In statistic analyze of data it was used Fisher (p) and χ^2 tests.

In the investigated group with synthetic calciumhydroxyapatite, by the hystologycal analyze it was concluded that the periphery part of bone is by kept lamelar building with osteocytes in their lacunas, but in Havers canals the blood vessels were visible. In 88,88% cases in the middle part of bone were found the storages of necrosed bone tissue with separate particles of bone sticks by hardly visible periphery connective tissue. In all 100% samples, by hystological analyzes was discovered the absence of young blood vessels in prolifered connective tissue (3^{rd} degree of vascularisation), i.e. at the places were the synthetic calciumhydroxyapatite were implanted. In this group of the tested animals, 1^{st} and 2^{nd} degree of vascularisation was not noted. By the hystological analyzes, in our work has been noticed the presence of granulated synthetic calciumhydroxyapatite, by which the fact was confirmed that 6 months after the implantation, the test material was not resorbed. From the results found in literature so as according to the results of our work, there is conclusion that synthetic calciumhydroxyapatite can be material of choice in the pre-implant surgery. The further investigations are necessary in purpose of confirmation the hypothesis that the higher degree of vascularisation can be reached by making canalicular structure of synthetic calciumhydroxyapatite.

P.S.E.16.

SUBSTITUTION OF OSTEOPOROTIC ALVEOLAR BONE WITH SYNTHETIC BIOMATERIALS

Z. Ajduković[1], D. Mihailović[2], V. Savić[3], S. Najman[4], Lj. Djordjević[4], D. Petrović[5], N. Ignjatović[6], D. Uskoković[6]
[1]Faculty of Medicine, Clinic of Dentistry, Department of Prosthodontics, Niš,
[2]Faculty of Medicine, Institute of Pathology, Niš,
[3]Faculty of Medicine, Institute of Biochemical Research, Niš,
[4]Faculty of Medicine, Institute of Biology, Niš,
[5]Faculty of Medicine, Clinic of Dentistry, Department of Maxillofacial Surgery, Niš,
[6]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro

Osteoporotic loss of bone tissue has an important place in dentistry. This bone loss makes adequate dental care impossible. Many synthetic materials based on HAp/PLGA (hydroxyapatite/polylactide-co-glycolide) composites have been applied to solve the problems which are caused by deficit of bone tissue in cases of advanced resorption of alveolar bone in systemic osteoporosis. The best results in regeneration, reparation and recovery of weak osteoporotic alveolar bone, have been achieved after implantation of HAp/PLGA composites mixed with autologue plasma. In these cases, osteogenesis is the closest to osteogenesis of a healthy bone in control group. HAp/PLGA biocomposite used in this study resulted in larger number of osteoblasts which are capable for faster reparatory processes in weak osteoporotic bone. Synthetic HAp/PLGA composite belongs to the group of biomaterials which facilitate forming of a new bone and rehabilitation of weak osteoporotic alveolar bone. Because of its osteoconductive effects, it is supposed to be the material of choice for replacement of bone tissue in the future.

P.S.E.17.

SEM ANALYSIS OF CHANGES OF DIFFERENT HAp/PLLA BIOCOMPOSITES AFTER INTRAPERITONEAL IMPLANTATION

Lj. Djordjević[1], S. Najman[2], M. Miljković[2], V. Savić[2], N. Ignjatović[3], M.B. Plavšić[4], D. Uskoković[3]

[1]Faculty of Science, Niš, Serbia and Montenegro;
[2]Institute for Biomedical Research, Medical Faculty, Niš, Serbia and Montenegro;
[3]Institute of Technical Science of SASA, Belgrade, Serbia and Montenegro;
[4]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

