THE SEVENTH YUGOSLAV MATERIALS RESEARCH SOCIETY CONFERENCE

YUCOMAT 2005

Programme
and
The Book of Abstracts

HERCEG NOVI,
September 12-16, 2005

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

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Yu-MRS

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INTRODUCTION:

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 and 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.

The First Conference on materials science and engineering, including physics, physical chemistry, condensed matter chemistry, and technology in general, was held in September 1995, in Herceg Novi. An initiative to establish Yugoslav Materials Research Society was born at the conference. Similar to other MR societies in the world, the programme was made and objectives determined. Until 2003 Conferences were held every second year and then they grew into Annual Conference that will be traditionally held in Herceg Novi in September of every year.

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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 12-16, 2005, 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 12, at 09.00 and end on Friday, September 16, 2005 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 11, from 16.00 to 19.00 and on Monday, September 12, from 07.30 to 09.00.

At registration, the participants are requested to submit proof of 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 Materials Science 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 2005 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 11, 2005

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

Monday, September 12, 2005

07^{30}-09^{00}	Registration
09^{00}	**OPENING CEREMONY** - Introduction and Welcome
10^{00}-13^{00}	**First Plenary Session**
13^{00}	**Photo Session**
15^{00}-19^{00}	**Symposium A**
19^{00}-20^{00}	**Coctail Party**
21^{00}	**Galla Dinner**

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 13, 2005

09^{00}-13^{00}	**Second Plenary Session**
15^{00}-19^{00}	**Symposium B**
20^{30}-22^{00}	**Poster Session I** (Symposium A)

Wednesday, September 14, 2005

09^{00}-13^{00}	**Third Plenary Session**
14^{00}-19^{00}	**Excursion**
20^{30}-22^{00}	**Poster Session II** (Symposium B)

Thursday, September 15, 2005

09^{00}-13^{00}	**Forth Plenary Session**
15^{00}-19^{00}	**Symposium C**
20^{30}-22^{00}	**Poster Session III** (Symposiums C, D and E)

Friday, September 16, 2006

09^{00}-10^{30}	**Symposium D**
11^{00}-12^{00}	**Symposium E**
12^{00}-12^{30}	**Awards and Closing**

CLOSE OF CONFERENCE

FIRST PLENARY SESSION

Monday, September 12, 2005

Session I: 10^{00}-13^{00}
Chairmen: V.R. Radmilović, R. Sinclair, S.K. Milonjić

10^{00}-10^{30} **DYNAMIC OBSERVATIONS OF THE GROWTH OF NANOSTRUCTURES**
F.M. Ross
IBM T. J. Watson Research Center, Yorktown Heights, NY, USA

10^{30}-11^{00} **FIB AND IN SITU TEM STUDIES OF ANISOTROPIC PROPERTIES OF A HIGH-K DIELECTRIC OXIDE**
R. Sinclair, K.H. Min
Department of Materials Science and Engineering, Stanford University, Stanford, California, USA

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

11^{30}-12^{00} **ATOMIC-LAYER ENGINEERING OF HIGH-TEMPERATURE SUPERCONDUCTORS AND OTHER STRONGLY CORRELATED OXIDES**
I. Božović
Brookhaven National Laboratory, Upton NY, USA

12^{00}-12^{30} **SURFACE MANIPULATION AND ASSEMBLIES OF QUANTUM DOTS FOR CHEMO- AND BIOSENSING**
R.M. Leblanc
University of Miami, Department of Chemistry, Coral Gables, FL, USA

12^{30}-13^{00} **ON THE MACROSCOPIC (DONNAN) ELECTRIC FIELD IN THE SEDIMENTATION-DIFFUSION EQUILIBRIUM OF CHARGED COLLOIDS**
A.P. Philipse
Van 't Hoff Laboratory for Physical and Colloid Chemistry, Utrecht University, Debye Institute, Utrecht, The Netherlands

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

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

Session I: 15^{00}-19^{00}
Chairmen: A. Montone, S. Bošković

15^{00}-15^{15} **ADVANCED WAYS AND EXPERIMENTAL METHODS IN SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS (SHS) OF INORGANIC MATERIALS**
M.V. Kuznetsov
Institute of Structural Macrokinetics and Materials Science Russian Academy of Sciences (ISMAN), p/o Chernogolovka, Moscow region, Russia

15^{15}-15^{30} **SHS OF BIOMATERIALS BASED ON Ti–Co AND Ti–Ni INTERMETALLIDES**
O.K. Kamynina[1], I.P. Gotman[2], S.G. Vadchenko[1], A.E. Sytschev[1]
[1]Institute of Structural Macrokinetics and Materials Science, Russian Academy of Sciences, Chernogolovka, Moscow, Russia, [2]Faculty of Materials Engineering, Technion–IIT, Haifa, Israel

15^{30}-15^{45} **CERIA NANOPOWDERS SYNTHESIS BY SELF PROPAGATING REACTION**
S. Bošković[1], D. Djurović[1], Z. Dohčević-Mitrović[2], Z.V. Popović[2], M. Zinkevich[3], F. Aldinger[3]
[1]Institute of Nuclear Sciences Vinča, Belgrade, [2]Institute of Physics, Zemun, Serbia and Montenegro, [3]Max-Planck Institute fuer Metallforschung, Stuttgart, Germany

15^{45}-16^{00} **ELECTRODEPOSITION AND MORPHOLOGY OF Co POWDER**
B.M. Jović[1], V. Maksimović[2], M.G. Pavlović[3], V.D. Jović[1]
[1]Center for Multidisciplinary Studies University of Belgrade, Belgrade, [2]Institute of Nuclear Science, "Vinča", Belgrade, [3]ICTM, Institute of Electrochemistry, Belgrade, Serbia and Montenegro

16^{00}-16^{15} **ELECTRICAL CHARACTERIZATION OF THE GRAIN BOUNDARY REGION OF SnO_2 VARISTORS**
M. Žunić[1], Z. Branković[2], G. Branković[1], D. Poleti[2]
[1]Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, University of Belgarde, Belgrade

16^{15}-16^{30} **IMPROVED MATERIALS FOR ENVIRONMENTAL APPLICATION: SURFACTANT-MODIFIED ZEOLITES**
V. Jovanović[1], V.T. Dondur[1], Lj. Damjanović[1], J. Zakrzewska[2], M. Tomašević-Čanović[3]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro, [2]Institute for General and Physical Chemistry, Belgrade, [3]Institute for the Technology of Nuclear and Other Mineral Raw Materials, Belgrade

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

17^{00}-17^{15} **COMPUTER SIMULATION OF PORE COALESCENCE AND SOLID SKELETON FORMATION DURING LIQUID PHASE SINTERING**
Z.S. Nikolić
University of Nish, Faculty of Electronic Engineering, Department of Microelectronics, Nish, Serbia and Montenegro

17^{15}-17^{30} **INFLUENCE OF SOLVENT POLARITY ON THE STRUCTURAL AND MORPHOLOGICAL PROPERTIES OF AgI PARTICLES PREPARED USING ULTRASONIC SPRAY PYROLYSIS**
I.Lj.Validžić[1], V. Jokanović[1], J.M. Nedeljković[2]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro, [2]Vinča Institute of Nuclear Sciences, Belgrade

17^{30}-17^{45} **LUMINESCENCE OF YAG:Ce $^{3+}$ POWDERS OBTAINED *VIA* SPRAY PYROLYSIS**
L. Mančić[1], M.E. Rabanal[2], B. Yang[3,4], P. Townsend[3], Z. Marinković[5], O. Milošević[1]
[1]Institute of Technical sciences of Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro, [2]University Carlos III, Madrid, Spain, [3]Scitec, University of Sussex, Brighton, UK, [4]Physics Department, Beijing Normal University, Beijing, China, [5]Center for Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia-Montenegro

17^{45}-18^{00} **ELECTRONIC STRUCTURE OF NEW TERNARY INTERMETALLIC COMPOUNDS: THEORY AND EXPERIMENT**
I.D. Shcherba[1,3], V.M. Antonov[2], L.O. Dobrianska[3], B. Kotur[3], P. Salamacha[3], Yu. Stadnyk[3]
[1]Institute of Techniques, University of Pedagogy, Krakow, Poland, [2]Institute of Metals NAN Ukraine, Kyiv, Ukraine, [3]Lviv National University by Ivan Franko, Lviv, Ukraine

18^{00}-18^{15} **MAGNETOEXCITONS IN TYPE-I AND TYPE-II SELF-ASSEMBLED**

QUANTUM DOTS AND QUANTUM-DOT MOLECULES
D. Veljković[1], M. Tadić[1], F.M. Peeters[2]
[1]*Faculty of Electrical Engineering, University of Belgrade, Serbia and Montenegro*
[2]*Department of Physics, University of Antwerp, Belgium*

18^{15}-18^{30} **FORMATION OF ZrO_2/Al_2O_3 SOLID SOLUTIONS IN NANOCRYSTALLINE POWDERS**
V.V. Srdić[1], M. Winterer[2]
[1]*Dept. Materials Engineering, Faculty of Technology, University of Novi Sad, Serbia and Montenegro,* [2]*Nanoparticle Process Technology, Faculty of Engineering, University Dusiburg-Essen, Germany*

18^{30}-18^{45} **SYNTHESIS, STRUCTURAL AND LUMINESCENT PROPERTIES OF Gd_2O_3-SiO_2:Eu^{3+} NANOPOWDER COMPOSITES**
M.D. Dramićanin[1], V. Jokanović[2], Ž. Andrić[1], B. Viana[3], P. Aschehoug[3], E. Antić-Fidančev[3]
[1]*Laboratory for Radiation Physics and Chemistry, Institute for Nuclear Sciences - Vinča, Belgrade, Serbia & Montenegro,* [2]*Institute of Technical Sciences of Serbian Academy of Science and Arts, Belgrade,* [3]*Laboratoire de Chimie Appliquée de l'État Solide CNRS UMR 7574, ENSCP, Paris cedex 05, France*

18^{45}-19^{00} **MICROWAVE DIELECTRIC RELAXATION OF MONTMORILLONITE DOPED WITH 12-TUNGSTOPHOSPHORIC ACID**
S. Sredić[1], T. Čajkovski[2], M. Davidović[2,3], A. Djordjević[3], D. Čajkovski[2], V. Likar-Smiljanić[3], R. Biljić[3], U.B. Mioč[4]
[1]*Institute of Mining, Prijedor, Republic of Srpska (Bosnia and Herzegovina),* [2]*The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro,* [3]*School of Electrical Engineering, University of Belgrade, Belgrade,* [4]*Faculty of Physical Chemistry, University of Belgrade, Belgrade*

SECOND PLENARY SESSION

Tuesday, September 13, 2005

Session II: 09^{00}-13^{00}
Chairmen: D. Raković, S. Macura, Z.Lj. Petrović

09^{00}-09^{30} **CORE-SHELL STRUCTURE FORMATION BY SOLID STATE REACTION**
V.R. Radmilović
National Center for Electron Microscopy, LBNL, University of California, Berkeley, CA, USA

09^{30}-10^{00} **PARTICLE SPLITTING IN Ni ALLOYS**
H.A. Calderon
Depto Ciencia de Materiales, ESFM-IPN, Mexico

10^{00}-10^{30} **PLASMA PROCESSING AND DIAGNOSTICS FOR BIO-SURFACE ENGINEERING**
P.D. Maguire
Nanotechnology Research Institute & N. Ireland Bio-Engineering Centre, University of Ulster, Jordanstown, North Ireland

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

11^{00}-11^{30} **COULOMB BLOCKADE AND TUNNELLING MAGNETORESISTANCE IN INSULATING NANOSTRUCTURED MAGNETIC MATERIALS**
X. Batlle[1], A. Labarta[1], Z. Konstantinović[1], M. García del Muro[1], B.J. Hattink[1], M. Varela[2]
[1]*Departament Física Fonamental, U. Barcelona, Barcelona, Catalonia, Spain*
[2]*Departament Física Aplicada i Òptica, U. Barcelona, Barcelona, Catalonia*

11^{30}-12^{00} **ADVANCED MAGNETIC MATERIALS: THE MATERIALS SCIENCE OF FERROMAGNETIC L1o INTERMETALLICS**
W.A. Soffa
Department of Materials Science, University of Virginia, Charlottesville, VA, USA

12^{00}-12^{30} **INFLUENCE OF EXTERNAL FACTORS ON AMORPHOUS AND NANOCRYSTALLINE SOFT MAGNETIC ALLOYS STUDIED BY MÖSSBAUER SPECTROMETRY**
J. Degmová, J. Sitek
Department of Nuclear Physics and Technology, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology, Bratislava, Slovakia

12^{30}-13^{00} **MAGNETIC BEHAVIOUR OF RARE-EARTH-TRANSITION METAL COMPOUNDS**

E. Burzo
Faculty of Physics, Babes-Bolyai University, Cluj-Napoca, Romania

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

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATION

Session I: 15^{00}-19^{00}
Chairmen: F. Hong, Dj. Koruga

15^{00}-15^{15} **PHONON SPECTRA OF THE ALKALI METAL SULFIDES**
Ž.P. Čančarević, J.C. Schön, M. Jansen
Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany

15^{15}-15^{30} **CHANGE OF ELECTRONIC STRUCTURE AND PROPERTIES OF NON-STOICHIOMETRICAL SOLIDS**
N. Kulagin
Kharkiv National University for Radioelectronics, av. Shakespeare, 6-48, Kharkiv 61045, Ukraine

15^{30}-15^{45} **A STUDY OF WATER INFLUENCE CO ADSORPTION AND OXIDATION ON NANOCRYSTALS OF γ-Fe_2O_3 AND $Mn_xZn_{1-x}Fe_2O_4$**
V.T. Dondur[1], N. Radić[1], B. Grbić[1], M. Drofenik[2]
[1]Belgrade University, Faculty of Physical Chemistry and IHTM, Belgrade, Serbia and Montenegro, [2]Jožef Stefan Institute, Ljubljana, Slovenija

15^{45}-16^{00} **OPTICAL PROPERTIES OF PTCDA BULK CRYSTALS AND ULTRATHIN FILMS**
I.D. Vragović[1], R. Scholz[2], J.P. Šetrajčić[3]
[1]Departamento de Fisica Aplicada, Universidad de Alicante, Alicante, Spain, [2]Institut für Physik, Technische Universität, Chemnitz, Germany, [3]Department of Physics, Faculty of Sciences, University of Novi Sad, Vojvodina, Serbia and Montenegro

16^{00}-16^{15} **PHOTOINDUCED EFFECTS IN CONJUGATED POLYMER/FULLERENE BASED ORGANIC FIELD-EFFECT TRANSISTORS (photOFETs)**
N. Marjanović, Th.B. Singh, S. Günes, H. Neugebauer, N. Serdar Sariciftci
Linz Institute for Organic Solar Cells (LIOS), Physical Chemistry,
Johannes Kepler University Linz, Linz, Austria

16^{15}-16^{30} **ELECTROCHEMICAL OXIDATION OF HYDROGEN AND CARBON MONOXIDE ON WELL CHARACTERIZED IRIDIUM AND IRIDIUM–TIN SURFACE ALLOY**

B.N. Grgur[1], N.M. Marković[2], Ph.N. Ross Jr.[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Lawrence Berkeley National Laboratory, Berkeley, CA, USA

16^{30}-16^{45} **NANOSCALE TOPOGRAPHY OF GC/Pt-C AND GC/Pt-Ru-C ELECTRODES STUDIED BY MEANS OF STM, AFM AND XRD METHODS**

A. Kowal[1], P. Olszewski[1], D. Tripković[2]
[1]Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Kraków, Poland, [2]ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro

16^{45}-17^{00} **PHASE TRANSFORMATIONS IN THE ZrO_2-Y_2O_3-La_2O_3 SYSTEM AT 1250 °C**

E.R. Andrievskaya, V.P. Red'ko
Frantsevich Institute for Problems of Materials Science NAS of Ukraine, Kiev, Ukraine

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

17^{30}-17^{45} **ELECTROXIDATION OF HYDROGEN ON NANO-STRUCTURED C/Pt CATALYSTS FOR POLYMER ELECTROLYTE FUEL CELL**

B. Babić[1], V.R. Radmilović[2], N. Krstajić[3]
[1]Vinča Institute of Nuclear Sciences, Belgrade, [2]Materials Sciences Division-LBL, Berkeley, USA, [3]Faculty of Technology and Metallurgy, University of Belgrade, Serbia and Montenegro

17^{45}-18^{00} **SEM AND XRD CHARACTERIZATION OF Ni-Hf ALLOYS AT LOW Hf CONCENTRATION**

A. Umićević[1], H.-E. Mahnke[2], B. Cekić[1], M. Mitrić[1], J. Grbović[1], V. Koteski[1], J. Belošević-Čavor[1]
[1]Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro, [2]Hahn-Meitner-Institut, Bereich Strukturforschung, Berlin, Germany

18^{00}-18^{15} **STRUCTURAL AND MECHANICAL PROPERTIES OF Ti_3Al INTERMETALLICS**

B. Dimčić, D. Božić, O. Dimčić, M.T. Jovanović
Institute of Nuclear Science "Vinča", Belgrade, Serbia and Montenegro

18^{15}-18^{30} **INTERPRETING XPS C_{1S} BINDING ENERGIES IN SILICON CONTAINING POLYMERS AND NANOPARTICLES**

E.A. Hoffmann[1], Lj.S. Korugić-Karasz[2]
[1]Department of Physical Chemistry, University of Szeged, Szeged, Hungary
[2]Department of Polymer Science and Engineering, University of Massachusetts, Amherst, USA

18^{30}-18^{45} **NON-REGULAR CN$_x$ CLUSTER ARRAYS GROWN BY PACVD METHOD ON H11 STEEL**
M. Zlatanović[1], N. Popović[2], S. Zlatanović[3]
[1]Faculty of Electrical Engineering, Belgrade, Serbia & Montenegro, [2]Nuclear Science Institute Vinča, Belgrade, [3]University of California San Diego, USA

18^{45}-19^{00} **MECHANISM OF CONSOLIDATION OF NANOSIZED PARTICLES IN THE SYSTEM DIAMOND -BORON OXIDE AT HIGH PRESSURES AND HIGH TEMPERATURES**
A. Bykov, G. Oleynik, A. Ragulya, I. Timofeeva, L. Klochkov, A. Kovalev
I.M.Frantsevych Institute for Problems in Material Science of NAS of Ukraine Kyiv, Ukraine

THIRD PLENARY SESSION

Wednesday, September 14, 2005

Session III: 09^{00}-13^{00}
Chairman: M. Drofenik, E. Antić-Fidančev, M. Zlatanović

09^{00}-09^{30} **THE DYNAMICS OF THIN ION EXCHANGE FILMS BY ATTENUATED TOTAL REFLECTANCE SPECTROSCOPY AND SPECTROSCOPIC ELLIPSOMETRY**
C.J. Seliskar, A. Piruska, N. Pantelić
Chemistry Department, University of Cincinnati, Cincinnati, OH, USA

09^{30}-10^{00} **SPECTROSCOPIC ELLIPSOMETRY AS A TOOL FOR ON-LINE MONITORING AND CONTROL FOR SURFACE TREATMENT PROCESSES**
H. Stoeri
Vienna University of Technology, Vienna, Austria

10^{00}-10^{30} **BROADBAND DIELECTRIC SPECTROSCOPY OF INORGANIC SOLIDS**
J.C. Badot
Laboratoire de Chimie Appliquée de l'Etat Solide, UMR CNRS 7574, ENSCP, Paris Cedex 05, France

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

11^{00}-11^{30} **DENSE NANOSTRUCTURED CERAMICS BY POWDER TECHNOLOGY**
F. Aldinger, K. Wetzel, G. Rixecker
Max-Planck Institut für Metallforschung und Institut für Nichtmetallische Anorganische Materialien der Universität Stuttgart, Stuttgart, Germany

11^{30}-12^{00} **DESIGNING OF ELECTRODE PROPERTIES IN Li-ION BATTERIES**
S. Pejovnik
Faculty of Chemistry and Chemical Technology, University of Ljubljana, Ljubljana, Slovenia

12^{00}-12^{30} **FILMS AS CHARACTERISTIC CONSOLIDATED NANOMATERIALS**
R.A. Andrievski
Institute of Problems of Chemical Physics, Russian Academy of Sciences, Chernogolovka, Moscow Region, Russia

12^{30}-13^{00} **THE NANOSCIENCE OF FULLERENES**
E.F. Sheka
Russian Peoples Frindship University, Moscow, Russia

FOURTH PLENARY SESSION

Thursday, September 15, 2005

Session IV: 09^{00}-13^{00}
Chairmen: M.B. Plavšić, I. Božović, V.T. Dondur

09^{00}-09^{30} **ORGANIC OPTOELECTRONIC DEVICES: PRESENT STATE AND FUTURE PROSPECTS**
N. Serdar Sariciftci
Linz Institute for Organic Solar Cells (LIOS), Physical Chemistry, Johannes Kepler University Linz, Linz, Austria

09^{30}-10^{00} **THERMAL, DYNAMIC MECHANICAL AND DIELECTRIC BEHAVIOR OF LIQUID-CRYSTALLINE LINEAR AND CROSSLINKED POLYURETHANES WITH MESOGENIC GROUP IN SIDE CHAINS**
M. Ilavský [1,2], H. Valentová[1], Z. Sedlákova[2], J. Nedbal[1], V. Velicko[1]
[1]*Faculty of Mathematics and Physics, Charles University, Prague 8, Czech Republic*
[2]*Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic*

10^{00}-10^{30} **FATTY ACID – BASED POLYOLS AND POLYURETHANES**
Z.S. Petrović[1], M. Lukić[2], W. Zhang[1], W. Shirley[2]
[1]*Kansas Polymer Research Center and* [2]*Chemistry Department, Pittsburg State University, Pittsburg, Kansas, USA*

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

11^{00}-11^{30} **REVERSE-ENGINEERING NATURE IN NANOTECHNOLOGY**
F.T. Hong
Dept. of Physiology Wayne State University, Detroit, Michigan, USA

11^{30}-12^{00} **ON NMR (NUCLEAR MAGNETIC RESONANCE) IN MATERIAL SCIENCES AND MATERIAL SCIENCES IN NMR**
S.I. Macura
Department of Biochemistry and Molecular Biology, Mayo College of Medicine, Mayo Clinic and Mayo Foundation, Rochester, MN, USA

12^{00}-12^{30} **RARE EARTH DOPED CRYSTALS FOR QUANTUM INFORMATION**
Ph. Goldner, O. Guillot-Noël
LCAES-CNRS-UMR 7574, ENSCP, Paris Cedex, France

12^{30}-13^{00} **BORON NITRIDE SUPPORTED METAL AND METAL OXIDE CATALYSTS: INFLUENCE OF THE PREPARATION METHOD**
G. Postole [1], A. Auroux [1], B. Bonnetot [2], A. Gervasini [3]
[1]Institut de Recherches sur la Catalyse, CNRS, Villeurbanne Cedex, France, [2]Laboratoire des Multimatériaux et Interfaces, bat. Berthollet, UCB Lyon I, Villeurbanne Cedex, France, [3]Dipartimento di Chimica Fisica ed Elettrochimica, Università di Milano, Milano, Italy

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

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

Session I: 15^{00}-19^{00}
Chairmen: R.A. Andrievski, J.M. Nedeljković

15^{00}-15^{15} **CARRIER CONFINEMENT EFFECTS IN III-N NANOCOLUMNAR HETEROSTRUCTURES AND NANOCAVITIES GROWN BY MOLECULAR BEAM EPITAXY**
J. Ristić[1], C. Rivera[2], E. Calleja[2], A. Trampert[3], K.H. Ploog[3], M. Povoloskyi[4], A. Di Carlo[4]
[1]Depto. de Ciencias de la Comunicación, Universidad Rey Juan Carlos, Madrid, Spain, [2]ISOM and Depto. de Ingeniería Electrónica, Universidad Politécnica, Madrid, Spain, [3]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany, [4]Dept. di Ingegneria Elettronica, Universita di Roma "Tor Vegata", Roma, Italy

15^{15}-15^{30} **COMPOSITION DEPENDENT RESONANT RAMAN SCATTERING IN $In_xGa_{1-x}As_{1-y}N_y$ / $Al_{0.33}Ga_{0.67}As$ MULTIQUANTUM WELLS**
S. Lazić[1], J.M. Calleja[1], R. Hey[2], K.J. Friedland[2], K.H. Ploog[2]
[1]Dept. Física de Materiales, Universidad Autónoma de Madrid, Cantoblanco, Madrid, Spain, [2]Paul-Drude Institut für Festkörperelektronik, Berlin, Germany

15^{30}-15^{45} **OPTIMIZATION OF SEMIMAGNETIC SEMICONDUCTOR-BASED NANOSTRUCTURES FOR SPINTRONIC APPLICATIONS**
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

15^{45}-16^{00} **HIGH ENERGY PROTON CHANNELING IN A DOUBLE-WALL CARBON NANOTUBE**

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

16^{00}-16^{15} **NANOSCALE Gd PARTICLES IN FULLERENES**
O. Nešković, M. Veljković, J. Cvetićanin, S.Veličković, J. Djustebek, V. Djordjević
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

Break: 16^{15}-16^{45}

16^{45}-17^{00} **SYNTHESES OF FERRITES NANOPARTICLES USING ULTRASOUND IRRADIATION**
M. Drofenik[1,2], D. Makovec[1], A. Košak[1], M. Kristl[2]
[1]Jožef Stefan Institute, Ljubljana, Slovenia,
[2]Faculty of Chemistry and Chemical Engineering, University of Maribor

17^{00}-17^{15} **AGGREGATION MECHANISM OF ULTRA THIN ORGANIC FILMS**
E. Suljovrujić[1,3], M. Micić[2], V. Srdanov[1]
[1]Institute for Quantum Engineering, Science and Technology, University of California, Santa Barbara,CA, USA, [2]Veeco Instruments Inc., Santa Barbara, California, USA, [3]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

17^{15}-17^{30} **FORMIC ACID OXIDATION AT MODEL AND REAL Pt CATALYSTS**
A.V. Tripković, K.Dj. Popović, J.D. Lović
ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro

17^{30}-17^{45} **CHARACTERISATION OF SILVER PARTICLES SPONTENIOUSLY DEPOSITED ON GLASSY CARBON**
V.M. Jovanović[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 Science, Krakow, Poland

17^{45}-18^{00} **EFFECTS OF NONSTOICHIOMETRY AND STRAIN ON RAMAN SPECTRA OF ANATASE TiO_2 NANOPOWDERS**
M. Šćepanović, M. Grujić-Brojčin, Z.D. Dohčević-Mitrović, Z.V. Popović
Institute of Physics, Center for Solid State Physics and New Materials, Belgrade, Serbia and Montenegro

18^{00}-18^{15} **HIGH PRESSURE SINTERING OF NANOSTRUCTURED COMPOSITES BASED ON TITANIUM NITRIDE**

V.S. Urbanovich[1], R.A. Andrievski[2]

[1]Institute of Solid State and Semiconductor Physics, National Academy of Sciences, Minsk, Belarus, [2]Institute for Problem of Chemical Physics, Russian Academy of Sciences, Chernogolovka, Moscow Region, Russia

18^{15}-18^{30} **FEATURES OF COMPOSITES ON REFRACTORY NITRIDES AND BORIDES BASE OBTAINED BY METHOD OF ELECTRIC DISCHARGE SINTERING**

A. Ragulya, O. Raychenko, O. Petukhov, O. Derev'yanko

Frantsevych Institute for Problems of Materials Science of NASU, Kyiv, Ukraine

18^{30}-18^{45} **SYNTHESIS OF NANOCRYSTALLINE AND AMORPHOUS ALLOYS FROM ELEMENTARY POWDERS BY INTENSE PLASTIC DEFORMATION UNDER PRESSURE**

A.V. Dobromyslov, E.K. Dolgikh, R.V. Churbaev

Institute of Metal Physics, Ural Division of Russian Academy of Sciences, Ekaterinburg, Russia

18^{45}-19^{00} **CRITICAL ANALYSIS IN PROCESS MECHANICS OF NANOMATERIALS**

Inderpreet[1], A. Bandopadhya[2]

[1]Punjab Engineering College, Chandigarh, India, [2]NIT Suratkal, Karnataka

SYMPOSIUM D: COMPOSITES

Friday, September 16, 2005

Session I: 09^{00}-10^{30}
Chairmen: M. Davidović, M. Stevanović

09^{00}-09^{15} **THERMOPLASTICS: PAST, PRESENT, AND FUTURE**
Lj.S. Korugić-Karasz
Department of Polymer Science and Engineering, University of Massachusetts, Amherst, USA

09^{15}-09^{30} **CORROSION BEHAVIOR OF SELECT MAX PHASES IN NaOH, HCl AND H_2SO_4**
V.D. Jović[1], M.W. Barsoum[2], B.M. Jović[1], S.R. Kukatla[2]
[1]Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia & Montenegro, [2]Department of Materials Science and Engineering, Drexel University, Philadelphia, USA

09^{30}-09^{45} **REPAIRING OF CRACKED OR DAMAGED PRESSURE PIPES WITH A COMPOSITE SLEEVE**
Ph. Jodin
Laboratoire de Fiabilité Mécanique, Université Paul Verlaine - Metz & ENIM, Metz, France

09^{45}-10^{00} **STATIC AND FATIGUE CHARACTERIZATION OF SANDWICH PANELS**
A. Abbadi[1, 2], S. Belouettar[2], Z. Azari[1], G. Pluvinage[1], J. Gilgert[1]
[1]LFM Université de Metz ENIM Île du Saulcy, Metz cedex, France,
[2]LTI, Centre Henri Tudor, Luxembourg

10^{00}-10^{15} **CORRELATION BETWEEN FRACTURE TOUGHNESS AND MICROSTRUCTURE OF SILICON NITRIDE**
D. Bučevac, S. Bošković, B. Matović
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

10^{15}-10^{30} **THIXOMOLDING® OF MODERN CREEP-RESISTANT Mg-ALLOYS**
O. Myronova, V. Goryany, P.J. Mauk
Institute of Applied Materials Technology (IAM) University of Duisburg-Essen, Duisburg, Germany

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

SYMPOSIUM E: BIOMATERIALS

Session I: 11^{00}-12^{00}
Chairmen: Z.S. Petrović, J.P. Šetrajčić

11^{00}-11^{15} **BACTERIORHODOPSIN AS AN ADVANCED BIOMATERIAL FOR NANOTECHNOLOGY**
F.T. Hong
Dept. of Physiology Wayne State University, Detroit, Michigan, USA

11^{15}-11^{30} **QUANTUM DECOHERENCE AND QUANTUM-HOLOGRAPHIC INFORMATION PROCESSES: FROM BIOMOLECULES TO BIOSYSTEMS**
D. Raković[1], M. Dugić[2], M.B. Plavšić[3], G. Keković[4], I. Ćosić[5], D. Davidović[6]
[1]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro, [2]Department of Physics, Faculty of Science, Kragujevac, [3]Faculty of Technology and Metallurgy, Belgrade, [4]Military Academy, Belgrade, [5]School of Electrical and Computer Engineering, RMIT, Melbourne, Australia, [6]Vinča Institute of Nuclear Sciences, Belgrade

11^{30}-11^{45} **CLASSICAL AND QUANTUM INFORMATION CHANNELS IN PROTEIN CHAIN**
Dj. Koruga[1], A. Tomić[2], Z. Ratkaj[1], L. Matija[3]
[1]Molecular Machine Research Center, Faculty of Mechanical Engineering, Belgrade, Serbia and Montenegro, [2]People Observatory, Kalimegdan, Belgrade, [3]Institute of Technical Sciences of SASA, Belgrade

11^{45}-12^{00} **NANOINDENTATION OF IN SITU POLYMERS IN HYDROXYAPATITE/POLY-L-LACTIDE BIOCOMPOSITES**
I. Balać[1], C.Y. Tang[2], C.P. Tsui[2], P.S. Uskoković[3], N. Ignjatović[4], D.P. Uskoković[4]
[1]Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, P.R. China, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, [4]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade

POSTER SESSION I

Tuesday, September 13, 2005, 20^{30}-22^{00}

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

P.S.A.1. **NUCLEATION BEHAVIOUR OF GLASSES WITH PRIMARY CRYSTALLIZATION**
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.A.2. **PROPERTIES OF DISPERSION HARDENED Cu-Al_2O_3 MADE BY INTERNAL OXIDATION**
V. Rajković[1], D. Božić[1], D. Vračarić[2], E. Romhanji[3]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro, [2]Military Technical Institute, Belgrade, [3]Faculty of Technology and Metallurgy, Belgrade

P.S.A.3. **INVESTIGATION OF IMPURITIES ON THE MECHANISAM OF $Al(OH)_3$ CRYSTAL GROWTH**
I. Nikolić[1], D. Blečić[1], M. Vukčević[1], V.R. Radmilović[2]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro, [2]LBNL, NCEM, MS-72, University of California, Berkeley, CA, USA

P.S.A.4. **RADIOLYTIC DEPOSITION OF SILVER ON AlOOH NANORODS**
I.A. Ruvarac-Bugarčić, M. Novaković, S.K. Milonjić, J.M. Nedeljković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.A.5. **NEW APPROACH ON DISSOLUTION OF HYDRATED ALUMINA IN CONCENTRATED SOLUTION OF SODIUM HYDROXIDE**
M. Stanković[1], L. Pezo[1], B.T. Kovačević[1], M. Jovanović[2], D. Debeljković[3]
[1]Eng. Dept. Holding Institute of General and Physical Chemistry, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, [3]Faculty of Mechanical Engeeniring, Belgrade

P.S.A.6. **ADSORPTION OF ITACONIC ACID ONTO ALUMINA**

J. Gulicovski[1], Lj.S. Čerović[1], S.K. Milonjić[1], I. Popović[2]
[1]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro,
[2]Faculty of Technology and Metallurgy, Belgrade

P.S.A.7. **OXIDE CATALYSTS FOR PURIFICATION OF GASEOUS FLUIDS, SUPPORTED ON THE RESIDUAL FROM SPENT ALUMINA-PALLADIUM CATALYST**

N. Kassabova[1], D. Stoyanova[2], D. Mehandjiev[2]
[1]University for Chemical Technology and Metallurgy, Sofia, Bulgaria,
[2]Institute of General and Inorganic Chemistry, BAS, Sofia

P.S.A.8. **THERMODYNAMIC MODELING OF BORON NITRIDE FORMATION IN THERMAL PLASMA**

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

P.S.A.9. **CARBON NITRIDE COATINGS ON PULSE PLASMA NITRIDED 4140 STEEL SAMPLES**

M. Zlatanović[1], N. Popović[2], Ž. Bogdanov[2]
[1]Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro,
[2]Nuclear Science Institute Vinča, Belgrade

P.S.A.10. **SYNTHESIS OF ZINC META-TITANATE BY REACTION SINTERING**

N. Labus[1], N. Obradović[1], T. 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, [3]Faculty of Electronic Engineering, University of Nis, Nis, [4]Serbian Academy of Sciences and Arts, Belgrade

P.S.A.11. **KINETICS AND MECHANISM OF MECHANOCHEMICAL SYNTHESIS OF Zn_2TiO_4**

N. Obradović[1], N. Labus[1], T. 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, [3]Serbian Academy of Sciences and Arts, Belgrade

P.S.A.12. **PREPARING OF NICKEL-FERRITES FROM COMPLEX COMPOUNDS AT DIFFERENT ATMOSPHERE CONDITIONS**
P. Osmokrović[1], A.S. Nikolić[2], J.M. Puzović[3], M.B. Pavlović[4]
[1]Faculty of Electrical Engeneering, Belgrade, Serbia and Montenegro, [2]Faculty of Chemistry, Belgrade, [3]Faculty of Physics, Belgrade, [4]Department of Physics, Tehnical Faculties, Belgrade

P.S.A.13. **SINTERING OF MECHANOCHEMICALLY ACTIVATED NATURAL SILICATE OF ALUMINA**
D. Živanović, Ž. Sekulić
Institute for Technology of Nuclear and Other Mineral Raw Materials, Belgrade, Serbia and Montenegro

P.S.A.14. **PREPARATION OF FOAMED SiO_2 WITH PREDETERMINED PORE SIZE**
B. Adnadjević[1], J. Jovanović[2]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro, [2]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade

P.S.A.15. **SEEDING EFFECT DURING ELECTROCHEMICAL SYNTHESIS OF IRON OXIDES**
Ž. Tomić[1], Lj. Vulićević[2], M. Srećković[3], N. Ivanović[4], V. Rajković[4], S. Vardić[2]
[1]IRITEL A.D, Belgrade, Serbia and Montenegro, [2]Technical Faculty, Čačak, [3] Faculty of Electrical Engineering, Belgrade, [4]Institute for Nuclear Sciences "VINČA", Belgrade

P.S.A.16. **STRUCTURAL, MAGNETIC AND ELECTRICAL CHARACTERISTICS OF METASTABLE IRON OXIDES NANO-SIZED POWDERS**
Lj. Vulićević[1], N. Ivanović[2], A. Maričić[1], M. Mitrić[2], N. Popović[2], A. Vučković[2], S. Vardić[2]
[1]Technical Faculty Čačak, Serbia and Montenegro
[2]Institute for Nuclear Sciences "VINČA", Belgrade

P.S.A.17. **FABRICATION OF SiC BY CARBOTHERMAL-REDUCTION REACTIONS OF DIATOMACEOUS EARTH**
B. Matović, A. Vučković, S. Bošković
Vinča Institute for Nuclear sciences, Material Department, Belgrade, Serbia and Montenegro

P.S.A.18. **SYNTHESIS AND CHARACTERIZATION OF THE POLY(ANILINIUM 5-SULFOSALICYLATE)**

B. Marjanović[1], G. Ćirić-Marjanović[2], I. Juranić[3], P. Holler[4]
[1]Centrohem, Stara Pazova, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, [3]Faculty of Chemistry, Belgrade, [4]Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic

P.S.A.19. SYNTHESIS OF THE 4-VINILPYRIDINE COPOLYMERS WITH METHYLMETHACRYLATE, AND THEIR APPLICATION FOR THE ADSORPTION OF GOLD

P. Miletić[1], V. Bojanić[2], S. Jovanović[3], M.B. Pavlović[4], Ž. Topić[2], M. Dragić[5]
[1]Faculty of Forestry, Banja Luka, Republic of Srpska, Federation of Bosnia and Hercegovina, [2]Faculty of Agriculture, Banja Luka, [3]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [4]ICMT, Institute for Electrochemistry, Belgrade, [5]MUP RS, Dept. of Criminality Technique, Banja Luka

P.S.A.20. INFLUENCE OF CARBON CONCENTRATION AND ROTATIONAL TEMPERATURE ON FULLERENE YIELD IN RF REACTOR

B. Todorović-Marković[1], Z. Marković[1], Z.M. Nikolić[2], I. Mohai[3], Z. Farkas[4], J. Szepvolgyi[3]
[1]"Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [2]Faculty of Physics, University of Belgrade, Belgrade, [3]Institute of Materials and Environmental Chemistry, Chemical Research Center, Hungarian Academy of Sciences, Budapest, Hungary, [4]Department of Silicate Chemistry and Materials Engineering, Veszprém University, Veszprém, Hungary

P.S.A.21. ANALYSIS OF SiO_2 THIN FILMS DEPOSITED BY REACTIVE SPUTTERING

I. Radović[1], Y. Serruys[2], Y. Limoge[2], O. Jaoul[3], N. Romčević[4], S. Poissonnet[2], N. Bibić[1]
[1]VINČA Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [2]CEA/Saclay, Section de Recherches de Métallurgie Physique, Gif sur Yvette Cedex, France, [3]Laboratoire des Mécanismes de Transfert en Géologie, Université de Toulouse-III-Paul Sabatier, Toulouse Cedex, France, [4]Institute of Physics, Belgrade, Serbia and Montenegro

P.S.A.22. COMPARATIVE ANALYSIS OF INFLUENCE OF ELECTRODE MATERIAL ON SURGE ARRESTERS CHARACTERISTICS IN γ AND X RADIATION FIELD

B. Lončar[1], N. Kartalović[2], A. Vasić[3], S.J. Stanković[4], R.M. Šašić[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro, [2]Technical College for Railway Engineering and Service, Belgrade, [3]Faculty of Mechanical Engineering, Belgrade, [4]Vinča Institute of Nuclear Sciences, Belgrade

P.S.A.23. THE EFFECT OF MAGNESIUM CONTENTS ON THE MICROSTRUCTURE AND PROPERTIES OF THE ALUMINIUM 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, [3]Institute for the Physics, Belgrade

P.S.A.24. **USEFUL PRODUCT TRANSFORMATION STUDY OF WASTES FROM PETROLEUM TANKS CLEANING OR THE PROFILE SHOPS, BY THERMAL TREATMENTS**
F. Barca, L.–I. Tone
University "Politehnica", Bucharest, Romania

P.S.A.25. **POSSIBILITIES FOR OBTAINING OF ACTIVATED CARBON AGENTS BY PYROLYSIS OF RESIDUAL MATERIALS PRODUCED IN FARMERS, VETERINARY CLINICS AND BUTCHERIES ETC**
F. Barca[1], E. Bugaru[2]
[1]University "Politehnica", Bucharest, Romania,
[2]Research and Development Institute for Bovine Balotesti

P.S.A.26. **COMPARISON OF THE CRYSTALOGRAPHIC TEXTURE WITH THE MICROPOROUS TEXTURE OF ALUMINA ACTIVATED IN THE REACTOR FOR PNEUMATIC TRANSPORT**
S.P. Petrović, Lj.S. Rožić, T.B. Novaković, Ž.D. Čupić
IChTM-Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

P.S.A.27. **THE EFFECT OF DIFFERENT DEPOSITION REGIMES ON THE ELECTRODEPOSITION OF SILVER POWDER**
Lj.J. Pavlović[1], M.G. Pavlović[1], V. Maksimović[2], M.V. Tomić[3], K.I. Popov[4]
[1]ICTM – Institue of Electrochemistry, Belgrade, Serbia and Montenegro, [2]Institute of Nuclear Science ¨Vinča¨, Belgrade, [3]Faculty of Technology Zvornik, Zvornik, Republic of Srpska, [4]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.A.28. **MORPHOLOGY OF Ni-Co ALLOY POWDERS ELECTRODEPOSITED FROM SULFATE-BORATE ELECTROLYTE**
V.D. Jović[1], M.G. Pavlović[2], V. Maksimović [3], B.M. Jović[1]
[1]Center for Multidisciplinary Studies University of Belgrade, Belgrade, Serbia and Montenegro, [2]ICTM, Institute of Electrochemistry, Belgrade, [3]Institute of Nuclear Science "Vinča", Belgrade

P.S.A.29. **BENTONITE – LOW COST SORBENT FOR SYNTHETIC DYES**
Z. Mojović, J. Krstić, A. Abu Rabi, Z. Vuković, D. Jovanović

IChTM – Centar of Catalysis and Chemical Engeneering, Belgrade, Serbia and Montenegro

P.S.A.30. **POLYMER STRUCTURE PREDICTION BY COMPUTER SIMULATION OF ZIEGLER-NATTA-KAMINSKY POLYMERIZATION BASED ON CHARGE PERCOLATION MECHANISM**

B. Pilić[1], D. Stoiljković[1], I. Bakočević[1], S. Jovanović[2], D. Panić[3], Lj.S. Korugić-Karasz[4]
[1]Faculty of Technology, Novi Sad, [2]Faculty of Technology and Metallurgy, Belgrade, [3]Technical Faculty, Novi Sad, Serbia and Montenegro
[4]Polymer Science and Engineering, University of Massachuttes, Amherst, USA

P.S.A.31. **MICROSTRUCTURE OF $LaNiO_3$ THIN FILMS OBTAINED BY SPIN-ON TECHNIQUE FROM CITRATE PRECURSORS**

M. Počuča[1], G. Branković[1], D. Vasiljević-Radović[2], Z. Branković[3], D. Poleti[3]
[1]Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia and Montenegro, [2]IHTM-CMTN, Belgrade, [3]Faculty of Technology and Metallurgy, University of Belgarde, Belgrade

P.S.A.32. **GRAIN SIZE EFFECTS ON THE MICROSTRUCTURE AND ELECTRICAL CHARACTERISTICS OF Nb/Mn AND Dy/Mn DOPED BARIUM TITANATE CERAMICS**

Lj. Živković[1], V. Paunović[1], M. Miljković[2], M.M. Ristić[3]
[1]Faculty of Electronic Engineering, Nis, Serbia and Montenegro, [2]Laboratory for Electron Microscopy, University of Nis, [3]Serbian Academy of Science and Arts, Belgrade

P.S.A.33. **MODIFIED Ni CATALYSTS FOR THE HYDROGENATION OF VEGETABLE OILS WITH LOW *TRANS*-ISOMER CONTENT**

M. Stanković, P. Banković, B. Marković, D. Jovanović
Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia and Montenegro

P.S.A.34. **MECHANOCHEMICAL SYNTHESIS OF $Bi_4Ti_3O_{12}$ CERAMICS**

Z. Ž. Lazarević[1], B.D. Stojanović[1,2], J.A. Varela[2]
[1]Center for Multidisciplinary Studies University of Belgrade, Belgrade, Serbia and Montenego, [2]Instituto de Quimica-UNESP, Araraquara, S.P., Brazil

P.S.A.35. **NANO-SECOND SURFACE MODIFICATION OF TITANIUM NITRIDE THIN FILM BY Nd:YAG AND TEA CO_2 LASERS**

B. Gaković[1], I. Pongrac[1], S. Petrović[1], D. Minić[2], M. Trtica[1]

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P.S.A.36. **STRUCTURAL ANALYSIS OF MECHANICALLY ACTIVATED ZINC OXIDE**
K. Vojisavljević[1], J. Blanuša[2], T. Srećković[1], M.M. Ristić[3]
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P.S.A.37. **SURFACE MODIFICATION OF TITANIUM BY THE HIGH INTENSITY ULTRA-SHORT Nd:YAG LASER**
M. Trtica[1], B. Gaković[1], D. Batani[2], T. Desai[2], R. Redaelli[2]
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P.S.A.38. **OSCILLATORY PHENOMENA DURING ANODIC COPPER ELECTRODISSOLUTION IN TRIFLUOROACETIC ACID SOLUTION**
N. Potkonjak[1], Lj. Kolar-Anić[2], T. Potkonjak[2], S. Anić[2]
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P.S.A.39. **SYNTHETIC ACTIVATED CARBONS FROM ION EXCANGE RESIN SYNTHESIS AND CHARACTERIZATION**
J. Krstić[1], O. Terzić, A. Rosić[2], S. Mentus[3], L. Novaković[4], D. Jovanović[1]
[1]IChTM – Center for Catalysis and Chemical Engeneering, Belgrade, Serbia and Montenegro, [2]Faculty of Mining and Geology, University of Belgrade, [3]Faculty of Physical Chemistry, University of Belgrade, [4]Faculty of Physic, University of Belgrade

P.S.A.40. **RAPID SYNTHESIS OF $LiCr_{0.15}Mn_{1.85}O_4$ BY GLYCINE-NITRATE METHOD**
I. Stojković[1], A. Hosseinmardi[2], D. Jugović[3], M. Mitrić[4], N. Cvjetićanin[1]
[1]Faculty of Physical Chemistry, Belgrade, Serbia and Montenegro, [2]Institute for Chemical Technology of Inorganic Materials, Graz, Austria, [3]Institute of Technical Sciences, SANU, Belgrade, [4]The Vinča Institute of Nuclear Sciences,Laboratory for Theoretical and Condensed Matter Physics, Belgrade

P.S.A.41. **STRUCTURAL PHASE TRANSITIONS IN TRIAMMONIUM HYDROGEN DISULPHATE**
L. Novaković[1], J. Dojčilović[1], S. Spasović[1], A.S. Nikolić[2]
[1]Faculty of Physics, University of Belgrade, Serbia and Montenegro,
[2]Faculty of Chemistry, University of Belgrade

P.S.A.42. **ION BEAM ASSISTED DEPOSITION OF TiN THIN FILMS ON Si SUBSTRATE**
V. Milinović, M. Milosavljević, D. Peruško, M. Popović, M. Novaković, N. Bibić
The Institute of Nuclear Sciences ″VINČA″, Atomic Physics Laboratory
Belgrade, Serbia and Montenegro

P.S.A.43. **THE MANY-BODY CALCULATIONS OF REFRACTIVE INDEX, DYNAMIC POLARIZABILITY AND VERDET COEFFICIENTS**
A.R. Tančić, M.S. Davidović
The VINČA Institute for Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.A.44. **DEPENDENCE OF THE CHARACTERISTICS OF MOULD MIXTURES FOR PRODUCTION OF MOULDS AND CORES FOR GREY CAST IRON PRODUCTS ON THE FELDSPAR CONTENT IN QUARTZ SAND**
M.M. Krgović[1]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro

P.S.A.45. **INFLUENCE OF TEMPERATURE AND SHAPING METHOD ON THE PROPERTIES OF SINTERED PRODUCTS ON THE BASIS OF ILLITE-KAOLINITE CLAY TYPE**
M.M. Krgović
University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro

P.S.A.46. **SYNTHESIS OF TITANIA MESOPOROUS SOL-GEL MATERIALS USING NONIONIC PEG SURFACTANT**
B. Pilić, Lj.M. Nikolić
Department of Materials Engineering, Faculty of Technology, University of Novi Sad, Serbia and Montenegro

P.S.A.47. **SINTERING KINETIC ANALYSIS OF MECHANICALLY ACTIVATED ZnO-SnO_2 SYSTEM**
T. Ivetić[1], T. Srećković[2], M.M. Ristić[3]
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P.S.A.48. **COMPACTION OF ANISOTROPIC GRANULAR MATERIALS: SYMMETRY EFFECTS**
Lj. Budinski-Petković[1], M. Petković[2], Z.M. Jakšić[3], S.B. Vrhovac[3]
[1]*Faculty of Engineering, Novi Sad, Serbia and Montenegro,* [2]*DMS group, Novi Sad,* [3]*Institute of Physics, Zemun, Belgrade*

P.S.A.49. **PHASE EVOLUTION DURING THE CARBONITRIDING OF DIATOMACEOUS EARTH**
A. Vučković, B. Matović, S. Bošković
Materials Science Laboratory, Institute of Nuclear Sciences "Vinča", Belgrade, Serbia and Montenegro

P.S.A.50. **THERMAL STABILITY OF Fe80 B20 METALLIC GLASS**
P. Tomić[1], M.S. Davidović[2], M. Gligorić[3], M. Jeremić[1]
[1]*Factory "Birac"AD Zvornik, Republic of Srpska (Bosnia and Herzegovina),* [2]*The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro,* [3]*Faculty of Technology, Zvornik, Republic of Srpska (Bosnia and Herzegovina)*

P.S.A.51. **GAMMA RADIATION EFFECTS MECHANICAL PROPERTIES OF CARBON/EPOXY COMPOSITES**
D.R. Sekulić[1], I.M. Djordjević[1], M. Gordić[1], Z. Burzić[2], M.M. Stevanović[1]
[1]*Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro*
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P.S.A.52. **CHARACTERISATION OF PLATINUM NANOPARTICLES ELECTROCHEMICALLY DEPOSITED ON GLASSY CARBON**
D. Tripković[1], S. Terzić[1], V.M. Jovanović[1], A. Kowal[2]
[1]*ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro, and* [2]*Institute of Catalysis and Surface Chemistry, Polish Academy of Science, Krakow, Poland*

P.S.A.53. **CORRELATION BETWEEN THE ELECTRON STATE DENSITY CHANGE AND THE SPECIFIC ELECTRICAL RESISTIVITY CHANGE IN THE AMORPHOUS POWDER OF THE NiMo ALLOY**
L. Ribić - Zelenović[1], L. Rafailović[1], M. Spasojević[1], A. Maričić[2]
[1]*Faculty of Agronomy, Čačak, University of Kragujevac, Serbia and Montenegro*
[2]*Technical Faculty, Čačak, University of Kragujevac*

P.S.A.54. **STRUCTURAL CHANGES OF THE AMORPHOUS POWDERS OF THE NiCo ALLOY**

L. Rafailović[1], L. Ribić - Zelenović[1], A. Maričić[2], M. Spasojević[1]
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[2]*Technical Faculty, Cacak, University of Kragujevac*

P.S.A.55. **MECHANISM OF A SOLID-STATE FORMATION OF $La_{1-x}Sr_xMnO_{3+\delta}$ ($0 < x < 0.5$) AND MAGNETIC CHARACTERIZATION THEREOF**

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

P.S.A.56. **CHARACTERIZATION OF NANOCRYSTALS EMBEDDED IN LAS - GLASS CERAMICS**

R. Krsmanović, O. Lebedev, G. Bertoni, G. Van Tendeloo
EMAT, University of Antwerp, Antwerp, Belgium

P.S.A.57. **FORMING OF THE SILICALITE-1 NANOPARTICLES IN THE SYSTEM WITH PRECIPITATED SILICA**

O.A. Kovačević[1], B.T. Kovačević[1], D. Arandjelović[1], N.L. Lazić[1], K. Andjelković[2], Ž.Lj. Tešić[2]
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POSTER SESSION II

Wednesday, September 14, 2005, 20^{30}-22^{00}

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATIONS

P.S.B.1. **A NOVEL ASPECTS TO THERMAL ANALYSIS OF THICK FILM POWER MODULES**
B. Radojčić[1], R. Ramović[2], O. Aleksić[3]
[1]Institute of Security, Belgrade, Serbia & Montenegro, [2]Faculty of Electrical Engineering, Belgrade, [3]Center for Multidisciplinary Studies, University of Belgrade

P.S.B.2. **RADIOLOGICAL CHARACTERIZATION OF SEMICONDUCTOR MATERIALS IN FIELD EFFECT TRANSISTOR DOSIMETER BY MONTE CARLO METHOD**
S.J. Stanković[1], R.D. Ilić[1], M. Petrović[1], B. Lončar[2], A. Vasić[3]
[1]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, [3]Faculty of Mechanical Engineering, Belgrade

P.S.B.3. **PHOTOTHERMAL DEPTH PROFILING OF INHOMOGENOUS SOLIDS**
S. Galović, M. Popović, D. Čevizović, Z. Stojanović
The "Vinča" institute of nuclear sciences, Laboratory of Theoretical and Condensed matter physics-020, Belgrade, Serbia and Montenegro

P.S.B.4. **EVALUATION OF AlGaN/GaN MODFET CARRIER SHEET DENSITY AND GATE CAPACITANCE**
D. Čevizović, S. Galović
The "Vinča" institute of nuclear sciences, Belgrade, Serbia and Montenegro

P.S.B.5. **POTASSIUM SODALITE: A NOVEL MATERIAL FOR EPR DOSIMETRY**
M. Mojović, I. Spasojević, A. Ignjatović, Lj. Damjanović, G. Bačić
Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro

P.S.B.6. **STRUCTURE OPTIMIZATION OF WELD METAL AND HAZ IN MICROALLOYED HIGH-STRENGTH STEEL WELDED JOINTS**
N. Bajić[1], V. Šijački –Žeravčić[2], M. Rakin[3], K. Kovačević[4]
[1]Chemical Power Sources Institute, Belgrade, Serbia and Montenegro, [2]Faculty of Mechanical Engineering, Belgrade, [3]Faculty of Technology and Metallurgy, Belgrade, [4]Institute of Ferrous Metallurgy, Niksic

P.S.B.7. **PHOTOACOUSTIC PROPERTIES OF THIN FILM ZINC-STANNATE**

T. Ivetić[1], M.V. Nikolić[2], D. Young[3], D. Urošević[4]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro, [2]Center for Multidisciplinary Studies of the University of Belgrade, Belgrade, [3]National Renewable Energy Laboratory, Golden, Colorado, USA, [4]Mathematical Institute, Serbian Academy of Sciences and Arts, Belgrade

P.S.B.8. **THERMAL DIFFUSIVITY AND ELECTRON TRANSPORT PROPERTIES OF NTC LAYERS OBTAINED BY PHOTOACOUSTIC TECHNIQUE**

S.M. Savić[1], D.T. Luković[1], O.S. Aleksić[2], V.Ž. Pejović[2]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Center for Multidisciplinary Studies of the University of Belgrade, Belgrade

P.S.B.9. **FRACTIONAL MODEL FOR THE COMPACTION OF A VERTICALLY TAPPED GRANULAR MATERIAL**

Lj. Budinski-Petković[1], M. Petković[2], Z. M. Jakšić[3], S. B. Vrhovac[3]
[1]Faculty of Engineering, Novi Sad, Serbia and Montenegro, [2]DMS group, Novi Sad, [3]Institute of Physics, Zemun, Belgrade

P.S.B.10. **THE AUSTEMPERING STUDY OF DUCTILE IRON ALLOYED WITH COPPER AND NICKEL**

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

P.S.B.11. **DOWNSTREAM PROCESSING OF SOME Al-Fe-Mn-Si AND Al-Fe-Si TRC ALLOYS AND ITS INFLUENCE ON THE SHEET/FOILS PROPERTIES**

K. Delijić, V. Asanović, D. Radonjić
University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Serbia and Montenegro

P.S.B.12. **STRUCTURE AND DYNAMIC MECHANICAL BEHAVIOUR OF LIQUID-CRYSTALLINE SIDE-CHAIN POLYURETHANES**

H. Valentová[1], D. Rais[1], J. Nedbal[1], Z. Sedláková[2], M. Ilavský[1, 2]
[1]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic
[2]Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic

P.S.B.13. **RELAXATION BEHAVIOUR OF POLYURETHANES WITH MESOGENIC GROUPS IN SIDE CHAIN**

J. Nedbal[1], H. Valentová[1], Z. Sedláková[2], M. Ilavský[1.2]
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[2] *Istitute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic*

P.S.B.14. **STRUCTURE AND PHYSICAL BEHAVIOR OF NETWORKS FROM POLY(OXYPROPYLENE)DIOL, DIISOCYANATE AND TRIMETHYLOLPROPANE PREPARED BY ONE- AND TWO-STAGE PROCESS. EFFECT OF CHEMICAL CLUSTERS**

J. Šomvársky[1], Z. Sedláková[2], J. Pleštil[2], M. Ilavský[1,2]
[1] *Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic,*
[2] *Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague*

P.S.B.15. **GAMMA IRRADIATION OF ORIENTED POLYOLEFINS. I. GEL CONTENT STUDY**

D. Milićević, A. Ivanović, S. Trifunović, E. Suljovrujić
Institute of Nuclear Sciences "Vinča", Laboratory for Radiation Chemistry and Physics, Belgrade, Serbia and Montenegro

P.S.B.16. **THE PROPERTIES OF DANGLING CHAIN-NETWORKS PREPARED BY CYCLOTRIMERIZATION OF TELECHELIC DIISOCYANATES**

J. Budinski-Simendić[1], M. Špirkova[2], K. Dušek[2], T. Dikić[1], R. Radičević[1], S. Prendzov[3], I. Krakovsky[4], M. Ilavsky[2,4]
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P.S.B.17. **STRAND DYNAMICS IN ELASTOMER BLENDS**

M.B. Plavšić, I. Pajić- Lijaković
Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.B.18. **OXIDATIVE CHEMICAL POLYMERIZATION OF 4-AMINO-3-HYDROXY-NAPHTHALENE-1-SULFONIC ACID AND ITS SALTS**

G. Ćirić-Marjanović[1], B. Marjanović[2], I. Juranić[3], P. Holler[4], J. Stejskal[4], M. Trchová[4]
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P.S.B.19. **MICROSCOPIC STUDIES OF THE GC/POLY-NiTMHPP/NAFION ELECTROCHEMICAL NITRIC OXIDE SENSOR**
M. Macherzynski[1], A. Kowal[2], B. Macherzynska[1], J. Golas[1]
[1]University of Science and Technology, Dept. of Environmental Sci., Dept. of Advanced Ceramics, Krakow, Poland, [2]Institute of Catalysis and Surface Chemistry, PAS, Krakow, Poland

P.S.B.20. **STRUCTURAL, ELECTRONIC AND OPTICAL PROPERTIES OF SOME PHENYL OLIGOMERS**
I. Radisavljević, D. Marjanović, N. Novaković, N. Ivanović
Institute for Nuclear Sciences "VINČA", Belgrade, Serbia and Montenegro

P.S.B.21. **STRUCTURE AND PHYSICAL BEHAVIOR OF LIQUID-CRYSTALLINE POLYBUTADIENE-DIOLS WITH VARIOUS MESOGENS IN THE SIDE CHAINS**
Z. Sedlákova[2], M. Ilavský[1,2], J. Spěváček[2], A. Jigounov[1]
[1]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic, [2]Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague

P.S.B.22. **KINETICS OF ISOTHERMAL DEHYDRATION OF HYDROGEL OF POLY(ACRYLIC ACID)**
B. Janković[1], B. Adnadjević[1], J. Jovanović[2], Lj. Kolar-Anić[1]
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P.S.B.23. **COMPARING OF SWELLING KINETICS OF POLY(ACRYLIC ACID) HYDROGEL IN DISTILLED WATER AND PHYSIOLOGICAL SOLUTION**
J. Jovanović[1], B. Adnadjević[2], A. Kostić[3]
[1]Institute of Technical Sciences of the Serbian Academy of Science and Arts, Belgrade, Serbia and Montenegro, [2]Faculty of Physical Chemistry, Belgrade, [3]Agryfaculty, Zemun