Implantation of biomaterial is nowadays one of important trends in solving the problem of bone tissue loss. Calcium hydroxiapatite (HAp), as the most representative bone element, has become a serious candidate for such implantations. Synthetic polymer poly-L-lactide (PLLA) in HAp/PLLA is often used as polymeric material, with the role in substitution of bone tissue collagen fibers. Fibers of PLLA may strengthen HAp and its good bioresorbility provides space for tissue remodelation. Differences in porosity, microstructure, compressive consistency as well as bioresorbility of HAp/PLLA may be achieved by using PLLA with different molecular weight. We used HAp/PLLA composites with PLLA of different molecular weight (50 000, 160 000, and 430 000), as well as combination of PLLA and hydrolyzed collagen implanted in mouse peritoneum. Microstructural changes of biomaterials (HAp/PLLA) surface, were analyzed 8, 20, 40 and 120 days after their implantation in mouse peritoneum. The results show significant difference of tissue reactions (ratio of degradation, intensity of cell proliferation, and collagenogenesis) on array of biocomposites, depending on their molecular weight. The scarce proliferation of cells was noticed on implants HAp/PLLA 50 000 and HAp/PLLA 160 000, versus the most intense at HAp/PLLA 430 000. In vicinity of HAp/PLLA/hydrolyzed collagen, intense colagenogenesis, and angiogenesis (with ectopic hematopoesis), were observed. The differences in biological reactions on examined materials may have significance in different practical applications of biocomposites.

P.S.E.18.

APPLICABILITY OF HAp/PLLA COMPOSITE MATERIAL IN FEMUR REPAIR

V. Savić[1], M. Mitković[2], S. Najman[1], M. Vukelić[1], Lj. Djordjević[3], Z. Ajduković[1], N. Ignjatović[4], M.B. Plavšić[5], D. Uskoković[4].
[1]Medical Faculty, Niš, Serbia and Montenegro, [2]Orthopaedic and Traumatology Clinic, Niš, [3]Faculty of Science, Niš, [4]Institute of Technical Science of SASA, Belgrade, [5]Faculty of Technology and Metallurgy, Belgrade

Experimental and clinical researches show that the grains and the powder of calcium hydroxiapatite can be succesfully aplied for reconstruction of bone deffects. Biocomposite material based on HAp/PLLa and poly-L-lactide has good characteristics both of them. The aim of our experiment was to evaluate usefullness of this biocomposite for reparation of bone deffects. Arteficial deffects which were made on rats femurs were filled with biomaterial HAp/PLLA. Two months after implantation, tissue samples were taken from place of deffect and microscopic analyze was done after HE staining. Intensive resorption, biocomposite fagocitosis and osteogenesis fields were clearly seen, expecially at the contact place beetween biocomposite and bone. Some places on biocomposite surface were covered by osteoblasts. Osteogenic potential and osteoconductivity, with previously examined characteristics like biofunctionality and biocompatibility, shows us that HAp/PLLA is material which can help reparation of bone deffects.

P.S.E.19.

INTERACTION OF HAp/PLLA BIOCOMPOSITES WITH BONE MATRIX AFTER ECTOPIC IMPLANTATION

P. Vasiljević[1], S. Najman[2], Lj. Djordjević[1], V. Savić[2], N. Ignjatović[3], M.B. Plavšić[4], D. Uskoković[3]
[1]Faculty of Science and Mathematics, Niš, Serbia and Montenegro, [2]Institute for Biomedical Research, Medical Faculty, Niš, [3]Institute of Technical Sciences of SASA Belgrade, [4]Faculty of Technology and Metallurgy, Belgrade

Biocomposite materials based on hydroxiapatite can be successfully applied in orthopedic and maxillofacial surgery. The aim of our experiment was to evaluate interaction between bone matrix and biocomposite material HAp/PLLA. Bone matrix and HAp/PLLA were crashed and mixed together. This mixture was intraperitoneal and subcutaneous implanted. In our experiment two types of biocomposite, different in molecular weight of PLLA (430 000 and 50 000) were used. Six and eight weeks after implantation, microscopic analyze was done. Intensive phagocytosis of HAp/PLLA particles was clearly seen in both biocomposites, but phagocytosis of bone matrix was weaker. Implant particles were surrounded by large number of multinuclear cells and fibrous capsule. Collagenogenesis and angiogenesis in implants were seen. Obtained results show that forming of extracellular matrix was followed by degradation of biocomposites, what is sign of good biocompatibility of examined materials.