P.S.B.24. **STYRENE BUTADIENE/CHLOROSULPHONATED POLYETHYLENE RUBBER BLEND REINFORCED BY HIGH-STRUCTURED CARBON BLACK**
G. Marković[1], B. Radovanović[2], J. Budinski-Simendić[3], H. Valentova[4], A. Radovanović[5]
[1]Tigar, Pirot, Serbia and Montenegro, [2]Faculty of Science, Niš, [3]Faculty of Technology, Novi Sad, [4]Sant Charles University, Macromolecular Physic Department, Prague, Czech Republic, [5]Faculty of Science, Institute of Chemistry, Skopje, Macedonia

P.S.B.25. **ELECTROCHEMICAL BEHAVIOUR OF A COMPOSITE Rh/TiO_2 LAYER FORMED POTENTIODYNAMICALLY ON TITANIUM SURFACE**

S. Mentus[1], I. Krstić[2], Ž.Lj. Tešić[2], J. Grbović[3,4], A. Montone[4]
[1]*Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia and Montenegro,* [2]*Faculty of Chemistry, University of Belgrade, Belgrade,* [3]*Institute of Nuclear Sciences Vinča, Belgrade,* [4]*Unita Materiali e Nuove Technologie, ENEA C.R. Cassacia, Roma, Italy*

P.S.B.26. **INFRA-RED AND DIELECTRIC PROPERTIES OF $SrTiO_3$:Nd**
S. Spasović[1], N. Paunović[2], D. Popović[1], J. Dojčilović[1]
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[2]*Institute of Physics, Belgrade*

P.S.B.27. **PHOTORESIST ASHING WITH THE FERRITE-CORE INDUCTIVELY COUPLED PLASMAS FOR THE APPLICATION TO THE LOW-K DIELECTRICS DEVICES**
J.H. Myung, H.W. Kim
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.B.28. **GROWTH AND THERMAL ANNEALING OF GaN/ZnO/Si STRUCTURES PREPARED BY THE RF MAGNETRON SPUTTERING**
H.W. Kim, Ch. Lee
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.B.29. **CRYSTAL-FIELD STRENGTH PARAMETER AS A GUIDE FOR THE ANALYSIS OF THE LOCAL ENVIRONMENT AROUND THE RARE EARTH IONS IN GLASSES AND IN CRYSTALLINE COMPOUNDS**
E. Antić-Fidančev, B. Viana, P. Aschehoug
Laboratoire de Chimie Appliquée de l'État Solide, CNRS, UMR-C7574, ENSCP, Paris Cédex 05, France

P.S.B.30. **BIOLOGICAL MATERIAL AND INFORMATION**
B.R. Jovanić[1], M.Ž. Sarvan[2]
[1]*Institute of Physics, Centre of Experimental Physics, Laboratory for Multidiscplinary Research, Zemun, Serbia and Montenegro,*
[2]*Faculty of Physics, Belgrade, Serbia and Montenegro*

P.S.B.31. **HIGH PRESSURE AND EMISSION SPECTRA OF Eu^{3+} IN L-$EuBO_3$**
B.R. Jovanić[1], E. Antić-Fidančev[2]
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P.S.B.32. **DIAGNOSTICAL METHOD FOR ELECTRIC FIELD DETERMINATION IN TRANSFORMER OIL APPLYING KERR EFFECT**
Z. Lazarević[1], R. Radosavljević[1], M. Pešić[2]
[1]*Faculty of Electrical Engineering, Belgrade, Serbia and Montenegro*

[2]JP "Elektrotimok", Zaječar

P.S.B.33. **THE INFLUENCE OF HEAT TREATMENT AND Ni-Cr PROTECTIVE LAYER ON Ti_3Al CYCLIC OXIDATION**
I. Cvijović[1], M.T. Jovanović[1], D. Vasiljević-Radović[2]
[1]Institute of Nuclear Sciences »Vinča«, Belgrade, Serbia and Montenegro
[2]IHTM - Institute of Microelectronic Technologies and Single Crystals, Belgrade

P.S.B.34. **FRACTURE SURFACE ANALYSIS OF Ti_3Al –BASED INTERMETALLICS PRODUCED BY POWDER METALURGY AND STANDARD MELTING AND CASTING PROCESSES**
D. Božić, B. Dimčić, O. Dimčić
Institute of Nuclear Science "Vinča", Belgrade, Serbia and Montenegro

P.S.B.35. **ELECTROCATALYTIC ACTIVITY OF NANO-SIZED EBONEX/Pt FOR UNDERPOTENTIAL DEPOSITION OF HYDROGEN**
Lj. Vračar, N. Krstajić
Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro

P.S.B.36. **COMPARATIVE THERMODYNAMIC PREDICTING IN Al-Co-Me (Me =Ti, Mo) SYSTEMS**
D. Živković[1], A. Kostov[2], I. Katayama[3], N. Štrbac[1]
[1]University of Belgrade, Technical Faculty, Bor, Serbia and Montenegro
[2]Copper Institute, Bor, Serbia and Montenegro, [3]Osaka University, Graduate School of Engineering, Department of Materials Science and Processing, Osaka, Japan

P.S.B.37. **THERMODYNAMICS AND SURFACE PROPERTIES OF LIQUID Ga-In ALLOYS**
D. Živković[1], R. Novaković[2]
[1]University of Belgrade, Technical Faculty, Bor, Serbia and Montenegro
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P.S.B.38. **CORRELATION BETWEEN STRUCTURAL RELAXATION AND CRYSTALLIZATION PROCESS AND CHANGE IN MAGNETIC PERMEABILITY OF THE $Fe_{89,8}Ni_{1,5}Si_{5,2}B_3C_{0,5}$ AMORPHOUS ALLOY**
A. Kalezić-Glišović[1], A. Maričić[1], L. Novaković[2], D. Minić[3]
[1]Technical Faculty, Čačak,, Serbia and Montenegro, [2]Faculty of Physics, Belgrade, [3]Faculty of Physical Chemistry, Belgrade

P.S.B.39. **RAMAN SPECTROSCOPY OF $Hg_{1-x}Mn_xSe$ ALLOYS: PART II**
A. Milutinović, M. Romčević, N. Romčević
Institute of Physics, Belgrade, Serbia and Montenegro

P.S.B.40. **LIGHT RESPONCE OF ZnS PLANAR LUMINOFORS AS A FUNCTION OF EXCITATION FREQUENCY**

S. Travica[1], O.S. Aleksić[2], M. Srećković [3]
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P.S.B.41. **MAGNETISM OF THE COMPOUNDS IN THE Hf-Co PHASE SYSTEM**

J. Belošević-Čavor[1], F. Congiu[2], B. Cekić[1], G. Concas[2], V. Koteski[1]
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P.S.B.42. **STRUCTURAL ANALYSIS OF BORON DOPED GLASS-LIKE CARBONS**

A. Devečerski, B. Matović, V. Rajković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.B.43. **SURFACE PROPERTIES OF GLASSY CARBON**

M. Baćić[1], A. Udovičić[2], Z. Laušević[2], A. Perić-Grujić[1], G. Starčević[3], M. Laušević[1]
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P.S.B.44. **THERMODYNAMICS AND STRUCTURAL ANALYSIS OF SOME Ag-In-Sn ALLOYS**

A. Milosavljević[1], D. Živković[2], Ž. Kamberović[3]
[1]Copper Institute, Bor, Serbia and Montenegro, [2]Technical Faculty, Bor,
[3]Faculty of Technology and Metallurgy, Belgrade

P.S.B.45. **PROPERTIES AND EFFICIENCY OF Pt/Al_2O_3 CATALYST APPLIED IN A SOLID FUEL THERMO-ACCUMULATING FURNACE**

S. Belošević[1], R. Mladenović[1], D. Dakić[1], M. Paprika[1], A. Erić[1], D. Djurović[1], N. Radić[2], B. Grbić[2], M. Komatina[3]
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P.S.B.46. **DUCTILE FRACTURE PREDICTION OF STEAM PIPELINE STEEL**

M. Zrilić [1], M. Rakin[1], A. Sedmak[2], R. Aleksić[1], Z. Cvijović[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia and Montenegro
[2]Faculty of Mechanical Engineering, Belgrade

P.S.B.47. **ELECTRON, HOLE, AND EXCITON STATES IN COUPLED SELF-ASSEMBLED QUANTUM RINGS**

T. Višnjevski[1], M. Tadić[2]
[1]High Railway School, Belgrade, Serbia and Montenegro
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P.S.B.48. **NOVEL ANALYTICAL MODEL OF HFET CURRENT-VOLTAGE CHARACTERISTICS**

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

P.S.B.49. **FIRST PRINCIPLE CALCULATIONS OF ALKALI HYDRIDE ELECTRONIC STRUCTURES**

N. Novaković[1], I. Radisavljević[1], D. Colognesi[2], N. Ivanović[1]
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P.S.B.50. **ELECTRICAL AND OPTICAL SIGNAL ANALYSIS OF PULSE POWERED GLOW DISCHARGE SYSTEM**

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

P.S.B.51. **CHARACTERISATION OF BIMETALLIC ZEOLITES: Cu,FeZSM-5, Cu,MnZSM-5 and Fe,MnZSM-5. ADSORPTION BEHAVIOUR**
V. Rakić[1,3], V. Rac[1], Lj. Damjanović[2], V.T. Dondur[2], A. Auroux[3]
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P.S.B.52. **PHOTOACOUSTIC PROPERTIES OF THICK NiO FILMS**
O. S. Aleksić[1], N. Begenišić[2], M. V. Nikolić[1], D. Urošević[3]
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P.S.B.53. **HIGH PRESSURE AND OPTICAL PROPERTIES OF LMA:Mn^{2+}**
B.R. Jovanić[1], B. Viana[2]
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P.S.B.54. **ELECTRONIC STRUCTURE OF TIN OXIDE FILMS**
I.D. Shcherba[1,*], J. Chmura[1], D.P. Uskoković[2], J. Szuber[3], V.N. Uvarov[4], B. Jatcyk[5]
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P.S.B.55. **UTILLIZATION OF FLY ASH IN DENCE CERAMIC COMPOSITES: ECOTECHNOLOGICAL AND ECONOMICAL BENEFITS**
Z. Baščarević[1], Lj. Petrašinović-Stojkanović[1], M. Komljenović[1], J. Bossert[2]
[1]Department of Materials Science & Energy Conversion, Center for Multidisciplinary Studies Belgrade University, Belgrade, Serbia and Montenegro
[2]Institute of Materials Science & Technology (IMT), Friedrich-Schiller-University Jena, Jena, Germany

P.S.B.56. **EQUILIBRIUM AND KINETIC STUDIES OF HEAVY METAL IMMOBILISATION BY HYDROXYAPATITE**
I.D. Smičiklas[1], A.E. Onjia[1], S. Raičević[1], Dj. Janaćković[2]
[1]The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro
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P.S.B.57. POINTS OF ZERO CHARGE OF DIFFERENT CARBIDES

Lj.S. Čerović[1], S.K. Milonjić[1], M. Todorović[1], M. Trtanj[1], Y. Pogozhev[2], V. Levina[2], E. Levashov[2]
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P.S.B.58. SALTS OF 12-TUNGSTOPHOSPHORIC ACID AS POTENTIAL SOLID ELECTROLYTES IN FUEL CELLS

T. Čajkovski[1], U.B. Mioč[2], M.R. Todorović[3], M.S. Davidović[1], I. Holclajtner-Antunović[2], Z. Laušević[1]
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POSTER SESSION III

Thursday, September 15, 2005, 20^{30}-22^{00}

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

P.S.C.1. **Co AS CATALYST FOR IMPROVED HYDROGEN SORPTION OF MECHANICALLY MILLED MgH_2**

A. Montone[1], J. Grbović[1,*], Lj. Stamenković[1,*], A.L. Fiorini[2], L. Pasquini[2], E. Bonetti[2], M. Vittori Antisari[1]

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P.S.C.2. **SYNTHESIS AND CHARACTERIZATION OF SINGLE-WALLED CARBON NANO-HORNES**

M. Vittori Antisari, R. Marazzi, D. Mirabile Gattia, L. Pilloni, V. Contini, A. Montone

Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy

P.S.C.3. **CHARACTARIZATION AND ISOLATION OF CARBON NANOTUBES**

O. Nešković[1], V. Djordjević[1], J. Cvetićanin[1], M. Veljković[1], S. Veličković[1], B. Babić – Stojić[1], M. Bohorov[2]

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[2]Center for Electron Microscopy, University of Novi Sad, Novi Sad

P.S.C.4. **COMPARATIVE ANALYSIS OF $\lambda\approx 9\mu m$ GaAs/AlGaAs QUANTUM CASCADE LASERS WITH DIFFERENT INJECTOR DOPING**

D. Indjin[1], S. Höfling[2], A. Mirčetić[3], V.D. Jovanović[1], J. Radovanović[4,3] , Z. Ikonić[1], N. Vukmirović[1], P. Harrison[1], R.W. Kelsall[1], V. Milanović[3,1], J.P. Reithmaier[2,5], A. Forchel[2]

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P.S.C.5. MECHANICAL OSCILLATIONS AND CHARGE CARRIERS IN NANOSTRUCTURES

B.S. Tošić[1], J.P. Šetrajčić[1], V. Sajfert[2], S.M. Vučenović[3], D.Lj. Mirjanić[3], S.K. Jaćimovski[4]
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P.S.C.6. OPTICAL PROPERTIES OF SIMPLE BILAYER POLYMER LIGHT EMITTING DIODE

V. Arsoski, R.M. Ramović, M. Srećković
School of Electrical Egineering, University of Belgrade, Serbia and Montenegro

P.S.C.7. CHARACTERISTICS OF INDIUM OXIDE ROD-LIKE STRUCTURES SYNTHESIZED USING METALORGANIC CHEMICAL VAPOR DEPOSITION

H.W. Kim
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.C.8. STUDY OF TIN OXIDE ONE-DIMENSIONAL NANOSTRUCTURES GROWN BY THERMAL EVAPORATION OF Sn POWDERS

H.W. Kim, S.H. Shim
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.C.9. SYNTHESIS AND CHARACTERIZATION OF THE FeOOH/PMMA NANOCOMPOSITE

M. Marinović-Cincović, M. Popović, J.M. Nedeljković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Monetenegro

P.S.C.10. SYNTHESIS AND CHARACTERIZATION OF TiO_2/PMMA NANOCOMPOSITE

E.S. Džunuzović[1], K. Jeremić[2], J.M. Nedeljković[1]
[1]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro
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P.S.C.11. NONAQUEOUS SYNTHESIS AND CHARACTERIZATION OF CRYSTALLINE TITANIA NANOPARTICLES

N.D. Abazović, I.A. Ruvarac-Bugarčić, M.I. Čomor, J.M. Nedeljković
Vinča Institute of Nuclear Sciences, Laboratory for Radiation Chemistry and Physics,Belgrade, Serbia and Montenegro

P.S.C.12. **RADIOLYTIC FABRICATION OF Ag-PVA NANOCOMPOSITES**
A. Krklješ, Z. Kačarević-Popović, J.M. Nedeljković
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

P.S.C.13. **SYNTHESIS AND CHARACTERIZATION OF CdS/PMMA COMPOSITE**
J. Kuljanin-Jakovljević[1], Z. Stojanović[1], N. Cvjetićanin[2], J.M. Nedeljković[1]
[1]Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, University of Belgrade, Belgrade

P.S.C.14. **ELECTROCHEMICAL DEPOSITION OF MAGNETIC NANOCONTACTS WITH A LARGE MAGNETORESISTANCE**
N.D. Nikolić
ICTM – Institute of electrochemistry, University of Belgrade, Belgrade, Serbia and Montenegro

P.S.C.15. **SEGMENTED THERMISTORS PRINTED BY NTC NANOMETRIC PASTE AND APPLIED IN VOLUME AIR-FLOW SENSORS**
O.S. Aleksić[3], S.M. Savić[1], M.D. Luković[2], K.T. Radulović[4], V.Ž. Pejović[3]
[1]ITN SASA, Belgrade, Serbia and Montenegro, [2]Institute of Security, Belgrade, [3]CMS UB, Belgrade, [4]IHTM Belgrade

P.S.C.16. **LOW TEMPERATURE SYNTHESIS OF NANOCRYSTALLINE $ZnFe_2O_4$ POWDERS**
M. Maletin[1], Ž. Cvejić[2], S. Rakić[2], V.V. Srdić[1]
[1]Dept. Materials Engineering, Faculty of Technology, University of Novi Sad, Serbia and Montenegro, [2]Dept. Physics, Faculty of Sciences, University of Novi Sad

P.S.C.17. **SORPTION OF FERRIC AND FERROUS IONS ON SILICA**
S.K. Milonjić, S.D. Čupić, Lj.S. Čerović
Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.C.18. **FERRICOXYCHLORIDE AND HEMATITE NANOCRYSTALS: SYNTHESIS AND PHASE TRANSFORMATION**
S.K. Milonjić[1], G. Wang[2], M. Fedoroff [3], Z.V. Šaponjić[1], M. Marinović-Cincović[1], J.M. Nedeljković[1]
[1]Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro, [2]CECM, CNRS, Vitry-sur-Seine, France, [3]Ecole Nationale Supérieure de Chimie de Paris, Paris, France

P.S.C.19. **PREPARATION AND CHARACTERIZATION OF POLY(VINYL**

CHLORIDE)/ BENTONITE NANOCOMPOSITES VIA MELT BLENDING METHODS
A.Z. Aroguz[1], S. Karakus[1], Lj.S. Korugić-Karasz[2]
[1]Istanbul University, Engineering Faculty, Chemistry Department, Avcilar, Istanbul, Turkey, [2]Department of Polymer Science and Engineering, University of Massachusetts, Amherst, USA

P.S.C.20. **COMPARISON OF STRUCTURE AND MORPHOLOGY OF NANOSIZED WTi/Al AND WTi/Si SYSTEMS**
S. Petrović[1], B. Adnadjević[2], D. Peruško[1], S.P. Zec[1], B. Gaković[1], Z. Rakočević[1]
[1]Institute of Nuclear Science – Vinča, Belgrade, Serbia and Montenegro
[2]Faculty of Physical Chemistry, Belgrade

P.S.C.21. **MAGNETIC DYNAMIC OF Zn,Mn FERRITE NANOPARTICLE ANSAMBLES**
B. Antić[1], V. Spasojević[1], M. Vučinić-Vasić[2], V. Kusigerski[1], Z. Jagličić[3]
[1]Condensed Matter Physics Laboratory, The "Vinča" Institute, Belgrade, Serbia and Montenegro, [2]Faculty of Technical Sciences, University of Novi Sad, Novi Sad, [3]Institute of Mathematics, Physics and Mechanics, Ljubljana, Slovenia

P.S.C.22. **MAGNETIC PROPERTIES OF NANOSTRUCTURED $SiO_2:Eu^{3+}$ POWDERS**
V. Spasojević[1], M.D. Dramićanin[1], V. Jokanović[2], Ž. Andrić[1], J. Blanuša[1], V. Kusigerski[1], M. Mitrić[1]
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[2]Institute of Technical Sciences of SASA, Belgrade

P.S.C.23. **MAGNETIC PROPERTIES OF NANOSIZED γ-Fe_2O_3**
V. Spasojević, V. Kusigerski, B. Matović, M. Mitrić, S. Bošković, B. Antić
The Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro

P.S.C.24. **MODELLING OF A PLASMA ETCHER FOR CHARGING FREE PROCESSING OF NANOSCALE STRUCTURES**
A. Stojković, Ž. Nikitović, A. Strinić, V. Stojanović, M. Radmilović-Radjenović, Z.Lj. Petrović
Institute of Physics, Belgrade, Serbia and Montenegro

P.S.C.25. **PHYSICAL AND MECHANICAL PROPERTIES OF ZIRCONIA AND ALUMINA-BASED NANOCOMPOSITES SINTERED AT HIGH PRESSURES**

V.S. Urbanovich[1], A.V. Chuevski[1], A.V. Kopylov[1], T.M. Ulyanova[2],
G.P. Okatova[3], K.I. Yanushkevich[1]
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P.S.C.26. **THE EFFECT OF HIGH PRESSURE AND HIGH TEMPERATURE ON PHASE COMPOSITION AND STRUCTURE OF AMORPHOUS SILICON NITRIDE NANOPOWDER AND NANOCOMPOSITES BASED ON AMORPHOUS SILICON NITRIDE**

V.S. Urbanovich[1], R.A. Andrievski[2], S.S. Turbinski[1], A.V. Kopylov[1]
[1]Institute of Solid State and Semiconductor Physics, National Academy of Sciences, Minsk, Belarus, [2]Institute for Problem of Chemical Physics, Russian Academy of Sciences, Moscow Region, Russia

P.S.C.27. **INFLUENCE OF THE DC CURRENT ANNEALING TREATMENT ON MAGNETOTRANSPORT PROPERTIES IN SOFT-MAGNETIC ALLOYS WITH AMORPHOUS PRECURSORS**

N. Mitrović[1], S. Roth[2], Sh. Kane[3]
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P.S.C.28. **SYNTHESIS OF $MnFe_2O_4$ NANOPARTICLES BY MECHANOCHEMICAL REACTION**

P. Osmokrović[1], Č. Jovalekić[2], D. Manojlović[3], M.B. Pavlović[1]
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[2]Center for Multidisciplinary Studies, Belgrade, [3]Faculty of Chemistry, Belgrade

P.S.C.29. **ELECTROREDUCTION OF OXYGEN ON NANO-STRUCTURED C/Pt CATALYST IN ACID SOLUTIONS**

Lj. Gajić-Krstajić[1], N. Krstajić[2]
[1]Institute of Technical Sciences of SASA, Belgrade, [2]Faculty of Technology and Metallurgy, University of Belgrade, Serbia and Montenegro

SYMPOSIUM D: COMPOSITES

P.S.D.1. **INTERACTION OF MATERIALS IN OPTICAL FIBER SENSORS**
S. Pantelić
Institute of Security, Belgrade, Serbia & Montenegro

P.S.D.2. **NON-HOOKEAN ELASTIC BEHAVIOR OF UNIDIRECTIONAL EPOXY MATRIX COMPOSITES WITH CARBON FIBRES OF DIFFERENT BREAKING STRAIN**
I.M. Djordjević, D.R. Sekulić, M.M. Stevanović
Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

P.S.D.3. **MODIFICATION OF DYNAMIC PROPERTIES OF THE SBR RUBBER COMPOSITES WITH SILICA FILLERS**
N.L. Lazić[1], J. Budinski-Simendić[2], M.B. Plavšić[3]
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P.S.D.4. **THE APPLICATION OF DSC METHOD IN MONITORING THE RETICULATION PROCESS OF AQUEOUS POLYURETHANE SYSTEMS**
S. Cakić[1], Č. Lačnjevac[2], J. Stamenković[1], Lj. Rašković[1], M.B. Rajković[2]
[1]*Faculty of Chemical Engineering, Leskovac, Serbia and Montenegro,* [2]*Faculty of Agriculture, Zemun*

P.S.D.5. **POTENTIALS OF FCC UNIT CELL IN PREDICTIVE MODELING OF THE MECHANICAL PROPERTIES OF SPHERE REINFORCED PARTICULATE COMPOSITES AND SOLIDS WITH SPHERICAL VOIDS**
I. Balać[1], M. Milovančević[1], C.Y. Tang[2], C.P. Tsui[2], P.S. Uskoković[3]
[1]*Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia and Montenegro,* [2]*Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, P.R. China,* [3]*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade*

P.S.D.6. **EARLY DAMAGE DETECTION IN COMPOSITE TUBES BY USING EMBEDDED OPTICAL FIBERS**
D. Perreux[1], F. Thiébaud[1], L. Farines[1], D. Chapelle[1], Lj. Brajović[2], D. Stojanović[3], P.S. Uskoković[3], R. Aleksić[3]
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P.S.D.7. **X-RAY DIFFRACTION ANALYSIS OF ORDINARY PORTLAND CEMENT**

CLINKER BASED ON FLY ASH

N. Jovanović[1], A. Rosić[2], Lj. Kandić[2], B. Živanović[1], M. Logar[2], Lj. Petrašinović-Stojkanović[1], M. Komljenović[1]
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P.S.D.8. **STRUCTURAL AND DIELECTRIC PROPERTIES OF $BaTi_{1-x}Sn_xO_3$ CERAMICS**

S. Marković[1], M. Mitrić[2], N. Cvjetićanin[3], Ž. Andrić[2], D.P. Uskoković[1]
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P.S.D.9. **INFLUENCE OF COOLING CONDITIONS AND AMOUNT OF RETAINED AUSTENITE ON THE FRACTURE OF AUSTEMPERED DUCTILE IRON**

V. Goryany, P.J. Mauk
Institute of Applied Materials Technology (IAM), University of Duisburg-Essen, Duisburg, Germany

SYMPOSIUM E: BIOMATERIALS

P.S.E.1. **NANO DESIGN OF BIPHASIC CALCIUMPHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLIDE, AS COMPOSITE BIOMATERIALS FOR HARD TISSUE RECONSTRUCTION**

N. Ignjatović[1], D. Vasiljević-Radović[2], J. Vukelić[3], D.P. Uskoković[1]
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[2]IChTM- Center for Chemistry, Belgrade, [3]Faculty of Physical Chemistry, Belgrade

P.S.E.2. **PROCESSING OF BIPHASIC CALCIUMPHOSPHATE/ POLY-DL-LACTIDE-CO-GLYCOLIDE COMPOSITE BIOMATERIALS THROUGH COLD AND HOT PRESSING**

N. Ignjatović[1], M. Mitrić[2], Z. Nedić[3], D.P. Uskoković[1]
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P.S.E.3. **XRD ANALYSIS OF CALCIUM PHOSPHATE AND BIOCOMPOSITE CALCIUM PHOSPHATE/BIORESORBABLE POLYMER**

Lj. Kandić[1], M. Mitrić[2], N. Ignjatović[1], D.P. Uskoković[1]
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P.S.E.4. **SYNTHESIS AND RHEOLOGICAL CHARACTERIZATION OF CALCIUM PHOSPHATE/POLY -(D,L-LACTIDE-CO-GLYCOLIDE) BIOCOMPOSITE PASTES**

V. Manojlović[1], J. Djonlagić[2], N. Ignjatović[1], D.P. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia and Montenegro
[2]Faculty of Technology and Metallurgy, University of Belgrade

P.S.E.5. **RADIOLOGICAL AND CLINICAL ASSESSMENT OF THE RESTORATION OF ALVEOLAR BONE DEFECTS TREATED WITH BIPHASIC CALCIUM PHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLID COMPOSITE**

Z. Ajduković[1], D. Petrović[2], N. Ignjatović[3], D. Mihailović[4], V. Savić[5], S. Najman[5], S. Petrović[6], D.P. Uskoković[3]
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P.S.E.20. *IN VITRO* INTERACTION BETWEEN BONE MARROW CELLS AND BIOCOMPOSITE Hap/PLLA

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Abstracts

Oral Presentation

PL.S.I.1

DYNAMIC OBSERVATIONS OF THE GROWTH OF NANOSTRUCTURES

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Nanostructures created spontaneously during vapour or liquid phase deposition have exciting possibilities as components of novel devices. For vapour phase deposition, various types of microscopy have been used to observe the formation of nanostructures in real time and have yielded useful information on growth mechanisms. However, growth from the liquid phase has been less amenable to study using real time microscopy. In this presentation I will describe transmission electron microscopy observations of the growth of nanostructures from the liquid phase, obtained by making use of a novel specimen geometry or by modifying the microscope itself. I will show two examples: the growth of semiconductor nanowires by the vapour-liquid-solid process, in which a droplet of liquid on a crystal surface acts as a catalyst for wire growth, and the formation of copper clusters on an electrode during electrochemical deposition from a copper sulphate solution. In each case I will show that quantitative information can be obtained which enables us to understand the details of the growth process, allowing us potentially better control of nanostructures in systems which are relevant to the microelectronics industry.

PL.S.I.2

FIB AND IN SITU TEM STUDIES OF ANISOTROPIC PROPERTIES OF A HIGH-K DIELECTRIC OXIDE

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One of the most challenging aspects in advancing micro-electronic integrated circuits concerns the replacement of materials making up the core of the transistors. It is thought that the traditional gate oxide (silica) must give way to a high-k dielectric oxide which is compatible with its surroundings and stable to processing. Candidate metal oxides crystallize relatively easily, and their structures are not symmetrical which could lead to anisotropic properties. In this paper we describe basic studies of the crystallization behaviour of one such oxide (tantalum pentoxide) using in situ transmission electron microscopy (TEM) and show how capacitance measurements can be made on individual crystals using a combination of a focused ion beam machine (FIB) and TEM. The FIB can also be used in novel ways to generate samples of complex capacitor structures for electron tomography and for depositing metals as contacts.

PL.S.I.3

ATOMIC-LAYER ENGINEERING OF HIGH-TEMPERATURE SUPERCONDUCTORS AND OTHER STRONGLY CORRELATED OXIDES

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We have built a 'next-generation' molecular beam epitaxy (MBE) system for atomic-layer engineering of complex oxides, integrating some state-of-the art surface-science tools for the first time.[1] The main (growth) chamber is equipped with (i) 16 metal atom sources, (ii) pure ozone source (providing high oxidation power in high vacuum), (iii) scanning quartz-crystal rate monitor (QCM), (iv) 16-channel atomic absorption spectroscopy system, (v) scanning RHEED, (vi) low-energy electron microscope (LEEM/PEEM/LEED), and (vii) time-of-flight ion scattering and recoil spectroscopy (TOF-ISARS) system. These tools provide the film grower an unprecedented level of information on surface morphology, chemistry, and crystallography, in real-time (during film deposition).

Leveraging on this capability, we have reproducibly synthesized thin films of high-temperature cuprate superconductors (HTS) with rms surface roughness in the range 0.2-0.5 nm, much less than the unit cell height (1-2 nm).[2] This technology has in turn enabled fabrication of precise and uniform hetero-structures, superlattices, and trilayer (sandwich) junctions, some of which contain barriers or superconducting layers that are just one-unit-cell thick and yet have no pinholes over macroscopic areas.[3] Apart from practical interest, these films and devices allow one to probe some fundamental physics questions.[3-5]

In terms of hetero-epitaxial growth, we have also studied the effects of epitaxial strain in other complex oxides, including titanates and manganites. We have observed interesting effects on transport, crystalline structure and even the stoichiometry of the films grown under identical thermodynamic conditions. We have also achieved epitaxial stabilization of novel phases – crystalline structures that normally do not form in nature in bulk form, for example, $SrMnO_3$ in perovskite structure. The same is true for precise superlattices of various phases, where the two component compounds alternate on the scale a fine as a single unit cell.

In the end, I will discuss the challenges for the future, including positioning an ALL-MBE system at a synchrotron beamline to enable in-situ study of pristine surfaces with the desired atomic-layer termination.

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[1] I. Bozovic, "Atomic-Layer Engineering of Superconducting Oxides: Yesterday, Today, Tomorrow", *IEEE Trans. Appl. Superconduct.* **11**, 2686 (2001).

[2] I. Bozovic, G. Logvenov, I. Belca, B. Narimbetov and I. Sveklo, "Epitaxial Strain and Superconductivity in $La_{2-x}Sr_xCuO_4$ Thin Films", *Phys. Rev. Lett.* **89**, 10701 (2002).

[3] I. Bozovic, G. Logvenov, M. A. J. Verhoeven, P. Caputo, E. Goldobin and T. H. Geballe, "No mixing of superconductivity and anti-ferromagnetism in a high-critical-temperature superconductor", *Nature* **422**, 873 (2003).

[4] P. Abbamonte, L. Venema, A. Rusydi, G. A. Sawatzky, G. Logvenov and I. Bozovic, "A Structural Probe of the Doped Holes in Superconducting Cuprates", *Science* **297**, 581 (2002).

[5] I. Bozovic, G. Logvenov, M. A. J. Verhoeven, P. Caputo, E. Goldobin and M. R. Beasley, "Giant Proximity Effect in cuprate superconductors", *Phys. Rev. Lett.* **93**, 157002 (2004)

PL.S.I.4

SURFACE MANIPULATION AND ASSEMBLIES OF QUANTUM DOTS FOR CHEMO- AND BIOSENSING

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Semiconducting (e.g. CdS, CdSe, and CdSe/ZnS) and metallic (Au) nanoparticles were investigated for use as luminescent probes. The particles were synthesized through arrested precipitation techniques and functionalized/stabilized with different organic molecules including thioglycolic acid, amino acids, peptides and peptidolipids. Quantum dots-based sensing devices were successfully developed for the detection of pesticides (paraoxon) and metallic ions such as Ag^+ and Cu^{2+}. The layer-by-layer film deposition techniques, amino acid sequence design and electrostatic interactions allowed building such sensing devices. Selectivity and detection limits ranging from micro- to nanomolar concentrations were achieved. Control of nanoparticles supramolecular organization could enhance the application of quantum dot-based materials in optoelectronics or magneto chemo- and biosensors. Therefore, immobilization within hydrogel matrices and the 2D self-assembly of the quantum dots at the air-water interface were also studied. For example, particle size, surface pressure, nature of surfactant, and mized monolayer systems collectively were found to influence the packing arrangement of the nanoparticles Langmuir monolayers. Advantages of this assembly technique include establishing of limitiming nanoparticle area, easy manipulation of the films, and interparticle distance control In addition, the detection of fibril formation resulting from the aggregation of amyloid β-peptide fragments was imaged with water-soluble and highly fluorescent CdSe/ZnS quantum dots in dried films and at the air-water interface. Overall, quantum dots were successfully utilized as a signal transducer for chemo- and biosensors as well as for the monitoring of bioprocesses through imaging.

PL.S.I.5

ON THE MACROSCOPIC (DONNAN) ELECTRIC FIELD IN THE SEDIMENTATION-DIFFUSION EQUILIBRIUM OF CHARGED COLLOIDS

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Sedimentation-diffusion (SD) equilibria from analytical ultracentrifugation of well-characterized charged silica spheres in ethanol deviate strongly from a barometric profile and demonstrate the existence and substantial effects of a recently predicted internal macroscopic electric field. Experimental SD-profiles yield the spatial gradient of the electrostatic potential energy of the colloids, which clearly manifests an almost homogeneous macroscopic electric field. Electrochemical Donnan potential measurements confirm a difference in electrical potential between top and bottom of the profiles.

A 'non-barometric' limiting law derived from electroneutrality describes trends in SD-profiles quite well. Our analysis of osmotic pressures (obtained from integrating SD-profiles) beyond this simple law includes, among other things, colloid-ion attractions and extra volume terms in the free energy.

As the simple (but profound) Donnan model explains the macroscopic field - a true many body effect - at least qualitatively, it is becoming increasingly clear that 'Donnan' offers unexpected clues for the modelling of long-range many-body effects for charged colloids at low ionic strength.

O.S.A.1

ADVANCED WAYS AND EXPERIMENTAL METHODS IN SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS (SHS) OF INORGANIC MATERIALS

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Complex investigation of heterogeneous combustion and phase formation processes requires principally new methods of analysis which are completely different from the standard optical pyrometry with its high experimental errors and micro-thermocouples methods due to its low thermal inertia. The new experimental methods for investigations of phase formation during SHS have been established. The first experiments using penetrating synchrotron radiation and energy dispersive detectors for the different classes of complex inorganic materials were carried out in ESRF (Grenoble, France), LURE (Orsay, France) and Daresbury (UK). A new and very sensitive thermal imaging method (Thermal Imaging Technique (TIT)) is based on the continuous registration of the whole combustion process by using a highly-sensitive IR-camera and software developed by MIKRON Instrument Co. (USA) was also used for precise registration of the combustion parameters. SHS were performed on different types of pure and doped complex inorganic materials in pellet and powder form in a range of magnetic field strengths up to 20 T and dc electric field up to ±220 kV/m. Constant magnetic field was applied during the reaction, supplied either by a permanent magnet (1.1 T) or by an electromagnet (up to 20 T) and dc electric field were applied to along a direction of the combustion wave front propagation. The combine process of SHS and Selective Laser Sintering (SLS) of 3D articles for the different powdered compositions was realized with the optimal parameters of a laser influence, under which the SHS reaction carries under control regime. Author thanks the Russian President's Grant MD-216.2003.03 and RS UK-FSU Programme for financial support.

O.S.A.2

SHS OF BIOMATERIALS BASED ON Ti–Co AND Ti–Ni INTERMETALLIDES

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Biomaterials based on Ti alloys are becoming more and more widely used in medicine. An artificial bone graft acting as a scaffold for bone tissue ingrowth be biocompatible and should have interconnected pores in the range of 200-500 μm. In this work, we produced some porous materials by self-propagating high-temperature synthesis (SHS) and demonstrated their applicability as a bone implant in orthopaedy. We carried out our experiments with the Ti–Co and Ti–Ni systems containing a blowing agent (TiH_2, C_2F_4, NH_4Cl). We investigated the influence of reaction conditions (initial temperature, amount of blowing agent, sample density) on the structure and mechanical properties of resultant porous samples. The microstructure of synthesized products was investigated by SEM while the phase composition, by XRD. This work was supported by the Russian Foundation for Basic Research (project no. 04-03-32628a) and the Russian Program for Support of Leading Research Schools (grant no. 1819.2003.03).

O.S.A.3

CERIA NANOPOWDERS SYNTHESIS BY SELF PROPAGATING REACTION

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One of the methods for powder synthesis that is cost and time effective is the self-propagating room temperature synthesis(SPRT). We applied this method to synthesize for the first time rare earth doped and co-doped ceria nanopowders. Since they exhibit very high ionic conductivity at intermediate temperatures these compositions are attractive as a new generation of nanostructured ceramics applicable in solid oxide fuel cells as an electrolyte. In this paper the reaction based on methatetical pathway is described, whereby solid solution nanopowders of rare earth elements wirh ceria are obtained at room temperature. Compositions of $Ce_{1-x}Re_xO_{2-\delta}$ (Re= Y , Nd) were synthesized with x ranging from 0 to 0.25. Moreover, co-doped ceria powders with both cations were synthesized by the same procedure. The reaction course is discussed in detail. Properties of the obtained powders are presented, too.

O.S.A.4

ELECTRODEPOSITION AND MORPHOLOGY OF Co POWDER

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The process of Co powder electrodeposition from ammoniacal electrolyte is investigated. Polarization curves with and without IR drop correction were recorded and results compared. It is shown that corrected polarization curve is significantly different than uncorrected one. A current density for hydrogen evolution is determined and subtracted from the total current density in order to obtain polarization curve corresponding to Co deposition. It is shown that Co electrodeposition starts at about -1.2 V vs. SCE with sudden increase of current density up to the diffusion limiting current density of about 800 mA cm^{-2}. It is also shown that the current density for hydrogen evolution is much higher than that for Co electrodeposition in the whole range of investigated potentials. Co powder was electrodeposited at the current density of 500 mA cm^{-2} and the morphology of its particles is investigated by SEM. It is shown that generally two different types of particles are obtained: fern-like dendrites, varying in the size from 5- 50 μm and big agglomerates, all of them varying in the size from 200 – 500 μm. For agglomerates three types are detected: compact agglomerates, spongy agglomerates and ball-like agglomerates. Characteristic of all agglomerates is the presence of deep cavities on their surfaces. Some of them (particularly ones obtained on ball-like agglomerates) were characterized by the presence of fern-like dendrites on their bottom. The mechanism of their growth is also discussed.

O.S.A.5

ELECTRICAL CHARACTERIZATION OF THE GRAIN BOUNDARY REGION OF SnO_2 VARISTORS

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The effect of Co, Cr and Nb on the electrical properties of the grain boundaries of SnO_2-based varistors was investigated. The powders were prepared by the method of evaporation and decomposition of solutions and suspensions. The varistor samples were obtained by uniaxial pressing followed by sintering at 1300°C for 1h. Electrical properties of the grain boundary region, such as resistance (R), capacitance (C) were determined using ac impedance spectroscopy in temperature interval 23-450°C. Activation energies for conduction (E_A) were calculated from the Arrhenius equation. The non-linear coefficients (α), breakdown electric fields (E_b) and leakage currents (J_L) of the samples were determined from current-voltage characteristics. The potential barrier height (Φ_b) and width (ω) were calculated using the Schottky type conducting model. After comparison of the characteristic parameters for different varistor compositions it was found that the Cr/Nb ratio has a crucial influence on the grain boundary properties in SnO_2 varistors.

O.S.A.6

IMPROVED MATERIALS FOR ENVIRONMENTAL APPLICATION: SURFACTANT-MODIFIED ZEOLITES

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The removal of pollutants from wastewaters has attracted growing attention in recent years. Surfactant-modified zeolites (SMZ) are potentially applicable materials due to their excellent instantaneous pollutants adsorption. While great effort has been exerted to develop new adsorbents for nonionic organic contaminants (benzene, toluene and phenol), the adsorption of insecticides and pesticides are not widely studied.

In this paper the surface properties of zeolites modified by adsorption of different cationic surfactants (HDTMA, SDMBA and DSDMA) are investigated. Long chain cationic surfactants such as HDTMA are too large to enter the zeolite pores. Therefore, the sorption of HDTMA is exclusively restricted to the external surfaces of zeolite particles. A monolayer is formed when the surfactant concentration is equal or less than its critical micelle concentration (CMC). If the surfactant concentration in solution exceeds the CMC, the hydrophobic tails of the surfactant molecules will associate to form a bilayer or as a whole hemimicelle aggregates.
The adsorptions of common insecticides and pesticides over surfactant-modified zeolites (SMZ): natural clinoptilolite, LTA FAU and ZSM-5 zeolites were investigated.

Batch adsorption experiment was carried out to remove malathion, fenitrothion, bentazon and dichloroprop from aqueous solution using the above-mentioned organo-zeolites. The increase in pesticide concentration or initial concentrations of surfactants resulted in an increase in the pesticides adsorption by the sorbents tested in this work. At a certain concentration, DSDMA modified zeolite showed to some extent higher adsorption of solute than that of the corresponding HDTMA modified zeolite.

O.S.A.7

COMPUTER SIMULATION OF PORE COALESCENCE AND SOLID SKELETON FORMATION DURING LIQUID PHASE SINTERING

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Some phenomena such as grain growth, grain coarsening, pore filling, pore coalescence and solid skeleton are very important for microstructural evolution during liquid phase sintering. In recent years, a range of computer simulation models, which leads better understanding of liquid phase sintering phenomena, have been developed with the aim of simulating the detailed evolution of microstructure during grain growth. In that sense, two-dimensional computer-based method for simulation of pore coalescence will be developed. However, the experiments evidence both macrostructural and microstructural effects associated with gravity force. Therefore we also will develop a numerical procedure for the estimation of how much gravity will influence domain growth, domain boundary migration and solid skeleton formation due to gravity induced segregation during liquid phase sintering. The method used for the simulation of a gravity field will be based on settling procedure. Such computer generated two-dimensional microstructures can be applied for prediction of grain coarsening under Earth-based condition.

O.S.A.8

INFLUENCE OF SOLVENT POLARITY ON THE STRUCTURAL AND MORPHOLOGICAL PROPERTIES OF AgI PARTICLES PREPARED USING ULTRASONIC SPRAY PYROLYSIS

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Silver iodide particles were synthesized in the process of ultrasonic spray pyrolysis using aqueous solutions of thermodynamically stable silver iodide clusters as precursor. The AgI particles were collected in solvents of different polarities such as water, 2-propanol and toluene. In order to study influence of solvent and aging time on the morphological and structural properties of the AgI particles ultra-filtration was employed to isolate solid material from solution. The scanning electron microscopy showed that morphology of the AgI particles is different for different solvents. The AgI particles with hexagonal/triangular shape were obtained in water and toluene, while in 2-propanol hollow spheres were formed. The X-ray diffraction analysis, besides wurtzite hexagonal and zinc blende cubic phases, revealed appearance of tetragonal high-pressure AgI modification for sample collected in toluene and for sample aged in 2-propanol. The aging in toluene induced transformation of all three AgI modifications into single phase with one preferred orientation.

O.S.A.9

LUMINESCENCE OF YAG:Ce $^{3+}$ POWDERS OBTAINED *via* SPRAY PYROLYSIS

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The yttrium-aluminum garnet phase (YAG) represents a suitable host material for solid-state lasers and is widely used for various display applications being doped with rare-earth ions. Introducing of Ce^{3+} ion as a luminescence centre transforms it from insulating to effective phosphor material capable to emitting radiation in visible spectrum. Superior luminescence performance is a result of the scope of the luminescence center- host lattice interactions and is primarily based on the material structure characteristics. These are related to the certain crystal structure formation and uniform distribution of the luminescence center. Recently, we have shown that YAG:Ce powders obtained *via* aerosol route posses demanded properties since this process enables generation of the uniformly shaped and sized particles. Additionally, the diversity of options through the process allows control of the particle surface morphology and compositions of the nano-clustered structure. However, the powder luminescence data recorded during radioluminescence (RL) and thermoluminescence (TL) measurements indicated that the cerium ions are not readily accommodated in the garnet lattice so resulting radiation is almost entirely dominated by variety of independent defects steadying in the garnet matrix. In continuation of this, a new set of luminescence measurements will be performed with the purpose to achieve better accommodation of Ce^{3+} ions into host lattice sites. The combinations of different analysis techniques (XRD, SEM/EDS, TEM, TL and RL measurement) will be used to supply information about the detail powder properties. The effects of both processing parameters and post annealing treatment conditions will be discussed from the viewpoint of establishing the best relationship between produced YAG:Ce crystal structure and the luminescence response.

O.S.A.10

ELECTRONIC STRUCTURE OF NEW TERNARY INTERMETALLIC COMPOUNDS: THEORY AND EXPERIMENT

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X-ray photoelectron, emission and absorption spectroscopy have been used to study the electron structure and valence state of new ternary intermetallic compounds, which crystallize in the $CeGa_2Al_2$ and $HfFe_2Si_2$ structures. X-ray emission spectra of M and Si atoms in $R.E.M_2Si_2$ (M=Fe, Co, Ni, Cu) compounds have been investigated and density of the total and partial electron states in this phase has been calculated within the selfconsistent LMTO method. The calculations of electron energy bands E(k) and partial DOS for $R.E.M_2Si_2$ compounds were performed by the semi relativistic linear muffin-tin orbital method without considerations of spin-orbit interactions. The eigenvalues were calculated at 244 points within a 1/16 Brillion zone. The exchange potential of Barth and Hedin was taken into account during the calculations. The analysis of the valence electron energy distribution was carried out using the K- and L-X-ray emission spectra of M-elements and Si. Effective filling numbers of electrons in different bands of components in $R.E.M_2Si_2$ compounds have been calculated. L_{III}-absorption spectra of Ce(Yb) in ternary $Ce(Yb)M_2Si_2$ compounds were obtained at 78K and 300K using a tube spectrometer equipped with an RKD-01 co-ordinate detector. The mixed valence state of Ce (Yb) was obtained in the investigated compounds.

O.S.A.11

MAGNETOEXCITONS IN TYPE-I AND TYPE-II SELF-ASSEMBLED QUANTUM DOTS AND QUANTUM-DOT MOLECULES

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The model of exciton states in type-I and type-II self-assembled quantum dots and quantum-dot molecules in the normal magnetic field is presented. The strain distribution is extracted from the continuum mechanical model, while the 8-band **k**.**p** theory is employed to calculate single particle states. Exciton states in InAs/GaAs ans InP/InGaP quantum dots are extracted from the exact-diagonalization-type approach. The spacer thickness is varied to explore variation of the electron and hole localization with the magnetic field. Angular momentum transitions in the ground state are found. Furthermore, Zeeman and diamagnetic contributions to the exciton energy are resolved and the results are compared with the photoluminescence measurements. Finally, the oscillator strength is computed as it varies with the magnetic field, and the reversals from dark to bright exciton are identified.

O.S.A.12

FORMATION OF ZrO_2/Al_2O_3 SOLID SOLUTIONS IN NANOCRYSTALLINE POWDERS

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Zirconia nanopowders containing up to 30 mol% Al_2O_3 were prepared by two different techniques: i) chemical vapor synthesis (CVS) and ii) wet-chemical synthesis (WCS). The as-synthesized CVS nanopowders with up to 15 mol% Al_2O_3 are crystalline, whereas all as-synthesized WCS nanopowders and the CVS nanopowder with >15 mol% Al_2O_3 are amorphous and crystallize during annealing. The crystallization temperature increases with Al_2O_3 content. Alumina stabilizes the tetragonal or cubic ZrO_2 phase, by Zr^{4+} cation substitution with Al^{3+} and formation of ZrO_2/Al_2O_3 solid solutions. Structural analysis of the corresponding XRD data was done by Rietveld refinement. It is shown that, in both CVS and WCS nanopowders, composition and stability of ZrO_2/Al_2O_3 solid solutions depend on annealing temperature and alumina content. Solubility of Al^{3+} in ZrO_2 decreases with increasing annealing temperature and decreasing alumina content. Even two different synthesis techniques were used, the similar solubility limit of at elevate temperature is observed in both nanopowders.

O.S.A.13

SYNTHESIS, STRUCTURAL AND LUMINESCENT PROPERTIES OF Gd_2O_3-SiO_2:Eu^{3+} NANOPOWDER COMPOSITES

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In view to improve the luminescent intensity in classical phosphors different new techniques of synthesis are developed. One of them is sol-gel technique for nanopowder synthesis. Applied to a binary system Gd_2O_3-SiO_2 doped with trivalent europium ion a very fine powder form samples have been obtained. In that case the emission intensity of $^5D_0 \rightarrow F_2$ electronic transition of $4f^6$ configuration is greatly enhanced compared to a bulk oxide. The lifetime measurements are given too. The size of nanoparticles is of about 10 nm, determined by transmission electron microscopy and dynamic light scattering. The structural data are obtained by means of XRD and IR spectroscopy.

O.S.A.14

MICROWAVE DIELECTRIC RELAXATION OF MONTMORILLONITE DOPED WITH 12-TUNGSTOPHOSPHORIC ACID

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Dielectric relaxations of Al-pillared montmorillonite clay (PILC MM) doped with 12-tungstophosphoric acid hexahydrate (WPA-6) were investigated at microwave frequencies (X-band) in the temperature interval from 296 to 350 K. This temperature interval was chosen since WPA-6 is stable in this range. Doping of PILC MM with WPA-6 was done by using sol-gel procedure. Measurements were made on compressed powder specimens.

Dielectric relaxation spectra were registered and possible relaxation mechanisms are discussed. Conductivity relaxation energy was determined.

PL.S.II.1

CORE-SHELL STRUCTURE FORMATION BY SOLID STATE REACTION

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Core-shell particle structures have received considerable recent attention because it has been demonstrated that the shell can significantly alter the core properties. Our investigation of an Al-Sc-Zr alloy has shown that a core-shell structure may be responsible for the modification of properties in a precipitate-hardened alloy system. It was demonstrated that the precipitates contained Sc and Zr, but that the distribution of Zr was not homogeneous. Instead, a Zr rich shell surrounded an Al_3Sc core. High-resolution Z-contrast images show that the highest contrast occurs at the $Al_3(Sc,Zr)$/Al matrix interface and that the contrast in the core is substantially higher that in the surrounding Al-rich matrix. It is also apparent that the precipitate is ordered, since only every other {002} plane is occupied by the heavy Sc or Zr solute atoms in the $L1_2$ structure, resulting in a fringe periodicity of 0.405nm. Since the HAADF-STEM images are obtained using collection angles between 60 and 100 mrad, the observed contrast can simply be interpreted in terms of differences in atomic number, i.e. the difference in Sc and Zr concentration in the core and shell of $Al_3(Sc,Zr)$ precipitates. Employing the simple correlation $\sigma \sim Z$, where σ is intensity, Z the atomic number and β a constant, and using the surrounding Al matrix as an internal standard, it is possible to estimate the Sc and Zr content in the core and shell as $Al_3(Sc_{.94}Zr_{.06})$ and $Al_3(Sc_{.03}Zr_{.97})$, respectively. These results indicate rapid initial formation of a Sc rich $Al_3(Sc,Zr)$ core followed by formation of a Zr rich $Al_3(Zr,Sc)$ shell which acts as a diffusion barrier and consequently modifies the growth rate of the Sc rich core.

PL.S.II.2

PARTICLE SPLITTING IN Ni ALLOYS

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The late stages of coarsening of coherent solid particles are strongly influenced by the reduction of elastic strain energy. This produces migration and alignment of particles as well as some other effects. In this investigation, the origin of the so called splitting pattern arrangement of γ’ precipitate particles, an arrangement which has often been interpreted as being due to splitting of a larger particle into smaller ones, has been studied. The two-particle relationship as to whether they are in-phase or out-of-phase is examined by means of a translation order domain analysis of high resolution electron microscopy images along a zone axis parallel to [001]. Ni alloys have been used for investigation including a binary Ni-Al alloy (producing different volume fractions) and two commercial multicomponent alloys with high volume fraction. About 72% of two-particle pairs forming the splitting configuration are in the out-of-phase relationship, indicating that adjacent pairs are randomly formed and that they are not formed by splitting of a large particle. In addition, an elasticity analysis shows that the elastic interaction energy of two γ’ particles exhibits a minimum at a certain separation distance along <100>. Thus grouping of particles in arrays can be explained on the basis of particle migration. On the other hand, it is shown that on the basis of a simple consideration of the elastic energy and the corresponding surface energy involved in an interfacial fluctuation that splitting is not an spontaneous phenomenon.

PL.S.II.3

PLASMA PROCESSING AND DIAGNOSTICS FOR BIO-SURFACE ENGINEERING

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Plasma processing offers considerable scope for the development of biomaterial surfaces and coatings with control of surface features and properties possible at the nanoscale. However, advances depend on detailed understanding of process plasmas and their interactions with surfaces in order to engineer the required electrical, mechanical and biological properties. We have undertaken detailed studies of noble and noble-halogen gas plasmas, at low and high power density, and their interactions with surfaces for applications in biomedical micro-electrode fabrication and bio-sensors. Hydrocarbon and carbon plasmas are used for deposition of diamond-like carbon and carbon nanotubes, the former of particular benefit for biocompatibility in implantable medical devices while the latter has potential applications in high sensitivity bio-electrodes and impedimetric bio-sensors. We have studied the growth of such materials using a range of techniques, such as RF PECVD, Filtered Cathodic Arc and more recently by microwave-ECR PECVD and have investigated the possible relationship between surface electrical/mechanical properties and the influence on cell growth and protein attachment. The focus of this talk is to highlight some of the more important issues in the disparate fields of plasmas and materials for successful bio-surface engineering.

PL.S.II.4

COULOMB BLOCKADE AND TUNNELLING MAGNETORESISTANCE IN INSULATING NANOSTRUCTURED MAGNETIC MATERIALS

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For most of the twentieth century, microelectronics (electron transport) and magnetism (electron spin) have mostly been treated as independent research fields. With the dawn of the new millennium, spin electronics –or *spintronics*– has emerged as a novel discipline that exploits electron spin in order to differentiate electrical carriers into two different types. In this talk we will review some of the phenomena appearing when electron transport takes place in insulating materials containing magnetic nanoparticles, paying special attention to the so-called Coulomb blockade and tunnelling magnetoresistance. Results will be compared to metallic magnetic nanostructures showing giant magnetoresistance, for which the physical scales are smaller than or comparable to the spin diffusion length.

PL.S.II.5

ADVANCED MAGNETIC MATERIALS: THE MATERIALS SCIENCE OF FERROMAGNETIC L1o INTERMETALLICS

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The L1o ordered intermetallic phases most prominently represented by the FePt, FePd, CoPt and Mn-Al-base magnetic alloys have been the focus of intense theoretical and experimental work over the past decade. These materials derive their extraordinary properties primarily from the high magnetocrystalline anisotropy exhibited by the tetragonal phases which produces an "easy" c-axis and are projected for a myriad of futuristic applications in thin film devices of various configurations, permanent magnets and magnetic recording media in diverse technologies including MEMS, NEMS, spintronics as well as the dental and medical fields. This talk will review the salient structure-properties-processing relationships characterizing the magnetic behaviour of these novel ferromagnets including the nature of the phase transformations controlling the evolution of unique microstructures and defect structures which emerge during heat treatment and thermomechanical processing. Also included in the discussion will be new work related to L1o-base ferromagnetic shape memory alloys (FSMA's) in the Co-Ni-Al system.

PL.S.II.6

INFLUENCE OF EXTERNAL FACTORS ON AMORPHOUS AND NANOCRYSTALLINE SOFT MAGNETIC ALLOYS STUDIED BY MÖSSBAUER SPECTROMETRY

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In this paper, a review of recent ^{57}Fe Mössbauer Spectrometry (MS) studies of external influence on the properties of amorphous and nanocrystalline Fe-based alloys is submitted. Different types of Fe-based alloys (FeCuNbZr, FeCuNbSiB, FeAlPCbSiGa and FeCoCuNbB) in the form of original amorphous and nanocrystalline ribbons were subjected to different external factors: temperature, different annealing atmosphere, mechanical stress (for example influence of ball-milling) and tensile stress. It will be shown that the Mössbauer Spectrometry is a suitable tool for such studies because the measured spectral parameters are very sensitive to the changes in the vicinity of the probe ^{57}Fe-nuclei and thus, this technique provides a wide variety of information about structural and magnetic behaviour of Fe-containing materials. The most sensitive parameters were hyperfine magnetic field in crystalline component, average hyperfine field in amorphous component and direction of net magnetic moment. External factors modified amorphous as well as nanocrystalline structure, which was determined by MS phase analysis.

PL.S.II.7

MAGNETIC BEHAVIOUR OF RARE-EARTH-TRANSITION METAL COMPOUNDS

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Magnetic measurements, XPS studies and band structure calculations were performed on RM_2, RM_5 R_2M_{17} and $R_2M_{14}B$ compounds, where R is a rare-earth and M = Fe, Co or Ni. These systems are used for technical applications as high energy permanent magnets, magnetostrictive devices or hydrogen storage. The magnetic behaviour of M elements are analysed. The appearance of induced cobalt and nickel moment at critical fields of 60 T and $\cong$ 40 T, respectively is discussed. Iron shows a relatively small variation, Δm, as function of exchange field: $\Delta m/\Delta H_{exch} = (20\cdot10^2)^{-1}\mu_B/T$. The ratio, r, between the number of spins determined from Curie constants and saturation magnetizations, for M metals, follows a linear dependence as functions of the reciprocal exchange field. Models for analyzing the above behaviour are presented. The effects of local 4f-5d and short range 5d-3d interactions on 5d band polarization were analysed. The first contribution is proportional to De Gennes factor while the second one is determined by the number of M atoms situated in the first coordination shell to a given R atom, as well as their magnetic moments.

O.S.B.1

PHONON SPECTRA OF THE ALKALI METAL SULFIDES

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The prediction of the existence and stability of (meta)stable phases in a chemical system is usually realized via a two-step process: 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. 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 at $T = 0$ K. However, at $T > 0$ K, the relevant quantity is the free energy of the structure candidate, where the contribution of the vibrational excitations needs to be taken into account.

Since, by assumption, the compound under investigation does not yet exist, it is necessary to calculate the phonon spectrum using ab initio methods. In this work, we have computed the phonon density of states and the elastic constants for structure candidates in the alkali metal sulfides, using the ab initio code CRYSTAL2003 and the program PHON as tools implemented in the script programs Hartree-P and Hartree-T, and compared the results with experimental data when possible.

O.S.B.2

CHANGE OF ELECTRONIC STRUCTURE AND PROPERTIES OF NON-STOICHIOMETRICAL SOLIDS

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Experimental and theoretical foundations of electronic structure and related properties, of oxides and fluoride solids are presented this communication. Ab initio approach and ways of prediction of spectral, dielectric, magnetic etc properties of oxide and fluoride compounds were discovered during study. The following tasks are focused:

- change of the electronic structure of doped samples;
- relation of the crystalline structure, electronic structure and spectral properties of the non-stoichiometrical crystals;

Change of the physical properties of the crystals and separate results of employment of non-stoichiometrical solids are discussed, too.

O.S.B.3

A STUDY OF WATER INFLUENCE CO ADSORPTION AND OXIDATION ON NANOCRYSTALS OF γ-Fe_2O_3 AND $Mn_x\ Zn_{1-x}\ Fe_2O_4$

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Catalytic oxidation of carbon monoxide at low temperature finds practical applications in several devices. Active catalysts are used in closed-cycle CO_2 lasers, in gas sensors for detection of trace amounts of CO in air, in CO safety masks, etc. The surface processes are influenced by the presence water vapor, which may alter the response to the CO adsorption and oxidation. The effect of humidity on CO adsorption can play a fundamental role in application the catalysts or active supports. In this paper the adsorption and oxidation of CO on nanocrystalline γ -Fe_2O_3 and the series of mixed ferrite with composition $Mn_x\ Zn_{1-x}\ Fe_2O_4$ is investigated. A temperature programmed desorption (TPD) study of the water and CO interaction with nanocrystalline adsorbents is presented. Nanocrystalline adsorbents are prepared by co-precipitation method and characterized using X-ray diffraction (XRD), specific surface (BET), transition electron spectroscopy (TEM) and magnetization measurements. The low-temperature oxidation of CO promoted by a noble metal supported on investigated systems is also studied.