Author Index

Sebastijan, Z.	vtsar@eunet.yu	71
Šegan, D.	segand@chem.bg.ac.yu	113
Sekulić, D.R.	pesican@vin.bg.ac.yu	47,105
Šetrajčić, J.P.	bora@im.ns.ac.yu	97
Šidjanin, L.		30,50
Simeunović, R.	lenka@tfc.kg.ac.yu	83,99
Simičić, M.		59
Simonović, B.		81
Sinclair, R.	bobsinc@stanford.edu	1
Šipka, V.	vesipka@rt270.vin.bg.ac.yu	72,78
Škipina, B.		20
Skuban, F.		83
Sladić, D.		115
Smičiklas, I.D.	ivanat@vin.bg.ac.yu	61
Spasić, M.		88
Spasojević, M.	stanasko@tfc.kg.ac.yu	63,82,83
Spasović, S.		79
Srdić, V.V.	srdicvv@uns.ns.ac.yu	104
Srećković, M.		60,86,88,96,106
Srećković, T.V.	tatjanas@afrodita.rcub.bg.ac.yu	65,66
Stančić, N.		59
Stanišić, G.		34
Stanković, S.		77
Steinhausen, R.		15
Stevanović, M.M.	stem@sezampro.yu; stem@vin.bg.ac.yu	47,105
Stoica, M.		25
Stojanović, B.D.	biljana@ibiss.bg.ac.yu	64,67
Stojanović, D.		120
Stojanović, M.	milosh25yu@yahoo.com	12
Stojanović, N.		112
Stojanović, Z.	zoranse@vin.bg.ac.yu	75,90
Stojković, A.	sandrast@phy.bg.ac.yu	58
Šućurović, A.		62
Suljovrujić, E.	sedin@ptt.yu; esuljovrujic@chem.ucsb.edu	28,53,90,118
Suvorov, D.	danilo.suvorov@ijs.si	6
Sužnjević, D.		81
Tadić, M.	tadic@kiklop.etf.bg.ac.yu	95,96
Tang, C.Y.		47
Thiébaud, F.		46
Todorović, G.	todor@grf.bg.ac.yu	39,60,96

Todorović, M.R.		113
Todorović, T.		115
Todosijević, Z.		54
Tomić, B.		61
Tomić, P.		27
Tomić, S.Lj.	simonida@elab.tmf.bg.ac.yu	118
Topalović, T.		45
Topić, Ž.		71
Tošić, M.B.	m.tosic@itnms.ac.yu	116
Trajković, S.	sale9yu@yahoo.com	118
Trampert, A.		37
Trchová, M.		90
Tripković, A.V.	amalija@elab.tmf.bg.ac.yu	14,24,35
Tripković, D.	amalija@tmf.bg.ac.yu	14
Trišović, T.	trisa@elab.tmf.bg.ac.yu	35
Trtica, M.		60
Tsui, C.P.		47
Udovičić, A.	anaudovicic@vin.bg.ac.yu	62
Uskoković, D.	uskok@itn.sanu.ac.yu	13,52,53,79,98,117,123, 124,125
Uskoković, P.S.	puskok@yubc.net	46,47
Uskoković, V.	vuk.uskokovic@ijs.si	33
Uskoković-Marković, S.	snezaum@pharmacy.bg.ac.yu	113
Valant, M.		6
Valčić, A.		85
Valentova, H.		92
Vardić, S.	ljvulic@tfc.kg.ac.yu	100,101
Vasić, A.	avasic@mas.bg.ac.yu	77
Vasiljević, P.	perica@pmf.ni.ac.yu	125
Veličković, S.	vsuzana@rt270.vin.bg.ac.yu	72,78
Veljković, D.		95
Veljković, M.		72,78
Veljković, O.	oliska13@yahoo.com	98
Veljović, Dj.		120
Viana, B.	viana@ext.jussieu.fr	16
Vidović, I.		59
Vilotijević, M.		29,110
Vittori Antisari, M.		10,11
Vlajić, M.D.	vlajicm@postqueensu.ca	17,21
Vlajić, M.M.		17

CIP – Каталогизација у публикацији
Народна библиотека Србије, Београд

66.017/.018(048)

YUGOSLAV Materials Research Society
Conference YUCOMAT (6 ; 2004 ; Herceg Novi)

Programme and the Book of Abstracts /
The Sixth Yugoslav Materials Research
Society Conference YUCOMAT 2004, Herceg Novi,
September, 13–17, 2004 ; organized by
Yugoslav Materials Research Society and
Institute of Technical Sciences of the SASA
; [editor Dragan P. Uskoković]. – Belgrade
; Institute of Technical Sciences of SASA,
2004 (Belgrade : Čigoja štampa). – XL, 139
str. : tabele ; 24 cm

Tiraž 250. – Registar.

ISBN 86–80321–07–9

a) Наука о материјалима – Библиографије,
реферативне b) Технички материјали –
Библиографије, реферативне
COBISS.SR-ID 115662860

ISBN 86-80321-07-9