O.S.B.4

OPTICAL PROPERTIES OF PTCDA BULK CRYSTALS AND ULTRATHIN FILMS

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Thin films and interfaces of crystalline organic dyes with semiconducting properties attracted a lot of attention in the last decade due to their numerous applications in electronics and optoelectronics. One of the most studied molecules is 3,4,9,10-perylene-tetracarboxylic-dianhydride (PTCDA); archetypal organic material that can grow into multilayer films. Despite the large interest and intensive investigations, its optical properties are still not completely understood. The interpretations range from Wannier-Mott exciton model to models of excitons of small radii. In the present work, we apply Frenkel exciton model in order to describe the optical behaviour of the solid phase of PTCDA, influenced by the transfer of excitations between different molecules. We are able to model the anisotropy of dielectric tensor, the lineshape of the complex index of refraction, the exciton dispersion and the large Stokes shift between absorption and photoluminescence, the results of electron-energy loss spectroscopy, and photoluminescence transition energies and decay times. In addition, we made an extension of the model towards ultrathin PTCDA films.

O.S.B.5

PHOTOINDUCED EFFECTS IN CONJUGATED POLYMER/FULLERENE BASED ORGANIC FIELD-EFFECT TRANSISTORS (photOFTEs)

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Photoactive organic field-effect transistors, photOFETs based on conjugated polymer/fullerene blend and polymeric dielectrics with top source and drain electrodes are fabricated and characterised in dark and under AM1.5 illumination. With Au as top source and drain metal contacts devices feature ambipolar transport in the dark while with LiF/Al as top source and drain contacts the devices feature unipolar, n-type transistor behaviour with electron field-effect mobility of 10^{-2} cm^2/Vs. Upon illumination, a large free carrier concentration from photo-induced charge transfer at the polymer/fullerene bulk heterojunction is created resulting in photodoping of the channel. An increase of the drain source current up to five orders of magnitude in the depletion regime was measured. A photoresponsivity of 5 A/W was observed in those devices, which is one of the highest reported so far for organic devices. The present study shows that the nature of the organic gate-insulating layer/organic semiconductor interface has a major role for the photoresponse and for transfer characteristics of the devices.

O.S.B.6

ELECTROCHEMICAL OXIDATION OF HYDROGEN AND CARBON MONOXIDE ON WELL CHARACTERIZED IRIDIUM AND IRIDIUM–TIN SURFACE ALLOY

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Iridium–tin surface alloy has been prepared using high-dose ion implantation of Sn into a polycrystalline Ir sample (previously cleaned in the UHV chamber by numerous cycles of thermal annealing and Ar^+ ion sputtering). Using the XPS, AES and LEIS techniques, tin content has been determined in the iridium surface. Surface composition determined by LEIS of ~14 at.% Sn has an identical value as "bulk composition", determined by XPS. The chemical shifts relative to the pure metals for Ir $4f_{7/2}$ and Sn $3d_{3/2}$ orbital was -0.1 ± 0.1 and $+0.9 \pm 0.1$ eV respectively which is characteristics for highly exothermic alloys. Alloy activity has been for the electrochemical oxidation reaction of hydrogen, carbon monoxide and their mixtures in the condition similar to polymer electrolyte low temperature fuel cell.

O.S.B.7

NANOSCALE TOPOGRAPHY OF GC/Pt-C AND GC/Pt-Ru-C ELECTRODES STUDIED BY MEANS OF STM, AFM AND XRD METHODS

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Electrodes, assigned as GC/Pt-C and GC/Pt-Ru-C, were formed by deposition of Pt-based catalysts (47,5 wt % Pt + high surface area carbon) and (54 wt. % Pt-Ru alloy + high surface area carbon) on glassy carbon (GC) discs. X-ray diffraction measurements were used for the determination of average crystallite size and phase composition of both catalysts. Crystallite size for Pt-C catalyst was 2.9nm for Pt-fcc. In diffraction pattern of the Pt-Ru-C catalyst two phases eg. Pt-Ru-fcc and Ru-hcp were refined using Rietveld method. Crystallite sizes were 3.9 nm for Pt-Ru-fcc and 2.8 nm for Ru-hcp. STM observations of the surface of GC/Pt-C and GC/Pt-Ru-C electrodes revealed the presence of metal particles of the size in the range 2-6 nm and Pt-C or Pt-Ru-C agglomerates in the range of several tenth of nm. The thickness of Nafion covering layer determined by AFM is ca 100 nm.

O.S.B.8

PHASE TRANSFORMATIONS IN THE ZrO_2-Y_2O_3-La_2O_3 SYSTEM AT 1250 °C

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Zirconia-based materials are used in high-temperature magnetohydrodyhamic electrodes, fuel-cells and sensors. For the fuel-cells application, the main problems are concentrating in the search of the best ion conductors by addition of complex dopants and grain boundary interface area increase. Thus, the searches of the best phases and establishing additions, which enable to improve strength, toughness, electromotive force, conductivity and other properties are in progress. The system ZrO_2-Y_2O_3-La_2O_3 contains such phases like stabilized zirconia and yttria doped $La_2Zr_2O_7$ which can be interesting candidates for the oxide ion conductor in fuel cells because their high thermodynamic stability and considerable ion conductivity at elevated temperatures.

Phase equilibria in the ternary system ZrO_2-Y_2O_3-La_2O_3 at 1250 °C have been studied and isothermal section have been developed with the purpose to determine the prospective compositions for high conductive solid electrolytes applications. Fine chemical technique such as co-precipitation was used to obtain ultrafine ceramic powders (with average particle size of 8-20 nm) available for non-isothermal sintering as well. The phase compositions of the annealed samples were studied by methods of X-ray analysis at 20 °C, petrography and electron microprobe X-ray analysis. No ternary compounds were found. The phase equilibria in the system are determined by intermediate phases: $La_2Zr_2O_7$ and $LaYO_3$ that crystallize in the pyrochlore and perovskite-type structures, respectively. Solid solutions based on the constituent oxides such as tetragonal (T) and cubic fluorite-type structure (F) ZrO_2, cubic form of rare-earth oxides (C-type) Y_2O_3, hexagonal (A) and monoclinic (B) forms La_2O_3 were found at 1250 °C. The phase of pyrochlore-type ($La_2Zr_2O_7$) is in equilibrium with all of the phases present in the system except of the B- form and δ -phase at 1250 °C. The sections $La_2Zr_2O_7$-Y_2O_3 and $La_2Zr_2O_7$-$LaYO_3$ are quasi-binary and partially quasi-binary respectively. The compound $LaYO_3$ is not stable in the binary system > 1585 °C, but under the influence of ZrO_2 its temperature range of stability expanded. Our data suggest that the composition ranges of all the phases present in the investigated system under consideration are determined by the ionic radii of Zr4+, La3+ and Y3+ in the substitution solid solutions and by the symmetry of their structures.

The features of non-isothermal sintering of stabilized zirconia and solid solutions based on pyrochlore-type are show in comparison with conventional isothermal sintering.

The nanocrystalline powders of solid solutions based on tetragonal phase deposition active densification on heating up to 1150-1400 °C and the powders of solid solutions based on lanthanum zirconate show active densification on heating up to 1550-1650 °C.

The electrical properties (at 600-950 °C) of yttria doped pyrochlore are measured, the highest conductivity has been revealed at 10 mol % Y_2O_3.

O.S.B.9

ELECTROXIDATION OF HYDROGEN ON NANO-STRUCTURED C/Pt CATALYSTS FOR POLYMER ELECTROLYTE FUEL CELL

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Pt / C catalyst were prepared by a modified polyol synthesis method in an ethylene glycol (EG) solution. The possible interaction of Pt with carbon surface groups was investigated by preparing catalysts on oxidized and non-oxidized carbon cryogel supports. Transmission electron microscopy (TEM) images show that the catalyst has the lowest mean particle size of 2.6 nm on non-oxidized carbon cryogel support. Pt nano-sized catalysts prepared on oxidized carbon cryogel and commercial Vulcan XC-72 R supports have the mean particle size of 3.4 and 3.6 nm, respectively. The hydrogen oxidation reaction (HOR) appears to proceed through an electrochemically reversible pathway at all electrodes, with exchange current densities comparable to those at supported and single crystal platinum electrodes in acidic aqueous media. Cyclic voltammetry (CV) shows that Pt supported non-oxidized carbon cryogel has larger electrochemical surface area and the highest utilization ratio of 90%, and exhibits higher HOR activity and better performance among these Pt-base catalysts.

O.S.B.10

SEM AND XRD CHARACTERIZATION OF Ni-Hf ALLOYS AT LOW Hf CONCENTRATION

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We have studied alloying and phase formation in Ni-Hf alloys with low hafnium concentration with the X-ray diffraction (XRD) technique and scanning electron microscopy (SEM). Ni-Hf samples with 0.2-, 2-, and 5-% Hf were prepared from high purity Ni (5N) and Hf (2N) in a RF oven under Ar overpressure, after the oven chamber had been cycled several times to considerably reduce the oxygen partial pressure. To achieve a homogeneous distribution the samples were turned over and remelted several times. From the known limited Hf solid solubility in Ni we expect the occurrence of different phases for the two samples with higher Hf concentrations.

Both characterization methods, XRD and SEM, revealed the presence of $HfNi_5$ phase (fcc structure) and much less of the $HfNi_3$ phase where the excess Ni atoms are present in the form of Ni or Ni-rich segregations in the sample containing 5-% Hf. The sample with 2-% Hf is characterized with the presence of the two phases present in the 5% sample and with Hf atoms which occupy substitutional lattice positions in the Ni lattice. Finally the third sample with 0.2-% Hf atoms does not give any indication for the occurrence of specific Ni-Hf phases, the Hf atoms mainly substitute for the Ni atoms in the lattice. This analysis is being complemented with additional information on the local structure around Hf by extended X-ray absorption fine structure spectroscopy (EXAFS).

O.S.B.11

STRUCTURAL AND MECHANICAL PROPERTIES OF Ti_3Al INTERMETALLICS

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A study of the microstructure and mechanical properties of three different Ti_3Al-based intermetallics produced by powder metallurgy (PM) and standard vacuum melting and casting processes has been carried out. Non-porous PM compacts were obtained by vacuum hot pressing of Ti_3Al, Nb and Mo powders. Compression tests were performed in the temperature range from 20 to 750˚C. All materials showed a positive temperature dependence of the compression yield strength. The maximum strength was attained between 250 and 300˚C after which the decrease occurs. With increase in temperature the ductility of all materials increases. Optical microscopy (OM), scanning electron microscopy (SEM), electron dispersive spectroscopy (EDS), X-ray and image analyzer were used for the characterization of the microstructure.

O.S.B.12

INTERPRETING XPS C_{1S} BINDING ENERGIES IN SILICON CONTAINING POLYMERS AND NANOPARTICLES

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A method for predicting XPS C_{1s} binding energies in polymers has been developed previously. The calculation uses partial atomic charges determined quantum chemically (by the semi-empirical AM1 Method), which are found to provide a linear correlation with the binding energies corrected by the so-called Madelung intramolecular potential. We used this method successfully for interpreting XPS spectra of partially degraded fluoropolymers. In the current contribution we investigate the possibility of developing a similar equation to describe silicon-containing polymers that are biologically and technologically important, and also some nanoparticles based on organo-silicon compounds.

O.S.B.13

NON-REGULAR CN_x CLUSTER ARRAYS GROWN BY PACVD METHOD ON H11 STEEL

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The samples made of hot work steel grade H11 were pulse plasma nitrided in hydrogen nitrogen mixture and post nitrocarburized in carbon containing discharge. Microhardness measurements, optical microscopy, SEM, Raman and XRD analyses were performed, as well as AFM surface tophography measurements. After plasma nitriding, a thin epsilon compound zone onto 150 micrometers thick diffusion layer was formed while a dense 1 micrometers thick carbonitride overcoating was grown during plasma post processing in carbon containing atmosphere. On the surface of plasma deposited hydrogenated carbon nitride films intended for tribological applications non-regular "arrays" of different size conductive clusters were found. Similar arrays architecture, when obtained intentionally, can be used for the resonant optical connections in nano and macro optics. Some coupled arrays like the fiberoptic waveides in fiber optics interferometers were also observed. Computer simulation showed that in the case of spherical Al clusters deposited onto dielectric substrate the resonant interaction of light beam with coupled arrays is possible resembling to the light beam splitter on nano scale.

O.S.B.14

MECHANISM OF CONSOLIDATION OF NANOSIZED PARTICLES IN THE SYSTEM DIAMOND — BORON OXIDE AT HIGH PRESSURES AND HIGH TEMPERATURES

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The sintering of nanosized diamond powders prepared by detonation synthesis is a topical problem of both practical tool materials science and fundamental materials science of covalent nanocrystalline ceramics. The study of the mechanism of consolidation of nanosized diamond particles in the monophase state and in compositions is one of the major courses aimed at solving the indicated problems. The experimental results of examinations of the consolidation mechanism of diamond nanosized particles in the presence of boron oxide binder are presented in the present work.

As an initial material, diamond powder with a particle size $\sim$ 6 nm was used.

Structural investigations by X-ray phase analysis and TEM showed that, in compacts obtained in the indicated temperature range, the inverse phase transformation of diamond does no occur. Boron oxide is located only in microregions. On the basis of the TEM results, it can be concluded that the consolidation of diamond particles during densification proceeds as a result of two sequential processes. (1). Formation of densified aggregates of particles without formation of continuous conjugation boundaries. Actually, local densification, which is a stage of structural preparation for further development of the process, is realized. (2). Formation of continuous boundaries of conjugation, i.e., monolithic volumes of particles in aggregates between particles. Since particles, depending on the morphology, can be bounded by the planes (111), (110), and (100), the formation of physical boundaries (of intergranular type) is determined by the conditions of conjugation of particles. The formation of such boundaries occurs mainly in the cases where particles contact along planes of the same order. In the case of contact along planes of different order, diffusion arrangement is required. In high-pressure densification, the diamond particle size and shape are retained. This indicates that, under such conditions, diffusion processes are completely suppressed.

It was established that as the densification (P = 7.5 GPa) temperature increases, the size of monolithic regions of particles increases, and their volume fraction in the mixture of densified aggregates of particles rises too. At T = 1100—1200 ^{0}C, the sizes of such regions are not larger than 10 nm, whereas at 1600—1800 ^{0}C, they attain 30 nm.

PL.S.III.1

THE DYNAMICS OF THIN ION EXCHANGE FILMS BY ATTENUATED TOTAL REFLECTANCE SPECTROSCOPY AND SPECTROSCOPIC ELLIPSOMETRY

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A chemically selective film, usually of optical quality, is a key component of optical and electrochemical sensors. We have examined the dynamics of various thin selective films by attenuated total reflectance (ATR) spectroscopy and spectroscopic ellipsometry. The ATR spectra of thin, highly absorbing films, are distorted both by reflectance and interference phenomena. Enhanced absorbance was observed under film leaky mode conditions. Spectroscopic ellipsometry provided a non-invasive method for measurement of optical constants (n(λ), refractive index; k(λ), extinction coefficient) and thicknesses of thin selective films which were conditioned in time by solvent and analyte mass transport. The methods we have developed allowed us to characterize film dynamic response, stability, and chemical-specific mass transport even to the point of quantitatively modelling both transport and structural changes.

PL.S.III.2

SPECTROSCOPIC ELLIPSOMETRY AS A TOOL FOR ON-LINE MONITORING AND CONTROL FOR SURFACE TREATMENT PROCESSES

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Modern material technology relies increasingly on processes for surface modification and coating. Generally we are lacking a possibility to monitor the progress of such processes. Thus the outcome can only be analyzed after the end of the whole process cycle. We are proposing to use spectroscopic ellipsometry (SE) as an on-line monitoring tool. As an optical method, SE is not affected by high temperatures, process gases, plasmas, etc. The virtues of SE as a monitoring tool will be demonstrated, using nitriding and coating processes as examples. We expect increased process stability and shorter development time as a practical benefit from the use of SE.

PL.S.III.3

BROADBAND DIELECTRIC SPECTROSCOPY OF INORGANIC SOLIDS

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Dielectric Relaxation Spectroscopy (DRS) probes the interaction of a material with a time-dependent electric field. The response is either expressed by the frequency dependent complex permittivity, conductivity or resistivity. The resulting charge density fluctuations are generally described by relaxations up to millimeter wavelengths. The timescale (or relaxation time) of these fluctuations depends on the sample and on the relevant relaxation mechanism. We present dielectric data covering a broad frequency range from 10 to 10^{10} Hz for some inorganic solids (hydrates, ionic conductors, semiconductors, etc.) at different temperatures between 200 and 450 K. We showed that the dielectric spectra can not be interpreted without previous characterisations of the studied compounds: knowledge of the nano- and microstructures, the crystal structure, the electronic properties, etc.

PL.S.III.4

DENSE NANOSTRUCTURED CERAMICS BY POWDER TECHNOLOGY

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Bulk silicon carbide ceramics with linear-intercept grain sizes of 55 to 70 nm and relative densities above 99% have been produced from ultrafine powder by sinter forging. This technique allows the decoupling of the kinetics of densification and grain growth which is attributed to the elimination of the large and most persistent pores by the deformation under the action of shear forces. The materials were characterized by means of mechanical strength, superplasticity and hardness measurements. The results were compared with data typical for microcrystalline silicon carbide ceramics.

PL.S.III.5

DESIGNING OF ELECTRODE PROPERTIES IN Li-ION BATTERIES

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The first commercial lithium ion rechargeable battery was produced by Sony in 1991. Ten years later, they represented 63 % of the market in the segment of portable rechargeable batteries. The key to the succes has been mainly their high energy density (150 Wh/kg or 300 Wh/L). The development of these batteries, however, continues with the same vigour as at their invention. Both positive and negative electrodes have to be further optimised or even replaced. For example, $LiCoO_2$, which is presently the most frequently used active material for the positive electrode, is very expensive and toxic. Replacement with other, less stable but cheaper materials, like nickelates, manganates, or iron phosphates, however, requires invention of new technologies to eliminate various problems imposed by these materials. On the other hand, the negative graphite electrode still suffers from exaggerated passivation leading to irreversible loss of capacity already in the first cycles.

Two novel concepts to resolve various problems associated with both negative and positive electrodes will be presented. The first one relates to surface pretreatment of active powders using various kinds of polyelectrolytes, such as gelatin, cellulose, gum arabic etc. This procedure allows designing of microstructures, including the micro-arrangement of active powder and additives (electronic conductors, binders) Furthermore, described technique has a substantial influence on the process of passive film formation and growth. The mechanisms leading to these effects will be explained. The second novel concept involves preparation of thin (several nm) conductive films around poorely conductive cathode materials, thus enhancing the material's average conductivity by several orders of magnitude. Combining this improvement with purposely introduced micro- and mesoporosity (where the pores are filled with liquid electrolyte) results in excellent mixed conductivity of the final cathode material. The practical impacts of the proposed new material's architecture are a higher energy density of the electrodes, lower electrode polarisation leading to higher capacities and higher charge/discharge rates and lower irreversible losses of capacity.

PL.S.III.6

FILMS AS CHARACTERISTIC CONSOLIDATED NANOMATERIALS

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It is well known that there are many methods of the consolidated nanomaterial preparation such as powder technology, severe plastic deformation, controlled crystallization from the amorphous state, and film/coating technique. Each method has own advantages and shortcomings. The most universal methods are powder technology and film/coating technique. However, the first one is often accompanied by residual porosity and results to preparation of specimens with not so small grain size (not lower than 20-30 nm). In this connection it is important to keep in mind that films are the characteristic type of consolidated nanomaterials. This is evident from the following reasons such as the universal composition, the possibility to obtain poreless samples with very wide interval of grain size including amorphous state and multilayer structures (superlattices). However, practically the thickness of films/coatings is limited but this disadvantage is not so important for model and theoretical considerations, notably in the size effect studies. Present review is devoted to description and analysis of new results as applied to strength, plasticity, hardness, deformation, electrical and magnetic properties, phase equilibrium and phase transformations as well as to the film nanostructure stability. New possibility to prepare films with using external additional magnetic fields are also discussed as applied to very fine nanostructure [1,2].

1. R.A. Andrievski and G.V. Kalinnikov. Synthesis and Properties of TiB_2/TiN and TiB_2/B_4C films. In "Nanostructured Thin Films and Nanodispersion Strengthened Coatings" (Eds. A.A. Voevodin et al.) Dordrecht, Kluwer Academic Publishers, 2004. – P. 175-182.
2. R.A. Andrievski, Z.M. Dashevski, and G.V. Kalinnikov. Conductivity and the Hall coefficient of nanostructured TiN films. Technical Physics Letters **30**, 11, 930 (2004).

PL.S.III.7

THE NANOSCIENCE OF FULLERENES

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One important area of research in nanoscience and nanotechnology is carbon-based physics in the form of the fullerene nanoscience. The paper starts with a brief review of fascinating medical applications of the fullerene C_{60} and its derivatives. A high efficacy of the free-radical-driven biological processes regulation becomes a basis of the molecule action. What is the origin of the phenomenon? Which properties of the molecule can be responsible for the action? The paper presents a new concept on electronic structure of this and other fullerene molecules, which can assist in looking for the answer to the question. That addresses to the problem considering particular features of the molecule odd electron behaviour, the number of which is determined by the difference between the numbers related to valence electrons and to bonds formed by atoms with each other. The odd electrons cause a particular chemical activity of the molecule atoms, which is based on two following concepts. The first concerns the grade of the interaction between odd electrons of the fullerene molecule, which takes a transient position between two limit cases of a strong (benzene molecule) and weak (carbene molecules) coupling. This results in a partial excluding of the odd electrons from the covalent bonding. Thus effectively non paired electrons by number N_D in total are a characteristic for a radical feature of the molecule while their partitioning over atoms N_{DA} exhibits individual chemical activity of the latter. Both quantities can be readily calculated within any unresricted Hartree_Fock SCF approximation. The availability of non-zero N_{DA} on the majority of the molecule atoms explains its high sensitivity to reactions with free radicals. The second concept concerns the key role of the N_{DA} quantity as a guiding factor at each sequential step of the relevant addition reactions with the participation of a fullerene molecule, so that a highly controlled *computational synthesis* can be performed. Two examples related to the $C_{60}X_k$ families (X=H, F; k=0,…60) as well as to a six-star pyrrolidone-C_{60} complex are considered. The obtained data have provided a convincing proof of the suggested approach and show the way how free radicals in a human body can interact with the fullerene molecule. Similarly, these concepts lay the foundation for exhibiting the magnetism origin in the crystals consisting of polymerized C_{60} molecules. As shown, nanoclustering of the crystal structure provides a considerable weakening of the interaction between odd electrons, so that exchange integrals, describing both the Coulomb and exchange electron interaction, become small enough to favor magnetic ordering in the body. The suggested "scally" nature of the phenomenon is well consistent with the latest experimental findings.

PL.S.IV.1

ORGANIC OPTOELECTRONIC DEVICES: PRESENT STATE AND FUTURE PROSPECTS

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Recent developments on "plastic" electronic and optoelectronic elements are reviewed. Semiconducting conjugated polymers as well as nanocrystalline inorganic semiconductors are used in composite thin films. The photophysics of such photoactive devices is based on the photoinduced charge transfer from donor type semiconducting conjugated polymers onto acceptor type conjugated polymers or acceptor molecules such as Buckminsterfullerene, C_{60} or nanoparticles. This photoinduced charge transfer can be reversible, ultrafast (within 40 femtoseconds) with a quantum efficiency approaching unity, and the charge separated state may reach metastable state (up to milliseconds at 80K). Similar to the first steps in natural photosynthesis, this photoinduced electron transfer leads to a number of potentially interesting applications which include sensitization of the photoconductivity and photovoltaic phenomena. Examples of photovoltaic architectures are discussed with their potential in terrestrial solar energy conversion. Several materials are introduced and discussed for their photovoltaic activities. Furthermore, nanomorphology has been investigated with AFM, SEM and TEM. The morphology/property relationship for a given photoactive system is found to be a major effect. Recent progress in the realization of improved photovoltaic elements with >3% power conversion efficiency is reported. Further progress in organic photoactive field effect transistors (photOFETs) will also be discussed.

PL.S.III.2

THERMAL, DYNAMIC MECHANICAL AND DIELECTRIC BEHAVIOR OF LIQUID-CRYSTALLINE LINEAR AND CROSSLINKED POLYURETHANES WITH MESOGENIC GROUP IN SIDE CHAINS

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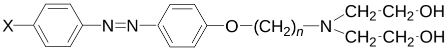
Thermotropic ordered polyurethanes were prepared from synthesized diols with mesogenic groups in the side chains based on diethanolamine derivatives



(structure of diols D1-D8: D1 (n=6, X=H), D2 (n=6, X=NC), D3 (n=6, X=NO_2), D4 (n=6, X=Ph), D5 (n=5, X=H), D6 (n=5, X=NC), D7 (n=5, X=Ph) and D8 (n=5, X=OC_8H_{17})) and three diisocyanates of various flexibility: 4,4'-hexamethylenedi(isocyanate) (HexMDI), 4,4'-methylenedi(cyclohexyl isocyanate) (HMDI) and 2(4)-methyl-1,3-phenylene diisocyanate (TDI). The polymerization of linear samples was carried out from diols and diisocyanates at the 1:1 mole ratio of OH and NCO groups in bulk state above melting temperatures of diols. Network formation process together with fully cured samples was investigated for D4/TDI system; as a crosslinker the poly(oxypropylene)triol (T1) and/or trimethylolpropane (T2) were used. The crosslinking and networks were prepared at initial mole ratios of the reactive groups, $r = [OH]_T/[NCO]_{TDI}/[OH]_{D4}$ ranging from 1/10/9 to 5/10/9 ($[NCO]_{TDI}/[OH]_{D4} = 10/9$ was constant). Polymers were investigated using the dynamic mechanical and dielectric spectroscopy, X-ray scattering, differential scanning calorimetry and polarizing microscopy. It was found: a) Thermal, dynamic mechanical and dielectric behaviour of linear polymers strongly depends on structure of diol and on the type of diisocyanate. The simplest thermal behaviour has been found for the polymers prepared from diols D1, D3 and D5; all polymers exhibit behaviour similar to that of amorphous materials. Most complex thermal properties were found for polymers based on D4 diol; e.g. for D4/TDI polymer two LC transitions were detected. b) Dynamic mechanical measurements during the curing reaction and on fully cured networks prepared from D4/TDI/T1 reactants showed that the power-law parameters, which characterize the critical gel (CG) state (gel strength *S* and relaxation exponent *n*), depend on the initial composition. Due to high flexibility and length of the triol T1 only amorphous structures were formed in these systems. On the other hand, the use of the short and stiff triol T2 in D4/TDI/T2 systems has led to the ordered structures and CG structure is determined by contribution of strong physical interactions as well as chemical junctions. The formation of the mesophase thus enhances the connectivity of the molecular structure at the gel point. Increasing the concentration of chemical crosslinks in systems (amount of crosslinker T2) makes network chains shorter and inhibits their conformational rearrangements required for ordering and makes the structure of network less ordered.

PL.S.IV.3

FATTY ACID – BASED POLYOLS AND POLYURETHANES

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Novel fatty acid polyols with primary and secondary OH groups were prepared by transesterification of triglyceride polyols with ethylene glycol. Starting polyols contained only secondary hydroxyl groups. The polyols were characterized by gel permeation chromatography (GPC), FTIR, NMR and chemical methods. New polyols had an order of magnitude lower viscosity than the starting polyols but higher reactivity. It was found that polyurethanes prepared from fatty acid polyols had comparable physical properties with those obtained the triglyceride polyols in spite of their lower functionality.

PL.S.IV.4

REVERSE-ENGINEERING NATURE IN NANOTECHNOLOGY

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The quest of nanotechnology brings the device size to the range where chemical reactions become feasible. The involvement of chemical reactions makes device actions less deterministic but also enhances the versatility and intelligence of devices. Since the body parts of living organisms, especially the human brain, are perhaps the most sophisticated devices, many investigators attempted to draw inspiration from biology. Reverse engineering biological structures thus becomes an indispensable aspect of nanotechnology. This paper discusses the essence of reverse engineering of biological structures and how the deciphered principles are implemented in nanotechnological designs. The pitfalls of reverse engineering are also pointed out.

PL.S.IV.5

ON NMR (NUCLEAR MAGNETIC RESONANCE) IN MATERIAL SCIENCES AND MATERIAL SCIENCES IN NMR

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Nuclear magnetic resonance (NMR) as a discipline has reached its maturity which is best illustrated by a series of Nobel prizes awarded to discoveries in and around it: for Physics (F. Bloch and E. M. Purcell, 1952), for Chemistry (R. R. Ernst, 1991 and K. Wüthrich, 2002) and for Physiology or Medicine (P. C. Lauterbur and P. Mansfield, 2003). NMR earned its prominence by its widespread application in medicine where it became indispensable tool for noninvasive diagnostics (MRI, MRS).

Almost every chemical element has stable isotope that can be detected by NMR. However, application is restricted to about twenty elements, either because of low abundance of active isotopes or their poor receptivity. In material science application is further reduced to nonconductive materials. In spite of these primary limitations NMR is very powerful method since it can be detected conveniently in most common chemical elements: ^{1}H, ^{7}Li, ^{11}B, ^{13}C, ^{15}N, ^{17}O, ^{19}F, ^{23}Na, ^{27}Al, ^{29}Si, ^{31}P, ^{51}V, ^{59}Co etc. Because of its ability to determine structural and dynamical properties, from atomic to macroscopic level, NMR is very popular tool in many fundamental and applied disciplines, from physics over chemistry and biology to medicine.

One can claim that in material science NMR has been applied since early days of its discovery in condensed matter, because first samples were materials easily available in the lab (paraffin, gypsum). Since then, almost any material, organic, inorganic, animate, inanimate… has been scanned by the NMR machine.

Very high technical demands to detect NMR signal have made modern NMR spectrometer (or scanner) a testing ground for new materials and technologies, starting from cryogenic and superconductivity technologies in design of high field magnets, to nano-technology and materials in synthesis of 'smart' NMR contrast agents.

In this presentation, basic NMR methods, parameters and their relationship to physicochemical properties of materials will be outlined and some application of NMR in material sciences[1, 2] and material science in NMR[3, 4] will be outlined.

PL.S.IV.6

RARE EARTH DOPED CRYSTALS FOR QUANTUM INFORMATION

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Quantum information manipulation applied to computing is a promising way to dramatically improve some complex calculations and quantum systems simulation. To date, the physical systems able to perform quantum calculations are still very rare and limited to a few quantum bits, so called qubits. It has been proposed that rare earth ions in single crystals at liquid helium temperature could provide a large number of qubits as well as mechanisms to implement multiple qubits gates. Several groups have initiated strong research efforts in this direction. Rare earth based quantum computation relies on transitions between hyperfine levels since they exhibit long coherence time (up to several milliseconds). The ratio between the inhomogeneous and homogeneous linewidths (10^7 in Eu^{3+}:$YAlO_3$) provides a very large number of individually addressable qubits. Several schemes based on optical excitation have been proposed to take advantage of rare earth-rare earth interactions in order to build quantum gates. The rare earth doped crystals needed for such applications have to meet two main criteria: ensuring a long coherence time for the rare earth hyperfine levels and allowing a large part of the ions to interact. This restricts considerably the possible materials which can be useful, considering also that the rare earth ion has to be excited by an ultra-stable laser. The case of oxide hosts will be discussed in detail. Another important point is the ability to easily manipulate individual qubits and particularly to initialize them in a definite state. This can be performed by lengthy optical pumping or directly by a coherent transfer of population between the hyperfine levels. It is well known that efficient coherent transfer is possible with three-level Λ systems. Such systems are also of considerable interest for coherent population trapping based on electromagnetically induced transparency, which has been recently demonstrated in Pr^{3+}:Y_2SiO_5. One of the practical problems which limit these three-level Λ systems is that the transition strengths of the optically pumped transitions are usually very different because of the $\Delta M_I=0$ selection rule on the nuclear spin projections. However, an appropriate external magnetic field can induce different M_I mixing in the ground and excited states and therefore release the selection rule. This effect has been studied for Pr^{3+} and Tm^{3+} ions by taking into account the magnetic interactions which appear at first and second order perturbations on the crystal field levels. We found that some orientations of the external magnetic field lead to significant improvements compared to the zero magnetic field case. Experimental results obtained in Tm^{3+}:YAG are in good agreement with theoretical predictions.

PL.S.IV.7

BORON NITRIDE SUPPORTED METAL AND METAL OXIDE CATALYSTS: INFLUENCE OF THE PREPARATION METHOD

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The use of a support that is chemically inert, stable at high temperature in presence of water vapor or poisons, hydrophobic, and a good thermal conductor is one of the corner stones of future catalysis technology. Boron nitride is known to display most of these properties. Our goal was the preparation of BN-supported noble metal (Pt, Pd, Ag) catalysts and BN-supported oxides such as Ga_2O_3, In_2O_3 and SnO_2. A comparative study of various dispersing solvents and active phase precursors has been carried out, and the resulting catalysts have been characterized, making it possible to optimize the operating parameters in order to maximize surface area and phase purity, and minimize particle size. Several solvents were tested, both inorganic (water) and organic (benzene, glyme, THF, diglyme, isopropanol, glycol), for dispersing the BN powder and precipitating the deposition of the active phase by hydrazine from acetylacetonate precursors. Higher values of the BET surface area (up to ca 230 m^2/g) were obtained in the presence of organic solvents. For the preparation of BN-supported oxides, the use of isopropanol led to a more uniform distribution of the oxide phase. For comparison, classical wetness impregnated BN powders were prepared using nitrate salts of Ga, In or Sn in aqueous solutions, giving rise to materials with lower surface areas. When preparing BN-supported noble metal catalysts, a smaller particle size was obtained in polar solvents such as glyme (ethylene glycol dimethylether) or THF (tetrahydrofurane). The samples were characterized by BET, XRD, TEM, TPR-TPO, and ammonia adsorption calorimetry for acid-base determination. Various experiments were conducted in order to test the catalytic activity and durability of the samples, in particular in presence of water vapour, thus allowing a comparison of the performances of the catalysts.

O.S.C.1

CARRIER CONFINEMENT EFFECTS IN III-N NANOCOLUMNAR HETEROSTRUCTURES AND NANOCAVITIES GROWN BY MOLECULAR BEAM EPITAXY

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Nanocolumnar III-nitride structures are gaining increasing interest, mainly because of the possibility to directly obtain nano-dimensional heterostructures for optoelectronic devices. Even though different nanocolumnar heterostructures have been successfully grown, very little is known about basic issues such as the influence of its geometry on strain distribution and on optical properties.

Carrier confinement effects in nanocolumnar AlGaN/GaN heterostructures, as well as in AlGaN/GaN nanocavities with AlN/GaN Distributed Bragg Reflectors, have been studied by photoluminescence, as a function of the Al content and quantum disc thickness and compared with theoretical calculations based on a 1D Schrödinger-Poisson solver, including polarization fields, surface potentials, and strain. An inhomogeneous biaxial (in plane) strain distribution within the GaN quantum discs, partially annihilates the piezoelectric field, giving rise to a specific carrier confinement mechanism (*strain confinement*), function of the disc thickness. The *strain confinement* mechanism affects the emission linewidth broadening and, more important, is the cause of the observed emission intensity quenching with decreasing disc thickness.

O.S.C.2

COMPOSITION DEPENDENT RESONANT RAMAN SCATTERING IN $In_xGa_{1-x}As_{1-y}N_y$ / $Al_{0.33}Ga_{0.67}As$ MULTIQUANTUM WELLS

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We report resonant Raman scattering (RRS) measurements on samples containing 50 $In_xGa_{1-x}As_{1-y}N_y$ quantum wells (MQWs) of 6 nm width having different In and N concentrations ($x \leq 0.12$ and $y \leq 0.04$). The wells are separated with 10 nm thick $Al_{0.33}Ga_{0.67}As$ barriers. The MQWs were grown on GaAs (100) substrates by plasma-assisted molecular-beam epitaxy. We observe marked changes in the GaAs-related phonons when brought in resonance with InAs-related electronic levels. These changes include a resonant asymmetric linewidth broadening as in the case of thick films, indicating localization of the N states. The N-related vibration mode around 470 cm^{-1} (some times termed LVM or Ga(In)N-like LO_2 mode) shows changes in intensity and shape when the N concentration is increased. These changes are attributed to different local bonding structures of N atoms, and do not allow for a precise determination of the N concentration, at difference with the GaAs:N system. However, a new vibration mode at 320 cm^{-1} has been observed, whose intensity scales linearly with the N concentration up to 4%. To our knowledge, this vibration mode has not been reported before. Its origin is not yet fully understood, but one can speculate with its relation to the interfaces of the MQW structure.

O.S.C.3

OPTIMIZATION OF SEMIMAGNETIC SEMICONDUCTOR-BASED NANOSTRUCTURES FOR SPINTRONIC APPLICATIONS

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We have analyzed the spin-filtering effects of the electron current in magnetically modulated $ZnSe/Zn_{1-x}Mn_xSe$ heterostructures, under the influence of both the external magnetic field and the bias voltage. In this type of semiconductor systems, conduction band electrons interact with 3*d* electrons of the magnetic Mn^{2+} ions. Because of this *sp-d* exchange interaction, an external magnetic field modulates the effective potential profile seen by spin-up and spin-down electrons, giving rise to a large Zeeman effect. It is found that the degree of spin polarization changes significantly when the electrical bias is switched from forward to reverse, thus the proposed structure displays obvious behaviour of spin-filter diode. This originates from the effective "lifting" of the potential for spin-up electrons which tunnel through actual potential barriers. Structural parameters optimization, with the goal of maximizing the spin-filtering coefficient, was performed by using simulated annealing algorithm. The described effect may be important for designing new tunable spin-based multifunctional semiconductor devices.

O.S.C.4

HIGH ENERGY PROTON CHANNELING IN A DOUBLE-WALL CARBON NANOTUBE

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We have investigated theoretically the angular distribution of 1 GeV protons channeled in a 1 μm long (5,5)@(10,10) double-wall carbon nanotube. The angular distribution was generated using the numerical solution of the proton equations of motion in the transverse plane and the computer simulation method. The Molière's expression for the continuum interaction potential of the proton and the nanotube was used in the calculations of the proton trajectories. We have analyzed separately the parts of the angular distribution generated by the protons with the impact parameters inside the nanotube of the smaller radius and in between the walls of the two nanotubes. A possible application of the results obtained for characterization of double-wall nanotubes is discussed.

O.S.C.5

NANOSCALE Gd PARTICLES IN FULLERENES

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Using ion implantation technique (introducing negatively charged fullerene into a low temperature gadolinium plasma column by a strong exial magnetic field), the gadolinium fullerenes Gd@C_{60} and Gd@C_{70} have been produced and characterized for the first time. Their existence was demonstrated through high sensitivity, magnetic mass spectrometer (TIMS – thermal ionization mass spectrometry) and MALI-TOF (Matrix assisted laser desorption time of flight mass spectrometry). These metallofullerenes were well identified as stable molecules. The corresponding endohedral ions undergo the Rice shrink-wrap mechanism demonstrated the loss of C_2 unit from the cage. The reaction of the obtained gadolinium endohedral metalofullerenes with H_2O, O_2 and N_2O in a pick-up set-up also presented. The result shows that the metallofullerenes are very inert to all of these gas phase oxygen-rich molecules, leading support to the endohedral structure of the metallofullerenes. The production of the gadolinium metallofullerenes found to be sensitive to the mixing concentration ratio of $GdCl_2$ and C_{60} or C_{70}. The relative abundance of endohedral fullerenes increases as the concentration of C_{70} to the concentration of $GdCl_2$ ratio decreases. Correlation of volatility of different rare earth elements (La, Nd and Gd) suggesting that the volatility of a metal plays an important role in a process of the metal encapsulation. Subsequent MALDI TOF mass spectral analysis of the powdered material collected from the cold parts of the ion source after completion of the reaction precisely reproduced the results obtained during the *in sity* experiments. We have ionized a mixture Gd compounds Gd@C_{60} and Gd@C_{70} by laser desorption time of flight mass spectrometer and characteristic mass spectrum with its isotope pattern is clearly observed. Observed ionization energies for Gd@C_{60} and Gd@C_{70} were 6.23 eV and 6.45 eV, respectively. Such encapsulation of Gd in carbon cage could facilitate their inert transport through biological systems and await further studies.

O.S.C.6

SYNTHESES OF FERRITES NANOPARTICLES USING ULTRASOUND IRRADIATION

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Various ferrites have been prepared using maghemite as a precursor. The suspension of maghemite and selected hydroxides were ultrasonic irradiated for various times with a high intensity ultrasound radiation (20 kHz, 600 W) by using a direct immersion titanium horn. The results show that the pH value of the suspension and the time of irradiation are the key parameters for the successful syntheses of ferrite nanoparticles.

The magnetic nanoparticles were characterized using techniques such as transmission electron microscopy, X-ray diffraction analysis and magnetic measurements. The magnetization and the size of ferrite nanoparticles gradually increase with the time of ultrasonic irradiation. Magnetic measurements indicate that the ferrite particles were superparamagnetic.

O.S.C.7

AGGREGATION MECHANISM OF ULTRA THIN ORGANIC FILMS

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The effects of thickness and deposition rate on the aggregation mechanism of organic thin films have been investigated. For this we utilized angular dependence of evaporation rate from a point source, to deposit a series of ultra thin films based on small organic molecules. Spatially correlated absorbance and AFM (atomic force microscopy) measurements were used to connect film morphology with the nominal thickness. The observed morphology trends can be explained through the interplay between adhesive forces (which determine surface mobility of small organic molecules) and the cohesive forces between small organic molecules, whose dynamical equilibrium can be influenced by the deposition rate.

O.S.C.8

FORMIC ACID OXIDATION AT MODEL AND REAL Pt CATALYSTS

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Formic acid oxidation was studied at low-index Pt single crystals (model systems) as well as at Pt/C supported on glassy carbon (real catalyst) in perchloric acid electrolyte. The Pt single crystals were characterized by LEED. The LEED patterns obtained after the mild heating of flame-annealed crystals showed clean, well ordered, unreconstructed surfaces. Pt/C supported catalyst on glassy carbon was analyzed by STM in air. STM images revealed the presence of Pt particles ranged from 2 nm to 6 nm and Pt/C agglomerates of several tenth of nm. Study of formic acid oxidation at Pt single crystals showed a pronounced dependence of the local symmetry of surface sites. Based on the mean Pt particle diameter in Pt/C supported catalyst the surface averaged distribution of low-index Pt single crystal facets was established.

O.S.C.9

CHARACTERISATION OF SILVER PARTICLES SPONTENIOUSLY DEPOSITED ON GLASSY CARBON

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Silver is an important material that can be used in electrochemistry, electrtocatalysis, electrochemical sensors, electronics etc. This metal can be deposited by various methods like chemical and electrochemical reduction, ion-exchange process, photochemical formation, and vacuum evaporation. We showed earlier that silver could be spontaneously deposited on glassy carbon simply by its immersion in silver nitrate solution. In the present work we deposited silver by immersion on activated glassy carbon in order to achieve better electric contact between Ag clusters and support. Activation of glassy carbon was achieved by electrochemical polarization during different times what lead to different roughness and activity of the material. Silver particles, deposited on such supports were characterized by AFM, STM, XRD and cyclic voltammetry.

O.S.C.10

EFFECTS OF NONSTOICHIOMETRY AND STRAIN ON RAMAN SPECTRA OF ANATASE TiO_2 NANOPOWDERS

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Nanosized titanium dioxide (TiO_2) powders in anatase phase were prepared by a laser-induced pyrolysis. Specific surface area of the as-grown powders measured by BET was about 110 m^2/g. The grain size of about 14.5 nm estimated from these data coincides well with the values obtained from XRD measurements. The mean grain size of about 35 nm obtained from the subsequent SEM measurements refers to considerable agglomeration of nanoparticles. Raman spectroscopy has been used to investigate the structural properties as well as changes under the laser irradiation of TiO_2 nanopowders. The blueshift and broadening of the lowest frequency E_g Raman mode were analyzed using a phonon-confinement model which includes strain effect and broadening associated with the size distribution. As this calculation gives smaller linewidths than the experimental results we believe that the nonstoichiometry effect largely broadens main Raman line. Alternatively, different changes in Raman spectra during the laser irradiation in vacuum were observed for the nanopowders with different strain. Namely, a very small blueshift and broadening of the main E_g mode in addition to decrease in the intensity of the all Raman modes is observed for the sample with a small strain value. Besides the greater blueshift and broadening of the E_g mode, an appearance of new modes at about 596 and 885 cm^{-1} was observed in the Raman spectra of the powders with higher strain value. This suggests much greater changes in stoichiometry and structure under the laser irradiation in vacuum for these samples.

O.S.C.11

HIGH PRESSURE SINTERING OF NANOSTRUCTURED COMPOSITES BASED ON TITANIUM NITRIDE

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Growing interest to nanocrystalline materials today is concerned with the possibility to increase their physical and mechanical properties in comparison with the microcrystalline materials. Titanium nitride is one of high-melting compounds with high durability of atomic bond, hardness and thermal stability. The usual methods of sintering such materials as pressureless sintering and hot pressing do not allow forming nanocrystalline structure in consequence of the grain growth in the recrystallization process. High pressure sintering is one of efficient methods of obtaining dense nanostructured ceramics based on titanium nitride. The peculiarities of high pressure consolidation of ultrafine TiN, TiN/TiB_2, TiN/Al_2O_3, TiN/Si_3N_4 powder mixtures prepared by different methods depending on particle size are discussed. The evolution of structure and properties of nanocomposites depending on sintering temperature in interval of 1000-1600 ^{o}C at pressures up to 4 GPa are studied.

O.S.C.12

FEATURES OF COMPOSITES ON REFRACTORY NITRIDES AND BORIDES BASE OBTAINED BY METHOD OF ELECTRIC DISCHARGE SINTERING

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Current state of science and technique requires the development of the engineering of refractory ceramics with high mechanical properties, in particular, for manufacture of cutting tools. Materials on the basis of composition $TiN-TiB_2$ are very important. Obtaining of this dense refractory material with high hardness and fracture toughness was realized in this work. For achieving of such a goal the mechanical activation of mixture TiH_2+BN and electric discharge sintering (EDS) were used. High energy milling in planetary ball mill was conducted. High energy milling of mixture TiH_2+BN during 300 sec results in formation of phase TiB_2. The milled powders were by electric current sintered (temperature ~1500^{0}C, time 3 min, loading pressure 60-80 MPa). During EDS the dehydrogenation of TiH_2 with further interaction of Ti and BN with formation of the dense material $TiN-TiB_2$ occurs. The materials on the basis of refractory composition TiN-36%TiB_2 (size of grains 500-700 nm, reduced density 98,5-99,0 %, hardness 18,6-19,8 GPa, fracture toughness 17,4-18,0 MPa/m^2 have been obtained. Possibility of obtaining $TiN-TiB_2$ composition directly from mixture TiH_2+BN, simultaneously with the dehydrogenation by method of the EDS reaction have been demonstrated. Increase of milling time of the mixtures with excess of BN (from 60 up to 300 s) stimulates roughening of obtained powder, (i.e. increasing of grain size), decreasing of density and hardness of sintered material. Decrease of content of BN in comparison with stoichiometry in starting mixture promotes increasing of the density and improvement of mechanical properties of obtained material.

O.S.C.13

SYNTHESIS OF NANOCRYSTALLINE AND AMORPHOUS ALLOYS FROM ELEMENTARY POWDERS BY INTENSE PLASTIC DEFORMATION UNDER PRESSURE

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Synthesizing alloys from elementary powders with the use of intense plastic deformation under pressure is a promising technique of production of new materials. In this work, results of systematic structural study of a large group of alloys (Zr−Ti, Zr−Cr, Zr−Nb, Zr−Mo, Zr−Fe, Zr−Co, Zr−Ni, Zr−Cu, Zr−Zn, Zr−Al, Ti−V, Ti−Cr, Ti−Ni, Ti−Cu, and Al−Fe alloys) fabricated using this method of mechanical alloying are presented. The alloys were synthesized by mechanical alloying of powders at room temperature under a quasistatic pressure using a pressure technique. The structure of samples was analyzed by X-ray diffraction using Cu K_α radiation. Microstructure investigations were performed in a JEM-200C transmission electron microscope and using selected area diffraction patterns (SAD), bright field and dark field images. The results of investigation show that the peculiarities of structure formation are affected by both the nature of interacting metals and their volume fractions in the mixture and the strain. After deformation under pressure, the minimal grain size in pure zirconium or titanium is 30-40 nm. The same grain size features the synthesized alloys of the Zr−Ti system. In binary alloys of titanium and zirconium with *d* metals of the VIII and I groups in the Periodic Table, the formation of nanocrystalline or amorhoups state depends on the ratio of volume fractions of components in the initial mixture of powders. With increasing amount of alloying element, the grain size significantly decreases and in the alloys of near-equiatomic compositions, the formation of amorphous state is observed, for instance in such alloys as Ti–Ni, Ti–Cu, Ti–Co, Zr–Ni, Zr–Co, and Zr–Cu. Mechanical alloying under high pressure results in the increase of the solid solubility of alloying metal in titanium or zirconium which are far in excess of the equilibrium solid solubility. In the Ti−Ni and Ti−Cu systems, the solubility of nickel in titanium grows to 13 at.%, and of copper to 10 at.%. The formation of structure of the alloys produced from elementary powders by intense plastic deformation under pressure is shown to be most affected by the interaction of the powder surfaces of dissimilar metals. This factor causes the compositions close to equiatomic to be the most favourable ones for the production of nanocrystalline and amorphous states.

O.S.C.14

CRITICAL ANALYSIS IN PROCESS MECHANICS OF NANOMATERIALS

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Nanomaterials are having huge potential applications in various areas such as materials and bio-medical sciences, electronics, optics, magnetism, electro-chemistry and energy storage. Ultra-small building blocks have been found to exhibit a broad range of enhanced mechanical, optical, magnetic, and electronic properties compared to coarser-grained matter of the same chemical composition. Significance of nanomaterials lays in their size many of the properties are size dependent, for example, an enhancement in the strength and hardness of solids. There are possibilities of modifications of their electrical properties by control of the arrangement within the constituent nano-clusters and of their assembly. One can control chemical reactivity by the attachment of functional side-groups. Also the control of optical properties by variation of the size and microstructure of the nano-clusters can be done. The possibility of creating nanostructures of metastable phases with non-conventional properties, including superconductivity and magnetism can't be ruled out. At present many processing techniques are available for the synthesis of nanomaterials. Fabrication of nanomaterials falls into one of two categories: *top-down* or *bottom-up*. In this paper various techniques of nanomaterials processing have been reviewed and tried to critically analyze each method with their merits and demerits under a single roof.

O.S.D.1

THERMOPLASTICS: PAST, PRESENT, AND FUTURE

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Thermoelectric field has already been around for nearly 200 years. In 1821, an Estonian physicist named Johann Seebeck discovered that when he joined two dissimilar conductors in a loop or circuit and heated one, it caused a compass needle to deflect. In 1834, French physicist Jean Peltier found the reverse was also possible: If you feed enough electricity to a circuit composed of two different conductors, you can push electrons to carry heat from one to another, causing the first conductor to cool while the another worms. In the early 1900s, other investigators discovered that the key to making efficient thermoelectric material is to boost their electrical conductivity while keeping their thermal conductivity as low as possible. That allows power to move easily trough the device while maintaining the temperature difference between the junctions necessary to produce the effect. In the early 20th century, researchers investigated all sorts of combinations of metals for their thermoelectric potential. By the 1950s it was shown that by engineering different semiconductor alloys they could control the thermal and electrical conductivity of materials separately. In the mid-1990, M. Dresselhaus (Massachusetts Institute of Technology) and G. Mahan (Pennsylvania State University) independently determined that thermoelectric materials could be made on the nanoscale and dramatically increase ZT.

All currently commercially available thermoelectric materials are based on metals and ceramics and with ZT maximum 2.4. The objective of our work is to investigate the properties and use of polymeric thermoelectric materials. Our research addresses inherently one-dimensional conducting polymers as a class of potentially high ZT thermoelectric materials. We are exploring thermoelectric properties of polyphenylene vinylene (PPV) and an alternating block copolymer containing oligomeric phenylene vinylene units. It is expected that these studies will provide insight into molecular architecture that yield high ZT organic materials.

O.S.D.2

CORROSION BEHAVIOUR OF SELECT MAX PHASES IN NaOH, HCl AND H_2SO_4

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Electrochemical corrosion of select MAX phases, namely Ti_2AlC, $(Nb\text{-}Ti)_2AlC$, V_2AlC, Cr_2AlC and V_2GeC in NaOH, HCl and H_2SO_4 solutions is investigated. Polarization characteristics recorded in NaOH solutions show that Ti_2AlC and $(Nb\text{-}Ti)_2AlC$ undergo passivation, while V_2AlC, Cr_2AlC and V_2GeC phases showed active dissolution at potentials more positive than the corrosion potential. In the HCl containing solutions Ti_2AlC and $(Nb\text{-}Ti)_2AlC$ were found to possess trans-passive behaviour depending on potential, while V_2AlC, Cr_2AlC and V_2GeC actively dissolved at potentials more positive than the corrosion potential, as in the case of NaOH solution. In H_2SO_4 solutions similar behaviour as in 1M HCl is obtained. Corrosion behaviour of Ti_2AlC, $(Nb\text{-}Ti)_2AlC$ is compared with the corrosion behaviour of pure Ti and pure Nb. Since no similarity between the polarization curves is obtained, it is concluded that MAX phases behave as completely different materials than their constituents, being defined by their own Gibbs energy and accordingly by different corrosion behaviour.

O.S.D.3

REPAIRING OF CRACKED OR DAMAGED PRESSURE PIPES WITH A COMPOSITE SLEEVE

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Pressure pipes may be externally damaged in different ways: corrosion or notch due to diving machines. These defects may initiate a fatigue crack, which is first part-through, then through the thickness. This first results in a weakened region of the tube, then in leak of the pressure fluid contained in the pipe.

There are several ways to repair the tube: changing the portion of tube, welding of extra metal in the defect, putting a welded metal sleeve or gluing a composite sleeve. This last solution seems to be the easiest and the cheapest. The advantage is that the repairing sleeve is made on site and can be put with a given pre-tension.

The work presented here is the numerical study of the fracture mechanics parameters of a through- or part-through crack in a tube submitted to internal pressure and repaired with a composite sleeve.

As there is a transfer of loading from the cracked tube to the repairing sleeve, the fracture mechanics parameters of the crack such as J integral or opening of the crack lips will be modified.

The study proposes a design procedure for such repairing sleeves.

O.S.D.4

STATIC AND FATIGUE CHARACTERIZATION OF SANDWICH PANELS

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Problems for load carrying elements reside mainly in buckling, embrittlement and corrosion. These problems can be mainly solved by t introduction of composite materials of sandwich type. These materials ally lightness, rigidity and resistance to the corrosion. For the design of a large number of applications, static and cyclic properties are necessary.

In this paper, first static and fatigue tests on four points bending of four types sandwich panels have been performed. Load/displacement and *S-N* fatigue curves are presented and analyzed. Fatigue failure and damage modes are observed with an electronic microscope and are discussed. Numerical simulation applied to the static tests is compared to the experimental results.

The second is to address such fatigue behaviour by using a damage model and check it by experimentation. This fatigue damage model is based on (degradation of stiffness degradation which is used as damage indicator. Three non-linear cumulative damage models derived from the chosen stiffness degradation equation are examined with assumption of linear Miner's damage summation. Predicted results are compared with available experimental data.

O.S.D.5

CORRELATION BETWEEN FRACTURE TOUGHNESS AND MICROSTRUCTURE OF SILICON NITRIDE

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Fracture toughness of silicon nitride ceramics have been improved by introducing β-Si_3N_4 seeds into matrix, which was consisted of α-Si_3N_4 powder and sintering additives. The seeds were obtained by our own method, described in paper. Two starting powders of α-Si_3N_4, with different grain size were mixed with additive, in our case with mixture of Y_2O_3 and Al_2O_3. The concentration of added seeds varied from 1-6 mass%. Hot pressing was performed at 1700°C under the pressure of 40 MPa in flowing nitrogen. Isothermal heating time ranged from 1-6 hours. Fracture toughness and microstructure, according to our results, were affected by seeds concentration, heating time and starting powder. The maximum fracture toughness, attained in sample with finer powder and 5 mass% seeds, was 9 $MPam^{1/2}$. Fracture toughness was determined by indentation method. Microstructure was investigated using scanning electron microscopy (SEM). These results will be discussed, as well.

O.S.D.6

THIXOMOLDING® OF MODERN CREEP-RESISTANT Mg-ALLOYS

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Thixomolding® offers a variety of possibilities for the processing or implementation of innovative material concepts and, due to its specific process technology and engineering, meets all requirements that are imposed on a resource-saving and eco-friendly production process for magnesium components. Within the scope of a research project modern non-reinforced and reinforced magnesium alloys with increased creep resistance were investigated. The Thixomolding® process allowed carbon-fiber additions to be implemented, with a good fiber bonding between magnesium matrix and carbon fibers being achieved. It was equally possible to admix silicon particles to the feed stock and to produce Si-particle-reinforced components from these magnesium alloys.

O.S.E.1

BACTERIORHODOPSIN AS AN ADVANCED BIOMATERIAL FOR NANOTECHNOLOGY

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Biomaterials are usually perceived as fragile and non-durable. Yet their functional versatility appears irresistible. Bacteriorhodopsin, a protein pigment from a salt-loving bacterium *Halobacterium salinarum,* is a notable exception. It can endure extreme temperature (up to 120^{o}C) and acidity (around pH 0). In the form of a dry film, its optical property and a portion of its electrical properties can be preserved virtually indefinitely. The paper summarized existing functional devices developed by various laboratories in the past couple of decades. Both electro-optic and photoelectric properties will be discussed.

O.S.E.2

QUANTUM DECOHERENCE AND QUANTUM-HOLOGRAPHIC INFORMATION PROCESSES: FROM BIOMOLECULES TO BIOSYSTEMS

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Our recently proposed quantum approach to biomolecular recognition processes, is hereby additionally supported by biomolecular Resonant Recognition Model and by quantum-chemical theory of biomolecular non-radiative resonance transitions. Previously developped general quantum-decoherence framework for biopolymer folding into native conformation during very selective ligand-proteins/target-receptors key/lock biomolecular recognition processes (with electron-conformational coupling, giving rise to dynamical modification of many-electron energy-state hypersurface of the cellular quantum-ensemble ligand-proteins/target-receptors biomolecular macroscopic quantum system, with revealed possibility to consider cellular biomolecular recognition as a Hopfield-like quantum-holographic associative neural network) is further extended from nonlocal macroscopic-quantum level of biological cell to nonlocal macroscopic-quantum level of biological organism, based on long-range coherent microwave excitations (as supported by macroscopic quantum-like microwave resonance therapy of the acupuncture system) - which might be of fundamental importance in understanding underlying macroscopic quantum (quantum-holographic Hopfield-like) control mechanisms of embryogenesis/ontogenesis and morphogenesis, and their backward influence on the expression of genes.

O.S.E.3

CLASSICAL AND QUANTUM INFORMATION CHANNELS IN PROTEIN CHAIN

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Because protein chain energy states have a high number quantum states and small difference between them, consideration is possible using eater Lagrangian or Hamiltonian approach. Reason for this result lies in fact that for stationary quantum state Hamilton is sum of kinetic (T) and potentional (V) energy, while Lagrangion is difference between them when system is in equilibrium with external forces. Two similar pictures exists, one classical (type **A**) another quantum (type **B**) of protein chain. In our synergetic approach to processing environment-peptide plane, and *vice versa*, we used three channels to carry signals in protein chain. The first one is a classical channel based on classical signal behaviour and classical acoustical communication. The second is hybrid one, which is based on *phonon-photon* coupling phenomena. The third one is on the amino acid/peptide plane level, which may activate at the same time left *and* right side of peptide plain or only left *or* right side of peptide plane. In the first case communication system is type **A** (*left-right* side is synchronized), while in the second case system is type **B**, and there is not photon-phonon coupling during peptide plane oscillation and left and right sides of peptide plane works separately, including the extreme case like *splitting*. Both systems have solutions in synergy of classical and quantum communications channels by perfect number law.

O.S.E.4

NANOINDENTATION OF IN SITU POLYMERS IN HYDROXYAPATITE/POLY-L-LACTIDE BIOCOMPOSITES

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In order to obtain more accurate properties after compaction of hydroxyapatite (HAp)/poly-L-lactide (PLLA) composite, high-resolution measurement of mechanical properties method is proposed to determine the properties of each phase separately, leading to information that are valuable for the development of new materials as well as for finite element modeling purposes. The PLLA polymer processing conditions used in hot pressing of the composite strongly influence final mechanical properties of material in the solid state. Since the aim was to measure PLLA material properties, acceptable findings could only be made using unconstrained, cured in situ nanoindentation tests. A finite element analysis of the in situ indentation experiment was performed to determine required size of plain polymer area, needed for indentation test, which would minimize the constraint of particles on the polymer deformation response.

Poster Presentation

P.S.A.1.

NUCLEATION BEHAVIOUR OF GLASSES WITH PRIMARY CRYSTALLIZATION

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Most of the published works have been limited by measuring the shift in T_p as a function of DTA heating rate and analyzing the data to determine the crystalization kinetics of the glass. Recently, there has been a renewal of interest in the use of DTA following the recongnition that the shift in the exothernic peak (ΔT_p) is a function of the pre-DTA time and temperature heat treatment for a fixed DTA heating rate. However, most studies related to the cases where the compositions of the crystal and the glass are the same (polymorphic crystallization). If the composition of the crystal phase is different than that of the parent glass(primary ctystalization), JMAK based models cannot be used to describe the kinetics of crystallization. In this study we were investigated nucleation behaviour of the glass where the compositions of the crystal and glass are different. The results of the examination of the peak shift $(\Delta T)_p$ as a function of the pre-DTA isothermal treatment were presented. The qualitatively different behaviour was observed than earlier reported, and a negative DTA peak shift depending on the growth extent taking place during the pre-DTA heat treatment.This shift towards high temperatures is due to diffusion-controlled crystal growth.

P.S.A.2.

PROPERTIES OF DISPERSION HARDENED Cu-Al_2O_3 MADE BY INTERNAL OXIDATION

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The prealloyed copper powders containing different amount of alumium were milled separately in a planetary ball mill to form Al_2O_3 particles in situ by internal oxidation. The milling process was performed in air as oxygen source. After milling the powders were heat treated in hydrogen in order to reduce copper oxide formed on particle surfaces during milling. The compacts were made by hot pressing. The compacts of treated powders exhibited a considerable higher microhardness than the pure copper compacted under the same conditions as well as a good electrical conductivity. It was observed that with an increase in alumina content both density and electrical conductivity decreased whereas microhardnes increased. After the exposure to high temperature in inert atmospheres the compacts retained a relatively high hardness.

P.S.A.3.

INVESTIGATION OF IMPURITIES ON THE MECHANISAM OF Al(OH)$_3$ CRYSTAL GROWTH

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Crystallization of Al(OH)$_3$ that occurs during the decomposition of caustic soda solutions is important part of Bayer process for alumina production. Several phenomena, which influence on physic-chemical characteristics of precipitated Al(OH)$_3$, occurs simultaneously during this process. There are nucleation, agglomeration and crystal growth of Al(OH)$_3$.

In this paper we have investigated the mechanism of Al(OH)$_3$ crystal growth from pure caustic soda solutions and in the presence of oxalic acid in dependence of temperature and caustic soda concentration.

The mechanism is discussed on the basis of microstructural investigation and on the basis results obtained by kinetic investigation. Results obtained by microstructural investigation have shown that the mechanism of Al(OH)$_3$ crystal growth follow the B+S (birth and spread) mechanism no meter does the crystallization occurs from the pure caustic soda solution or in the presence of oxalic acid. This mean that the growth proceed through the simultaneously formation of multiple nuclei before the complete spread of existing nuclei, and the formation of nuclei on the top of existing ones is possible too. In the presence of oxalic acid the presence of elongated hexagonal crystals is observed, i.e. the crystal habit is occurs. Results obtained by kinetics investigation have confirmed the mentioned mechanism of Al(OH)$_3$ crystal growth.

P.S.A.4.

RADIOLYTIC DEPOSITION OF SILVER ON AlOOH NANORODS

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An AlOOH colloidal dispersion (sol) was prepared by peptization of freshly precipitated aluminium hydroxide in a boiling nitric acid solution (0.2 mol dm^{-3}) under reflux and continuous stirring conditions for 6 hours.

The AlOOH nanorods were surface modified with amino acids (alanine or histidine) and IR measurements were performed in order to understand the surface structure of AlOOH after its modification. Silver was deposited on the surface of the modified AlOOH nanorods by steady state γ-irradiation. Transmission electron microscopy was used in order to find out the morphology of the obtained nanocomposites. The effort was also made to determine the precise conditions for silver deposition on AlOOH nanorods without formation of individual silver nanoparticles.

P.S.A.5.

NEW APPROACH ON DISSOLUTION OF HYDRATED ALUMINA IN CONCENTRATED SOLUTION OF SODIUM HYDROXIDE

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The most industrial plants for the zeolite synthesis have worked with a sodium aluminate which contains 3-4 wt. % of undissolved alumina. This affects not only the production yield but also increases the production costs requiring additional equipment. It is vitally important to reach and maintain working conditions that enable complete dissolution of hydrated alumina as an alumina source, which could be achieved by using adequate mathematical models. This paper considers three simple models, which are applicable to complete dissolution of hydrated alumina. The first model is based on the rate control by chemical reaction occurring at the particle surface, the second one is based on the rate control by diffusion, whereas the third, mixed-control model, is a combination of these two models. It gives the best agreement with the experimental data.

P.S.A.6.

ADSORPTION OF ITACONIC ACID ONTO ALUMINA

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This research is a continuation of our previous work, aimed at the investigation of potential dispersants for aqueous processing of alumina powders. The adsorption of itaconic acid, $C_5H_6O_4$, as a function of its concentration and solution pH, onto alumina was studied by the solution depletion method, using UV spectrophotometry. KNO_3 (10^{-2}mol/L) was added as a background electrolyte. Starting with the initial concentration of 0.15g/L, the adsorption of itaconic acid was found to be negligible in the basic region, pH~8. In the acidic one, pH~5, however, the adsorption reached 60 % after 6 hours of agitation, and remained unaffected with prolonged equilibration time. The difference in sorption are discussed in terms of surface charge of the alumina powder used (pH_{PZC}=8.3) and degree of dissociation of the itaconic acid (pK_{a1}=3.85 and pK_{a2}=5.55).

P.S.A.7.

OXIDE CATALYSTS FOR PURIFICATION OF GASEOUS FLUIDS, SUPPORTED ON THE RESIDUAL FROM SPENT ALUMINA-PALLADIUM CATALYST

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The use of catalytic methods and the respective catalysts for neutralizing the harmful emissions of motor vehicles, power plants, chemical works etc., results in accumulation of huge amounts of spent catalysts. These, in their turn, represent a potential source of harmful emissions and solid residuals.

The aim of the present work was to investigate the possibility to utilize the residual of spent Pd-catalyst, remaining after the active component extraction, as a component for oxide catalysts. The high price of Pd and respectively of the Pd catalyst, is the motivation to check this possibility. A Cu-Co oxide phase has been deposited on the residual of the extracted spent catalyst containing 0.093% Pd. The activity of the prepared catalytic material has been tested in regard to CO oxidation and NO reduction, monitoring at the same time its stability with respect to catalytic poisons – SO_2. For comparison Cu-Co oxide catalysts were used, which were prepared by deposition on various alumina supports and on regenerated Pd catalyst with a Pd content of about 2%. The physical-chemical and physical-mechanical parameters of the studied samples have been evaluated. It was established that the deposition of the Cu-Co active phase on the residual from the extracted spent catalyst leads to shifting of the catalytic activity towards the lower temperatures in comparison to the other catalyst samples.

The carried out investigations gave us the reason to conclude that the preliminary stable modification of the corundum residual, containing Pd, combined with the Cu-Co oxide phase contributes to the promotion of the activity both in the CO oxidation and in the NO reduction reactions.

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P.S.A.8.

THERMODYNAMIC MODELING OF BORON NITRIDE FORMATION IN THERMAL PLASMA

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After diamond, the hardest known materials are boron-rich, for example cubic boron nitride, boron carbide and titanium diboride. Like diamonds, these materials also have low densities, high melting points and considerably mechanical strengths. They are chemically inert. Because of these properties these materials have wide applications. One important technique to produce these substances is chemical vapour deposition (CVD) in particular thermal plasma CVD. Thermal plasma, as high temperature mixture of atoms, molecules, ions and electrons is widely used for the synthesis of high purity ultra fine powders (in size range of 10-100 nm) of silicon, boron, aluminum, titanium etc. oxides, nitrides and carbides. Reactants introduced into thermal plasma evaporate and, depending on the temperature, partially dissociate into atoms and ionize, producing ions and electrons. The formation of molecules 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. It is generally difficult to optimize conditions in thermal plasma because of complex interactions but the first and very useful step is undoubtedly thermodynamic analysis.

In this paper we consider the formation of boron nitride at high temperatures in thermal plasma. This process is investigated theoretically by computing the equilibrium composition of the gas mixture containing boron (boron as reactant is assumed to be in the form of boron trifluoride, BF_3 or diborane, B_2H_6) with argon and nytrogen or nytrogen with hydrogen). The calculation is performed for temperature range between 500 and 6000 K, for different B/N ratios and for the total pressure in the system of 1 bar and 0.5 bar. Use is made of the fact that a thermal plasma is a 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 oversaturated vapor of B and BN were determined and the formation of solid boron and boron nitride *via* different reaction routes was analyzed.

P.S.A.9.

CARBON NITRIDE COATINGS ON PULSE PLASMA NITRIDED 4140 STEEL SAMPLES

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Nitriding media in solid, liquid, gas or plasma states, containing the active ingredients for nitrogen diffusion into the workpiece surface, provide the formation of surface structures with different properties. The salt bath based on cyanides is known to produce the compound nitride zone with superior tribological properties in some applications. This is believed to be due to the ferrous carbonitrides formation in the outer compound zone. Various forms of carbon coatings like DLC, CN and graphite were also found to exhibit superior tribological properties in contact with several materials. We performed a pulse plasma nitriding process with subsequent treatment in carbon containing atmosphere in order to enhance the surface properties of AISI 4140 steel samples. Both, pulse plasma nitriding and post "nitrocarburizing" lasted for 4 hours at 500^0C substrate temperature, 5 kHz pulse frequency and 95% duty cycle. The nitriding process was switched to nitrocarburizing by adding the carbon containing gas. The "white layer" about 9 μm thick was found on polished and etched sample cross section, while the surface microhardness of 4140 and 1045 steel samples was nearly the same. Besides the γ' and ε Fe phases formed during nitriding., the XRD analysis revealed the formation of the cementite phase during the post nitrocarburizing. A compact, dense coating with the clusters of about 150 nm size was found by the SEM analysis. The AFM investigations confirmed the existence of less than 200 nm diameter clusters. The analysis of raman active vibration spectra excited by 532 nm laser beam incident on the uncoated, nitrided and nitrided and post nitrocarburized samples revealed the existence of the a-CN:H coating on previously nitrided surface.

P.S.A.10.

SYNTHESIS OF ZINC META-TITANATE BY REACTION SINTERING

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Mechanical activation and sintering process are used for obtaining zinc-metatitanate, $ZnTiO_3$. Starting powder mixtures of ZnO and TiO_2, in an equimolar ratio that is in accordance with stoichiometry of zinc titanate $ZnTiO_3$, were mechanically activated using planetary mill during different time intervals from 0 to160 minutes.

Both isothermal and non-isothermal sintering was performed. Conditions during isothermal sintering were heating at 850°C for four hours, while non-isothermal sintering was investigated by dilatometric measurements with heating rate of 10°C/min until 1100°C with one hour holding.

The progress of the solid-state reaction during isothermal sintering was followed using X-ray powder diffraction. Scanning electron microscopy was employed to observe morphology of the samples microstructure obtained by non-isothermal sintering.

P.S.A.11.

KINETICS AND MECHANISM OF MECHANOCHEMICAL SYNTHESIS OF Zn_2TiO_4

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Kinetics and mechanism of Zn_2TiO_4 formation, during mechanochemical treatment of ZnO-TiO_2 system, were observed. Mixtures of ZnO and TiO_2 powders were mechanically activated using high-energy ball mill during different time intervals from 0 to 300 minutes. Quantitative XRD analyses were performed in order to give information about reaction kinetics and phase composition. Specific surface area results along with micrographs obtained by scanning electron microscopy support the recommended mechanism of mechanochemical reaction.

P.S.A.12.

PREPARING OF NICKEL-FERRITES FROM COMPLEX COMPOUNDS AT DIFFERENT ATMOSPHERE CONDITIONS

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Ultrafine nickel-ferrite materials were prepared from complex compounds with acetylacetonato-ligands, according to the previosly developed method. The influence of different (air, oxygen and nitrogen) atmospheres approved during the thermal decomposition of precursors, was studied. It was found that prefered preparing conditions were: air atmosphere and relativly low temperature (400°C). The characterization of the final products was done by X-ray and SEM analysis. All obtained materials had ultrafine particle sizes (less than 200 nm) and very high ferritization ratio.

P.S.A.13.

SINTERING OF MECHANOCHEMICALLY ACTIVATED NATURAL SILICATE OF ALUMINA

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In this paper we present physical research of sintered material which is mechanochemically activated natural silicate of alumina. Based on the results of sintering and physical properties (SP, dilatometry, change of density, pore distribution), we can conclude that mechanical activation of investigated material improves these properties and in the same time enables energetically better obtaining of these products based on this material.

P.S.A.14.

PREPARATION OF FOAMED SiO_2 WITH PREDETERMINED PORE SIZE

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Process for preparation of foamed SiO_2 with predetermined mesh of cylindrical pores was developed. Basic stages of this process are the following steps: preparation of the solution of potassium poly(silicates) (PPS); gelation of the PPS; ion-exchange of potassium from PPS hydrogel with ammonium's ions; thermal activation of the ammonium-poly(silicates) xerogel. Influence of the module (molar ratio SiO_2/K_2O) of the starting PPS on the texture properties (specific area, specific volume, pore dimensions distribution, bulk density) and especially mean pore diameter. Table 1 shows influence of module PPS on the average pore diameter of the foamed SiO_2. Module increase of starting mixture from value 4 to value 6, leads to linear decrease of the average diameter pore from 500nm to average diameter pore to 190nm. Increase of module of the starting mixture as much as 9.0 leads to relatively small but controlled exchange of the average pore diameter of the foamed SiO_2 (within the range of pore diameter 50-25 nm). Mechanism of creation the porous system of foamed SiO_2 was discussed.

Table 1. Influence of PPS module on the average pore diameter of the foamed SiO_2

(SiO_2/K_2O) (mol/mol)	dp (nm)
4.0	500
5.0	360
6.0	190
7.5	110
9.0	50
12	30

P.S.A.15.

SEEDING EFFECT DURING ELECTROCHEMICAL SYNTHESIS OF IRON OXIDES

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Electrochemical synthesis of iron oxide nano-sized powders can be conducted under various conditions. The small changes in the current density, temperature of the mother liquor, pH, and other parameters influences dramatically on the crystallochemical, magnetic and electrical properties of the obtained powders. One of the contiguous cases was considered in this paper. Namely, for the given conditions, the small changes in current density and some other parameters can produce the occurrence of nonmagnetic, iron oxi-hydroxide (goethite) or magnetite phases. Mentioned phases show different phase transition routes through heating. On the other hand, the synthesis process can be controlled by seeding effect in order to obtain the powders with desired properties.

P.S.A.16.

STRUCTURAL, MAGNETIC AND ELECTRICAL CHARACTERISTICS OF METASTABLE IRON OXIDES NANO-SIZED POWDERS

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Structural, magnetic and electrical properties of iron oxides nano-sized powders synthesised electrochemically under various conditions are presented. The influence of the temperature, current density and time of the synthesis on powder particle size and particular characteristics is established. Possibilities for co-existence of various phases and their impact on powder properties, as well as feasible paths of phase relaxation and transition during (non)isothermal heating, are evaluated, too. This way, optimal procedures for the preparation and stabilisation of iron oxides nano-sized powders of different characteristics are determined.

P.S.A.17.

FABRICATION OF SiC BY CARBOTHERMAL-REDUCTION REACTIONS OF DIATOMACEOUS EARTH

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In this paper the possibility of using diatomaceous earth as Si precursor for low temperature synthesis of silicon carbide (SiC) by carbothermal-reduction reactions was studied. A diatomaceous earth of Serbian origin and carbon black as reducing agent were used. The green bodies with different C/SiO_2 ratio were heated at temperatures between 1150 and 1550 °C with controlled Ar flow atmosphere. Phase evolution, phase content and weight loss were followed as a function of annealing time and sintering temperature. It was found that reaction proceeded via many intermediate stages. Already at 1200 °C nano sized SiC powders have been obtained. The comparatively low reaction temperature is attributed to the nano-porous nature of the raw material. By means of was X-ray; TEM and SEM investigations powders have been characterized. The results show that diatomaceous earth can be very effective source for obtaining of silicon carbide powders.

P.S.A.18.

SYNTHESIS AND CHARACTERIZATION OF THE POLY(ANILINIUM 5-SULFOSALICYLATE)

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Novel conducting polymeric material was synthesized by oxidative chemical polymerization of anilinium 5-sulfosalicylate salt using ammonium peroxodisulfate as an oxidant, in aqueous solution at room temperature. Obtained green polymer was self-doped showing conductivity of ~ 0.13 S cm^{-1}. Poly(anilinium-5-sulfosalicylate) was also characterized by elemental analysis, gel-permeation chromatography and infrared spectroscopy. From founded content of sulfur, the doping level of poly(anilinium 5-sulfosalicylate) is determined. The mass-average and number-average molar masses, M_w and M_n, were calculated from the GPC data to amount 22900 g mol^{-1} and 8490 g mol^{-1}, respectively. Elemental analysis of deprotonated poly(anilinium-5-sulfosalicylate) revealed that polyaniline chains are in some extent functionalized with covalently bonded 5-sulfosalicylate. MNDO-PM3 semi-empirical quantum mechanical calculations allow us to specify dominant coupling reactions of 5-sulfosalicylate.

P.S.A.19.

SYNTHESIS OF THE 4-VINILPYRIDINE COPOLYMERS WITH METHYLMETHACRYLAT, AND THEIR APPLY FOR THE ADSORPTION OF GOLD

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During this work the meshed copolymers on the basis of 4-vinylpyridine have been synthesized with metylmethacrylate, and meshing process has been performed by using divinylbenzene: poly-4-vinylpyridine-copolimer-metylmethacrylate poly (4-VP-co-MMA) . 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. Suspension copolymerisation had the temperature regime as follows: the substances in the reaction were to be heated until the temperature of 40^{o}C was reached, then the temperature was elevated at 70^{o}C, and finally, reaction finished at 90^{o}C. Mixing regime was as much adjusted as that it ranged from 150-200 revolutions a minute. Composed meshed copolymers 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 copolymers was proved by IR-spectroscopy, which showed the appearance of the characteristic band. Quantity of the adsorpted gold in the copolymers has been proved by using methodes of gravimetry and spectrofotometry. Gold has been separated from its diluted water-sollutions by copolymers. These copolymer separated the following quantity of gold poly(4-VP-co-MMA) 0,795 g Au/g copolymer.

P.S.A.20.

INFLUENCE OF CARBON CONCENTRATION AND ROTATIONAL TEMPERATURE ON FULLERENE YIELD IN RF REACTOR

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In this paper, report on fullerene formation in RF thermal plasma reactor is presented. In order to determine the degree of evaporation of used graphite precursor, SEM analysis of deposited soot in different part of RF reactor has been done. It was found that fullerene yield varied in dependence of position of soot on chamber walls. Carbon concentration and rotational temperature of C_2 radicals in plasma flame have been calculated as well.

P.S.A.21.

ANALYSIS OF SiO_2 THIN FILMS DEPOSITED BY REACTIVE SPUTTERING

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SiO_2 layers were deposited by 1 keV Ar^+ ion sputtering from a high purity silicon target using different values of the oxygen partial pressure and of the electrical current on the target. The substrate temperature was held at 550°C or at room temperature. The argon partial pressure during ion gun operation was $1 \cdot 10^{-3}$ mbar. The analysis of their stoichiometry and purity was performed by Rutherford backscattering spectrometry (RBS analysis). Experimental spectra were analyzed with the programmes PERM, version 2003.02 and SIMNRA, version 5.0. The analysis of purity was also performed by electron microprobe, Raman spectroscopy and X-ray diffraction (XRD analysis). Reactive sputtering has proved efficient for the deposition of silica at 550°C, using Ar^+ ions with an oxygen partial pressure of $2 \cdot 10^{-4}$ mbar and an electrical current on the target of 5,5mA.

P.S.A.22.

COMPARATIVE ANALYSIS OF INFLUENCE OF ELECTRODE MATERIAL ON SURGE ARRESTERS CHARACTERISTICS IN γ AND X RADIATION FIELD

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Resistance to the occurrence of over-voltage is significantly reduced through components miniaturization. The surge arresters are non-linear over-voltage protection components. They are made of two or three electrodes with ceramic or glass housing. The aim of this paper is to find the possibility for improvement of the surge arresters characteristics in γ and X radiation field by appropriate choice of electrode materials. For that purpose electrodes of different materials were incorporated in originally developed surge arresters model. Obtained results show that both in γ and X radiation field, brass electrodes are optimal solution, since they have the highest resistance to the radiation effects. Also, it was shown that surge arresters have high resistance to the γ radiation, but X radiation leads to significant degradation of their characteristics.

P.S.A.23.

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

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The effect of magnesium content on the microstructure and properties of aluminium alloys was examined. The effect of the magnesium 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 α-solid solution and the eutectic. In alloys containing more magnesium the average values of the DAS and grain size were found to decrease. Also, microstructure was investigated in the electron microprobe analyzer JCXA-733. Testing of properties of these materials included also measuring of hardness and determination of pressure strength. Hardness was measured by the Brinell method. Pressure strength of the samples was tested on an electronic cutter of 10 t. The changes in chemical composition of the alloy cause changes in the structure and these are reflected in the Brinell hardness and the compression strength. By increasing the content of magnesium the hardness and compression strength also increase.

P.S.A.24.

USEFUL PRODUCT TRANSFORMATION STUDY OF WASTES FROM PETROLEUM TANKS CLEANING OR THE PROFILE SHOPS, BY THERMAL TREATMENTS

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The fluid result from car washing stations, from profile shops, from tanks’ cleaning or petroleum tank car, after decantation, is separated into heavy petroleum product and water.

The heavy petroleum products contain 40 -50 % water undecantated and unseparated by centrifugation.

The petroleum component has a distillation beginning at 220 ^{0}C, separation of the two phases, by such process is possible because the big difference between boiling temperature of water and beginning of distillation at atmospheric pressure of the petroleum component.

By distillation, from petroleum product result, at temperature until 150 ^{0}C, 50 – 55 % water faint impurity and after 230 ^{0}C to 450 ^{0}C a black oil similar to that represented from paraffinous crude oil represented 35 – 38 % and a amount of solid residue by 6 – 7 %. The solid residue content a 35 % ash, 6 – 7 % volatile material and a 5500 kcal/kg calorific power and about 4 % petroleum gasses $C_1 – C_4$.

An economic study shows that process benefits because gasses can contribute at heat necessary for distillation thermal treatment and liquid product type black oil meted the process expenses.

This account justifies proposal to ecologizies by atmospheric distillation of this wastes.

P.S.A.25.

POSSIBILITIES FOR OBTAINING OF ACTIVATED CARBON AGENTS BY PYROLYSIS OF RESIDUAL MATERIALS PRODUCED IN FARMERS, VETERINARY CLINICS AND BUTCHERIES ETC.

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Usually the bovine breeding and butcheries produce biomaterials that au infected or may be easily infected neutralized at the present by burning in ground. This paper presents a new possibility for recycling of these materials by pyrolysis at 400 – 500 ^{0}C.

By this method a solid carbonic residue is obtained, about 3 – 20 % relative to biomaterial, who contains 10 – 25 % ash and also results crack able fluids and gases.

The absorption capacity of the solid carbonic residue has been studied and values have been determined for iodine, methyl blue and toluene.

The results justify the usage carbonic residue as an activate carbon agent for waters purification.

The fluids from pyrolysis have been cracked and transformed in combustible gases. These gases and those resulted from pyrolysis can in part provide the necessary energy of the process.

P.S.A.26.

COMPARISON OF THE CRYSTALOGRAPHIC TEXTURE WITH THE MICROPOROUS TEXTURE OF ALUMINA ACTIVATED IN THE REACTOR FOR PNEUMATIC TRANSPORT

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Alumina samples are obtained by flash calcination of gibbsite in the reactor for pneumatic transport. In the present paper we study the effect of the gibbsite dehydration temperature on the crystallographic structure and texture and the microporous texture of the activated aluminas. The XRPD patterns of activated alumina samples consists of broadened lines with smaller intensity then the XRPD patterns of starting gibbsite, without new reflections and without significant changes in the lattice parameters, which means that during activation, crystallization into new phases does not occurs. As a consequence of the partial dehydration of the gibbsite, open micro- and mezopores inside the grains of the original gibbsite crystals were formed. The values of fractal dimension of activated alumina samples increase with the increasing of the temperature of thermal treatment from 2.02 to 2.55.

P.S.A.27.

THE EFFECT OF DIFFERENT DEPOSITION REGIMES ON THE ELECTRODEPOSITION OF SILVER POWDER

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The effect of different deposition regimes (constant, pulsating and reversing currents, constant and pulsating overpotential), on the powdered and dendritic silver electrodeposits morphology were investigated. The morphology of electrodeposited silver powder was studied utilizing a scanning electron microscope. The results obtained in constant regimes were compared with those obtained in pulsating and reversing regimes. The size of dendrites decreased strongly with increased overpotential or current. It was also shown that the agglomeration of silver dendrites in spongy-like deposits was strongly decreased by pulsating overpotential electrodeposition. The possibility of obtaining powder particles, with different properties, depending on conditions of electrolysis was demonstrated.

P.S.A.28.

MORPHOLOGY OF Ni-Co ALLOY POWDERS ELECTRODEPOSITED FROM SULFATE-BORATE ELECTROLYTE

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The morphology of Ni-Co powders electrodeposited from sulfate-borate containing electrolyte are investigated as a function of alloy powder composition. Composition of the electrolyte, i.e. the ratio of Ni^{2+}/Co^{2+} concentration is found to influence both, the alloy composition and the morphology of Ni-Co alloy powders. The Ni-Co alloy powder electrodeposition process is found to belong to the type of irregular co-deposition. At the highest ratio of Ni^{2+}/Co^{2+} concentration typical fern-like dendritic particles were obtained. With the decrease of Ni^{2+}/Co^{2+} ions ratio among fern-like dendrites, agglomerates of the size of about 100 μm, composed of a large number of small dendrites on their surface were obtained. At the lowest Ni^{2+}/Co^{2+} concentration ratio, three types of particles were detected in the Ni-Co powder: fern-like dendrites, compact agglomerates typical for pure Co powder and smaller agglomerates composed of a large number of dendrites.

P.S.A.29.

BENTONITE – LOW COST SORBENT FOR SYNTHETIC DYES

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Technological development brought a number of advantages and convenient to the modern life, but also brought many problems, environment pollution above all. One of these problems is removal of synthetic dyes from the waste waters of different branches of industry. Although a number of methods for water refining are already developed, there is still a demand to find a more efficient, cheaper and ecologically more acceptable sorbents. Possibility of using bentonite as naturally occurring material for methylen blue removal from its aqueous solutions was investigated in this paper. The influence of the bentonite activation and acidity of the initial solution were also examined. Equilibrium sorption isotherms were determined. The obtained data were correlated with textural material properties (specific area, structure, particle diameter). By using of natural materials it is possible to avoid secondary environment pollution.

P.S.A.30.

POLYMER STRUCTURE PREDICTION BY COMPUTER SIMULATION OF ZIEGLER-NATTA-KAMINSKY POLYMERIZATION BASED ON CHARGE PERCOLATION MECHANISM

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Recently a new charge percolation mechanism (CPM) of Ziegler-Natta-Kamisky polymerization of olefins by supported transition metal (Mt) complexes has been presented: a macromolecular chain is formed by polymerization of the monomer cluster (nM) adsorbed at the support (S) between two immobilized Mt ions, some in the higher (Mt^{n+1}, i.e. acceptors) and the other in the lower (Mt^{n-1}, i.e. donors) oxidation state:

$$(Mt^{n+1\cdots}nM^{\cdots}Mt^{n1})/S \rightarrow (Mt^{n}\quad Mt^{n})/S + \text{polymer.}$$

According to the CPM it is possible to distinguish the basic paricipants (support, active centres, i.e. acceptors and donors, and monomer) and the basic events at the support (formation of active centres, monomer adsorption, monomer cluster formation and growth, building-up a bridge between donor and acceptor and percolation, i.e. simultaneous active center deactivation and polymerization and polymer removal from the support).

A special computer program «Lattice» has been developed to simulate olefin polymerization based on CPM using a Monte Carlo procedure. The basic input simulation parametars are: a type of the support, a number of adsorption sites, a number of active centres at support and the sequence of chemical components addition.

The effects of reaction conditions (Mt concentration, Mt/S ratio, sequence of chemical components addition, temperature, pressure and time) of ethene and propene polymerization by various Mt precursors ($TiCl_4/MgCl_2$, CrO_x, metallocenes) and supports ($MgCl_2$, SiO_2, methylaluminoxane) on molecular mass and molecular mass distribution have been predicted by simulation and confirmed by published experimental results.

P.S.A.31.

MICROSTRUCTURE OF $LaNiO_3$ THIN FILMS OBTAINED BY SPIN-ON TECHNIQUE FROM CITRATE PRECURSORS

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Morphology of perovskite $LaNiO_3$ thin films is very important feature considering the fact that they could be used as an electrode material in ferroelectric devices. In this work LNO films were prepared from citrate precursors. Films were deposited on silicon (100) and platinum covered silicon substrates [Pt (111) / Ti / SiO_2 / Si] using spin-on technique. Microstructures of films were investigated by atomic force microscopy. The influence of metal ion : citric acid : ethylene-glycol ratio and viscosity of precursor solution on the morphology of films was investigated. After optimization of these parameters the homogenous, uniform and crack-free $LaNiO_3$ films were obtained.

P.S.A.32.

GRAIN SIZE EFFECTS ON THE MICROSTRUCTURE AND ELECTRICAL CHARACTERISTICS OF Nb/Mn AND Dy/Mn DOPED BARIUM TITANATE CERAMICS

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The effects of Nb/Mn and Dy/Mn as dopant/additive on the microstructure and dielectric properties of codoped $BaTiO_3$ ceramics were investigated. The Nb/Mn and Dy/Mn doped $BaTiO_3$ samples were prepared by conventional solid state procedure with concentrations ranged from 0.1 up to 2 at% of additives. The Mn concentration of 0.05at% was the same in bath types of samples. The samples were sintered in temperature interval from 1290^0C to 1350^0C in an air atmosphere for two hours. The microstructure and composition uniformity were investigated using SEM and EDS techniques.

Variation of dielectric constant and dielectric losses with temperature and frequency for different amount of additive were investigated. In all investigated samples the dielectric permittivity and dielectric losses after initially large values at low frequency attain a constant value. The shift of Curie temperature towards lower temperature has been noticed in all samples. For the analysis of the permittivity behavior in paraelectric region Curie-Weiss law and modified Curie-Weiss law were used. The dependence of Curie constant and the exponent of non-linearity of the permittivity in function of sintering temperature and concentration of additive were given.

P.S.A.33.

MODIFIED Ni CATALYSTS FOR THE HYDROGENATION OF VEGETABLE OILS WITH LOW *TRANS*-ISOMER CONTENT

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Catalysts obtained by precipitating Ni onto suitable thermostable porous supports are used in the process of partial hydrogenation of vegetable oils, within the temperature and pressure range from 180 to 210°C and from 0,1 to 1,0 MPa, respectively. In such conditions of the process, parallel, *cis-trans* isomerization reactions can be encountered with undesirable *trans*-product yields, decreasing the selectivity for the main reaction. Properties of the used catalyst as well as temperature and pressure affect the selectivity of the process.

In this work, the results of research on the influence of the concentration of Ag-modifier on physico-chemical and catalytic properties of modified Ni catalysts are presented.

The obtained results showed that the content of the used modifier influenced on the texture of the modified Ni catalysts resulting in the difference in selectivity of the catalyst samples. The greater the amount of Ag modifier used, the lower the amount of trans fatty acids obtained, probably due to the faster hydrogenation reaction achieved when catalyst samples with greater specific surface were used.

P.S.A.34.

MECHANOCHEMICAL SYNTHESIS OF $Bi_4Ti_3O_{12}$ CERAMICS

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Ferroelectric $Bi_4Ti_3O_{12}$ (BIT) ceramics are potential candidates for device applications due to their high dielectric constant, high Curie temperature and high breakdown strength. The synthesis of more resistive BIT ceramics would be preferable advance in obtaining of well-densified ceramic with small grains randomly oriented to limit the conductivity along the $(Bi_2O_2)^{2+}$ layers. Having in mind that the conventional ceramic route for the synthesis can lead to non-stoichiometry in composition, in consequence of the undesirable loss in bismuth content through volatilization of Bi_2O_3 at elevated temperature, our efforts were addressed to preparation of BIT by mechanical activation the constituent oxides. The nucleation and phase formation of BIT, crystal structure, microstructure, powder particle size and specific surface area were followed by XRD, Rietveld refinement analysis, thermal analysis, SEM microscopy and the BET specific surface area measurements.

P.S.A.35.

NANO-SECOND SURFACE MODIFICATION of TITANIUM NITRIDE THIN FILM by Nd:YAG and TEA CO_2 LASERS

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The interaction of nano-second, Nd: YAG and TEA CO_2, lasers with titanium nitride (TiN) thin film were investigated. Both lasers, for used power densities of about 10^9 and 10^8 W/cm^2, induced modification of TiN film. The utilized experimental parameters were: Nd:YAG laser-wavelength=1.064 μm, FWHM=10 ns; TEA CO_2 laser-wavelength= 10.06 μm, FWHM (initial spike)=100 ns, tail duration=2 μs; TiN thin film thickness=1μm. Thin film was deposited by PVD method on silicon substrate. The energy absorbed from lasers beams were partially converted into thermal energy, thus effects like melting, vaporization, exfoliation, etc. were registered. The Nd:YAG laser produced craters with sharp periphery while, TEA CO_2 laser created damages with broad boundary zone. Hydrodynamical effects were especially pronounced during irradiation with TEA CO_2 laser. For applied power densities the interaction was always followed by plasma creation in front of the target.

P.S.A.36.

STRUCTURAL ANALYSIS OF MECHANICALLY ACTIVATED ZINC OXIDE

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Modification of microstructural properties of commercial zinc oxide powder was achieved by mechanical activation in a both high-energy vibro and planetary ball mill. Microstructural characteristics of powders were analyzed by scanning electron, atomic force and transmission electron microscopy. Structural parameters of unmilled and milled zinc oxide powders were analyzed by Rietveld's powder structure refinement method, using X-ray powder diffraction data. KOALARIET X-FIT program was used for profile analyses. Relation between microstructural and structural parameters, such as average grain and crystallite size, lattice parameters, crystal lattice microstrain, and milling parameters were established.

P.S.A.37.

SURFACE MODIFICATION OF TITANIUM BY THE HIGH INTENSITY ULTRA-SHORT Nd:YAG LASER

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The interaction of 40 ps (FWHM) Nd:YAG laser (wavelengths 1.06 μm and 0.53 μm) with solid Titanium (Ti) target has been investigated. Experiments were performed in the air at an atmospheric pressure. Results have shown that Ti surface was modified for laser power densities exceeding 10^{10} W/cm^2. Initial investigations show that the absorbed laser energy has been used for creating the plasma plume, radiation and thermal energy etc. The role of thermal energy has been in generating effects like melting, vaporization, shock waves, etc. Morphological manifestation on the Ti surface can be summarized as follows: appearance of crater like structure and presence of hydrodynamical features in the center and its periphery of the irradiation region. Two damage zones could be clearly distinguished. Surface modifications for both laser wavelengths were sharp implying the importance of the laser wavelength. Importance of this study is the adaptability of the results in industries like automotive, chemical and medicine.

P.S.A.38.

OSCILLATORY PHENOMENA DURING ANODIC COPPER ELECTRODISSOLUTION IN TRIFLUOROACETIC ACID SOLUTION

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The interest in the phenomenon of passivity of metals is due to both, the theoretical investigations and its practical significance in the corrosion resistance of metals and alloys. Here, the anodic behavior of copper electrode in trifluoroacetic acid solution was examined. The anodic I-E polarization curves taken under near steady state conditions can exhibit the oscillatory behavior. Namely, the domain of the polarization potentials which generate the oscillatory evolution of current in our Cu/CF_3COOH system was defined and analyzed.

P.S.A.39.

SYNTHETIC ACTIVATED CARBONS FROM ION EXCANGE RESIN SYNTHESIS AND CHARACTERIZATION

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The activity on research and development of materials with controlled porosity and shape has rapidly grown during the last then years. As for synthetic carbons, the interest was driven by numerous potential applications possibilities of these materials such as molecular sieves, adsorbents, catalyst supports, electrodes for electric double-layer capacitors, etc. In the present work six samples of synthetic activated carbons (SAC) were synthesized by controlled thermal decomposition of macroreticular styrene/divinylbenzene sulfonic acid ion exchange resin Amberlite 200 (Registered Trademark of Rohm and Haas Company). Characterization of all SAC samples was performed by XRD, SEM and physisorption by N_2 at -196ºC. Using EDX method the amount of all elements as well as their distribution was estimated for all synthesized materials. Magnetic susceptibility at 20ºC off investigated materials was determined. Thermal stability of SACs was estimated by TGA in air atmosphere. The influence of different cations (H^+, Cu^{2+} end Ni^{2+}) applied before thermal decomposition and two different activation procedures was discussed.

P.S.A.40.

RAPID SYNTHESIS OF $LiCr_{0.15}Mn_{1.85}O_4$ BY GLYCINE-NITRATE METHOD

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$LiMn_2O_4$ spinel as a cathode material for ion-lithium batteries delivers high voltage, good initial capacity and it is a low cost and non-toxic material. Unfortunately it shows large capacity fade during cycling. $LiM_xMn_{2-x}O_4$ spinels in which some manganese is substituted by other metal cations shows better capacity retention. In this work $LiCr_{0.15}Mn_{1.85}O_4$ has been synthesized by rapid and cheap glycine-nitrate method. All reflections of obtained XRPD pattern correspond to pure spinel phase. The lattice parameter a = 8.2338 Å, acquired from Rietveld structure refinement, has a lower value than for $LiMn_2O_4$ due to increased M-O bond covalence. SEM micrographs of obtained powder material show that average particle size is below 500 nm. The BET surface area is 9.6 m^2 g^{-1}. $LiCr_{0.15}Mn_{1.85}O_4$ shows initial discharge capacity of 110 mAh g^{-1} and after 50 cycles discharge capacity decreases to 91 mAh g^{-1}.

P.S.A.41.

STRUCTURAL PHASE TRANSITIONS IN TRIAMMONIUM HYDROGEN DISULPHATE

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The temperature dependences of mass magnetic susceptibility, relative dielectric permittivity, tangent loss and specific electrical resistivity were investigated. Measurings on polycrystalline sample $(NH_4)_3H(SO_4)_2$ (TAHS) in the temperature range 293-470K were carried out. By these measurings the anomalous behavior at temperature 320K, 373K, 413K, 433K was detected. The electrical resistivity of the sample decreases drastically in the vicinity of transition temperature 413K. This fact indicates that the sample becomes a fast ionic conductor.

P.S.A.42.

ION BEAM ASSISTED DEPOSITION OF TiN THIN FILMS ON Si SUBSTRATE

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In this paper we present a study of the formation of TiN thin films during the IBAD process. We have analyzed the effects of process parameters such as Ar ion energy, ion incident angle, Ti evaporation rates and partial pressure of N_2 on preferred orientation and resistivity of TiN layers. TiN thin films were grown by evaporation of Ti in presence of N_2 and simultaneous bombarded with Ar^+ ions. Argon ion energy was varied from 1.5 to 2.0 keV and the angle of ion beam incidence from 0^o to 30^o. All samples were analyzed by Rutherford backscattering spectroscopy (RBS). We have also used X-ray diffraction (XRD) for phase identification. The resistivity of samples was measured with four-point probe method. The results clearly show that TiN thin layer grows with (111) and (200) preferred orientation, depending on the IBAD deposition parameters.

P.S.A.43.

THE MANY-BODY CALCULATIONS OF REFRACTIVE INDEX, DYNAMIC POLARIZABILITY AND VERDET COEFFICIENTS

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Within the framework of the many-body theory by using the method of the Random Phase Approximation with Exchange (RPAE) we calculated the refractive index, the frequently dependent polarizabilities and Verdet coefficients of some atoms. Calculated time-dependent peculiarities of set of atoms (ions) are very important in the nano-region and for designing new materials.

P.S.A.44.

DEPENDENCE OF THE CHARACTERISTICS OF MOULD MIXTURES FOR PRODUCTION OF MOULDS AND CORES FOR GREY CAST IRON PRODUCTS ON THE FELDSPAR CONTENT IN QUARTZ SAND

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In this paper the influence of feldspar content in quartz sand on properties and quality of mixtures for moulds and cores for grey cast iron products is presented. Technological tests of coating were performed and the values of cold and hot compressive strength and softening temperature for the samples with and without scale were obtained. Some results are related to mixtures for moulds and cores on the basis of coated sand are presented, also.

Before coating tests, the characterization of investigated sand species was performed with the determination of mineral content, of chemical content, grains microscopic view and granulometric analysis. Four different species of quartz sand (marked as "V", "D.B.R.", "R" and "T") were investigated. As technological tests of quartz sand coating, the softening temperature for samples with and without scale and the hot and cold compressive strength were determined. For tests of non coated mixtures phenol-formaldehyde resin Resofen FF600 was used.

Based on experimental findings, correlations for the influence of feldspar content in quartz sand on quality of casting mixtures for moulds and cores were deduced demonstrating a direct dependence of hot and cold compressive strength and softening temperature of casting mixtures on feldspar content in coated quartz sand.

P.S.A.45.

INFLUENCE OF TEMPERATURE AND SHAPING METHOD ON THE PROPERTIES OF SINTERED PRODUCTS ON THE BASIS OF ILLITE-KAOLINITE CLAY TYPE

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The aim of this investigation was to obtain sintered product with high values of compressive strength, low values of porosity and satisfactory values of shrinkage during sintering process on the basis of illite-kaolinite clay used as a raw material. These characteristics of sintered products have enabled: the choice of shaping method, sintering temperature and granulometric content of clay. The obtained results demonstrate that these characteristics of sintered products can be obtained at shaping by hot- pressing of powdered mixture, at the optimal sintering temperature of 1000 ºC, with appropriate granulometric content of raw material.

The formation of specimens was shaped in two ways:

- by hot pressing of powdered mixture at the temperature of 300 ºC (in the form of a cylinder with Ø 2.9 cm and a height of 0.8 cm);
- by manual plastic shaping in a mould corresponding to a parallelepiped with dimensions of 7.7 cm x 3.9 cm x 1.6 cm.

The firing process of shaped products was performed at the temperatures of 800 ºC, 900 ºC, 1000 ºC, 1100 ºC, 1200 ºC and 1300 ºC (samples are marked as 1, 2, 3, 4 ,5 ,6, respectively).

Considering the obtained values of total porosity and compressive strength at the temperature of 1100 ºC, and the energy spent during sintering process of products at the temperatures of 1200 ºC and 1300 ºC, it can be considered that it is an optimal temperature of sintering.

P.S.A.46.

SYNTHESIS OF TITANIA MESOPOROUS SOL-GEL MATERIALS USING NONIONIC PEG SURFACTANT

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Mesoporous materials are materials with specific pore structure and properties. Porosity in these materials on two or three different length scales in an ordered fashion with interconnectivity between the pores and with hierarchical structure have many potential applications in the field of catalysts, separation media, electrode materials, sensors etc.

In this paper mesoporous titania materials were obtained using sol-gel method and different molecular weights of nonionic surfactant polyethylene glycol (PEG 400, and 1000) as templates. As precursors for titania obtaining were used tetrabutyl orthotitanate, iosbutanol, water and HCl as catalyst. Control samples were made under otherwise identical condition without of PEG template. Experimental procedure was strictly controlled to prevent fast precipitation of the TiO_2 solid. Thus obtained transparent and light yellow gels were carefully dried. After removing templates, the gels were monitored by FTIR spectroscopy and by TGA after solvent extraction. The samples with and without PEG were heated up to 650°C for 2 to 5h, under constant heating rate up to 5°/min. Microstructures, especially pore structures, were characterized by BET method, XRD and SEM. The obtained results showed that the control sample, without template have small BET surface and pore volumes. After the template extraction, both the surface areas, and pore volumes increase drastically. Samples show a surface area range between 200 and 300 m^2/g and pore volume of 0.2-0.34 cm^3/g. Mostly mesopores in the titania samples contribute to the measured pore volumes and areas.

P.S.A.47.

SINTERING KINETIC ANALYSIS OF MECHANICALLY ACTIVATED $ZnO-SnO_2$ SYSTEM

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The object of this work is to determine the parameters of sintering kinetics, in order to find the correlation between densification and microstructural evolution during initial stage of sintering of mechanically activated equimolar mixtures of zinc oxide and tin oxide powders. Densification rate curves have been investigated under non-isothermal conditions using data acquired by sensitive dilatometer at three different heating rates (5, 10 and 20 ^{0}C/min) up to 1200^{0}C. Microstructures of sintered quenched compacts were characterized by scanning electron microscopy and the phase composition was determined by X-ray analysis.

P.S.A.48.

COMPACTION OF ANISOTROPIC GRANULAR MATERIALS: SYMMETRY EFFECTS

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We perform numerical simulation of a lattice model for the compaction of a granular material based on the idea of reversible random sequentiel adsorption. Reversible random sequential adsorption of objects of various shapes on a two-dimensional triangular lattice is studied numerically by means of Monte Carlo simulations. The growth of the coverage $\rho(t)$ above the jamming limit to its steady-state value ρ_∞ is described by a pattern $\rho(t) = \rho_\infty - \Delta\rho E_\beta [-(t/\tau)^\beta]$, where E_β denotes the Mittag-Leffer function of order $\beta \in (0; 1)$. For the first time, the parameter τ is found to decay with the desorption probability P_- according to a power law $\tau = A P_-^{-\gamma}$. Exponent γ is the same for all shapes, γ = 1:29±0:01, but parameter A depends only on the order of symmetry axis of the shape.

P.S.A.49.

PHASE EVOLUTION DURING THE CARBONITRIDING OF DIATOMACEOUS EARTH

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This paper deals with the phase evolution during the carbonitriding of diatomaceous earth. The results show that the reaction products depend of the reaction temperature and carbon/ silicon ratio, where many intermediate compounds appear in small quantities. At low temperature the reaction products are mixture of different oxides and Si_2N_2O. Powders obtained at higher temperature are the mixture of sialon and silicon nitride with well-defined crystal geometry. Increasing carbon / silicon ratio, the amount of sialon increase compared to silicon nitride. By means of was X-ray, TEM and SEM investigations powders have been characterized.

P.S.A.50.

THERMAL STABILITY OF Fe80 B20 METALLIC GLASS

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The thermal stability and crystallization behaviour of metallic glass $Fe_{80}B_{20}$ were investigated by Dynamic Temperature Resistivity Measurement (DTRM) technique from room temperature to 1050K in forward and reverse mode at a heating rate of 40 K/min. The slope of Resistivity-Temperature-Curve (RTC) changes sign and magnitude at the temperature where the transition takes place.

Differential Thermal Analysis (DTA) was carried out at the heating rates of 10, 20, 30 & 40 K/min. A comparison of the results of DTRM and DTAmeasurements shows that crystallization in this alloy is two-stage process. Activation energy for two crystallization steps was calculated from DTA data, using various peak shift equations. The activation energy for first step was found to be lower than the second.

P.S.A.51.

GAMMA RADIATION EFFECTS MECHANICAL PROPERTIES OF CARBON/EPOXY COMPOSITES

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Unidirectional and angle-ply carbon/epoxy laminates were gamma irradiated up to doses of 12 and 20 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, as well as, delamination strain energy release rate, 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. The immersion of composite plate in water at 80 ^{o}C and mechanical measurements on elevated temperatures emphasized the irradiation effects on mechanical properties.

P.S.A.52.

CHARACTERISATION OF PLATINUM NANOPARTICLES ELECTROCHEMICALLY DEPOSITED ON GLASSY CARBON

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During last several decades platinum catalyst supported on high area carbon material has been intensively studied due to its possible application in fuel cell - a potential new energy source. It was noticed that the nature of carbon support affected structure of platinum deposits and thus their activity. In our studies we deposited platinum on glassy carbon and examined the influence of support properties on the properties of the catalyst. Deposition of platinum was performed electrochemically at the same conditions, while the properties of the support were changed by its treatment. Platinum nanoparticles were characterized by AFM, STM, XPS, XRD and cyclic voltammetry.

P.S.A.53.

CORRELATION BETWEEN THE ELECTRON STATE DENSITY CHANGE AND THE SPECIFIC ELECTRICAL RESISTIVITY CHANGE IN THE AMORPHOUS POWDER OF THE NiMo ALLOY

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Structural changes in the amorphous powder of the NiMo alloy, pressed under pressure of 600 MPa, were examined by measuring the temperature dependence of a thermo electromotive force (TEMF) and specific electrical resistance in the temperature interval from 290 K to 1000 K.

The temperature dependences of the electrical resistivity showed that the powder crystallization process was performed in two stages in the temperature interval from 700 K to 900 K.

Multiple measurements of the temperature dependence of the TEMF showed that the structural relaxation process and each crystallization stage caused changes in the temperature coefficient of the thermo electromotive force (TCTEMF). From the changes in the TCTEMF corresponding relative changes in the electron state density were determined. As indicated, the changes in the electron state density after the structural relaxation and after each crystallization stage were completely correlated with related changes in the specific electrical resistivity.

P.S.A.54.

STRUCTURAL CHANGES OF THE AMORPHOUS POWDERS OF THE NiCo ALLOY

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The differential scanning calorimetry (DSC) method and X-ray structural analysis were used to examine the effect of structural changes on electric and magnetic properties of the amorphous powders of the NiCo system.

Investigations were made of the structural changes of the powders $Ni_{80}Co_{20,}$, $Ni_{45}Co_{55}$ and $Ni_{20}Co_{8}$ in the temperature interval from room temperature to 900 K.

It was shown that all the three powders crystallized in two stages in the temperature interval from 690 K to 800 K. The change in the chemical composition of the system resulted in a temperature peak shift of crystallization maximums.

Maximum thermic stability of the amorphous structure was reached at approximately identical cobalt to nickel ratio.

The XRY analysis results were in complete correlation with the DSC analysis results.

Each crystallization stage, as it was shown, caused corresponding changes in the magnetic permeability for all the three NiCo alloy compositions.

P.S.A.55.

MECHANISM OF A SOLID-STATE FORMATION OF $La_{1-x}Sr_xMnO_{3+\delta}$ (0 < x < 0.5) AND MAGNETIC CHARACTERIZATION THEREOF

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Rich diversity of potential, substantially different micro-structural arrangements - reflecting on the wide potential set of interesting properties, ranging from high electrical conductivity to giant, collossal or low-field magnetoresistance to low Curie point - of LaSr-manganite materials opens possibilities for numerous scientific investigations oriented towards revealing correlations on the influence line: procedure of synthesis → inherent properties → measured properties → application of the material. The investigations of the influence of synthesis procedures and LaSr-manganite stoichiometries on the Curie point (and other magnetic characteristics) of the material, being the topic of this work, are attractive since they present a necessary primal step in the development of nano-magnetic drug carriers based on these materials. In the course of such an investigation, the mechanism of the formation of the desired manganite compounds by following a classical solid-state preparation method, was also studied.

P.S.A.56.

CHARACTERIZATION OF NANOCRYSTALS EMBEDDED IN LAS - GLASS CERAMICS

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The samples of transparent glass-ceramics in the ternary system Li_2O-Al_2O_3-SiO_2 (LAS), with ZrO_2 as nucleating agent and Eu_2O_3 or Er_2O_3 as luminescent dopant, have been studied. Microstructural parameters are responsible for a number of physical properties of glass-ceramics, so the objective of this investigation is to study the crystalline forms of the precipitates. The main interest is to characterize luminescent nanoparticles in a glass matrix, to determine their size, shape and distribution, and to identify the crystal phases and chemical composition as they influence luminescence efficiency of the material. The samples were studied by X-ray powder diffraction, transmission electron microscopy (TEM), high resolution TEM (HRTEM) and energy filtered TEM (EFTEM).

P.S.A.57.

FORMING OF THE SILICALITE-1 NANOPARTICLES IN THE SYSTEM WITH PRECIPITATED SILICA

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Nanosized precipitated silica as initial material and TPABr as templating agent was used in a low temperature (358 K) synthesis of silicalite-1 (MFI zeolite structure). The powder was investigated using IR, XRD and SEM measurements. The average particlel size was calculated from spesific surface area (S_{BET}). In the presence of TPA^+ cations, nanoparticles of precipitated silica were preserved, with certain changes before and during temperature treatment in three crystallization systems: A-system without sodium and without possibility for transformation into silicalite-1 in “definitive” time, B-system with sodium in which silicalite-1 has been formed and C-system with sodium in an excess and without possibility of the silicalite-1 forming. Silicalite-1 phase of high crystallinity was appeared (B-system) inside of the nanosized particles ($\leq$ 50 nm), which were agglomerated in the wide scale of size.

P.S.B.1.

A NOVEL ASPECTS TO THERMAL ANALYSIS OF THICK FILM POWER MODULES

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In this paper thermal analysis of thick film power modules was done in several aspects: thermal properties of materials, electronic substrate effect, process of heat transfer and dissipation mechanisms, device geometry, mounting technology etc. Thermal resistances of the different layers and configuration in thick film power modules are described in brief. We proposed methods to reduce the thermal resistance which include the use of BeO as substrate material instead Al_2O_3, coolers and use of special techniques in cooling such as heat pipes. A thermal mathematical and physical model presented in this work helps to predict and control potential temperature problems. To obtain the temperature distribution in thick film power module we have used the two-dimensional thermal mathematical and physical model for thick film integrated circuits. We have performed simulation results and presented the influence of power dissipation on the total temperature field T(x,y) of thick film power module. A verification of the proposed model was done using a semiempyrical method based on temperature measurements in selected points on the top surface of the thick film power module. Finally theoretical and experimental thermal distributions obtained for choosed thick film power module at different ambient temperatures and power loads were compared.

P.S.B.2.

RADIOLOGICAL CHARACTERIZATION OF SEMICONDUCTOR MATERIALS IN FIELD EFFECT TRANSISTOR DOSIMETER BY MONTE CARLO METHOD

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The use of semiconductor materials in radiation processing, radiation therapy and diagnostics and detection of cosmic radiation motivated developing of numerical methods for its radiological characterization. This paper presents the application of Monte Carlo method using the FOTELP-2K4 code in aim of radiological characterization of metal oxide semiconductor field effect transistor (MOSFET) dosimeter. The advantages of MOSFET dosimeters include small size, immediate readout, and ease of use into wide photon energy range. To determine the dosimeter response accurately, this investigation has taken the distribution of absorbed dose to MOSFET structure. Our results show that the developed simulation model calculates absorbed dose distribution very satisfactorily in comparision with publishing data.

P.S.B.3.

PHOTOTHERMAL DEPTH PROFILING OF INHOMOGENOUS SOLIDS

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An analytical solution for the photothermally measurable surface temperature of a sample with polynomial inhomogeneous depth profile of the thermal conductivity is presented. Focus is on the optically opaque media. An example is given to demonstrate the potential of defining the thermal conductivity profile from the frequency dependence of the surface temperature.

P.S.B.4.

EVALUATION OF AlGaN/GaN MODFET CARRIER SHEET DENSITY AND GATE CAPACITANCE

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A new theoretical model based on analytical expression setting the relation among channel carrier capacitance, sheet density carriers in the heterointerface inversion layer, gate bias, intrinsic parameters of semiconductor layers and devices geometry has been derived.

The dependence of sheet density carriers and channel carrier capacitance on inverse gate polarisation has been evaluated and compared with literature values.

The influence of both, donor doping concentration to sheet carrier density dependence and channel carrier capacitance dependence on gate bias has been investigated and discussed.

P.S.B.5.

POTASSIUM SODALITE: A NOVEL MATERIAL FOR EPR DOSIMETRY

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Electron paramagnetic resonance (EPR) dosimetry is a standard method for measurement of radiation doses. Most studies have been concerned with alanine dosimeters whose sensitivity is known to be relatively low, so new materials for determination of doses in the interval from 0.5 to 100 Gy are needed. In the present study we employed potassium sodalite ($K_6[Al_6Si_6O_{24}]\bullet nH_2O$) as a novel material for EPR dosimetry. We observed significant yield of EPR active F-centers induced by radiation. In addition, gamma-irradiated sodalite showed sharp spectral line and excellent thermal and temporal stability of radicals at room temperature which are important criteria for EPR dosimetry. Therefore, we propose potassium sodalite as a new sensitive dosimeter system.

P.S.B.6.

STRUCTURE OPTIMIZATION OF WELD METAL AND HAZ IN MICROALLOYED HIGH-STRENGTH STEEL WELDED JOINTS

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In the paper structural transformations of weld metal and heat affected zone (HAZ) of welded joints of high-strength microalloyed steel of Nb/Ti grade resulting from modification of the filler quality and welding regime have been studied. Experimental welding of the samples was carried out in two processes: MMA and MAG. The microstructure of HAZ and weld metal was determined using light and scanning electron microscopes. Structural transformations and the content of individual microconstituents in percentages were defined by comparative analysis using continious cooling transformation diagrams. Selection of optimum structure of weld metal was made based on the needle ferrite fraction in weld metal, while selection of optimum structure of HAZ was made based on ferrite grain size and the level of heat input during welding.

P.S.B.7.

PHOTOACOUSTIC PROPERTIES OF THIN FILM ZINC-STANNATE

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Thin films of single-phase zinc-stannate (Zn_2SnO_4) were grown by rf magnetron sputtering onto glass substrates. Transmission in the visible range was measured enabling determination of the energy gap and thickness of analyzed thin film samples using interference fringes. The photoacoustic phase and amplitude spectra of all samples were measured as a function of the modulating frequency using a transmission detection configuration. Fitting of experimental data enabled calculation of thermal diffusivity, the coefficient of minority carrier diffusion, their mobility and lifetime.

P.S.B.8.

THERMAL DIFFUSIVITY AND ELECTRON TRANSPORT PROPERTIES OF NTC LAYERS OBTAINED BY PHOTOACOUSTIC TECHNIQUE

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Thermal diffusivity and electron transport parameters of thick film NTC layers were determined by the photoacoustic technique. Two powder mixtures composed of CoO, MnO, NiO and Fe_2O_3 were milled to nanometer particle size. NTC thick discs were dry powder pressed and sintered at different temperatures in the range from 900 to 1200 ^{0}C for half an hour. A second group of NTC discs was sintered at 1200 ^{0}C with the sintering time varying from half an hour to 4 hours. These NTC samples were polished and exposed to a chopped laser beam in order to plot a response in the acoustic range (PA-photoacoustic spectroscopy). After that NTC layers were made by sequentional screen-printing and drying. They were co-fired at 900-1100^{o}C. PA phase and amplitude diagrams were measured at room temperature and numerically analyzed by a fitting procedure. Finally, a parallel analysis of pressed and screen printed NTC samples was performed.

P.S.B.9.

FRACTIONAL MODEL FOR THE COMPACTION OF A VERTICALLY TAPPED GRANULAR MATERIAL

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The vibratory compaction of granular materials has long been of importance in technological applications. A number of different approaches have been proposed in order to connect observed slow compaction with effects of excluded volume and geometrical frustration without reaching a unique conclusion concerning the temporal behaviour of the density change. When analyzing the previous experimental results, we found that the density relaxation of a vibrated granular material follows the Mittag-Leffler law in the whole temporal range. Furthermore, a fractional model of granular compaction that captures this relaxation dynamics is presented.

P.S.B.10.

THE AUSTEMPERING STUDY OF DUCTILE IRON ALLOYED WITH COPPER AND NICKEL

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The remarkable mechanical properties of austempered ductile irons arise from their microstructure, which is composed of a high –carbon stabilized austenite matrix filled with small isles of bainitic ferrite platelets, appropriately called ausferrite. In this paper an investigation has been conducted on ADI alloyed with 1,6%Cu and 1,5%Ni and austempered in a range of times and temperatures. The microstructures were characterized by light microscope and X-ray diffraction. The fracture mode developed throughout these treatments has been identified by means of scanning electron microscopy. It was shown that the mechanical properties strongly depend on amounts of bainitic ferrite and retained austenite. Based on these results an optimal processing window has been established.

P.S.B.11.

DOWNSTREAM PROCESSING OF SOME Al-Fe-Mn-Si AND Al-Fe-Si TRC ALLOYS AND ITS INFLUENCE ON THE SHEET/FOILS PROPERTIES

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Twin roll casting has been used throughout the aluminum industry to produce stock for a variety of fin and foil products for over three decades. The twin roll casting process has gained more advantages due to its higher productivity and improved cast surface quality. A substantial portion of aluminum foil for packaging applications is manufactured from the Al-Fe-Si and Al-Fe-Mn-Si systems. The performance of the packaging foils depends not only on mechanical properties but on the corrosion resistance of the aluminum foil. One of the most important factors is the intermetallic particles dispersed in the aluminum matrix of foils. Some of these particles may become anodic in most corrosive environments with the respect to the aluminum matrix, microgalvanic cells may form and lead to the local perforation of the aluminum foil.

This paper describes the general trends correlating mechanical and corrosion parameters to chemical composition of some Al-Fe-Si and Al-Fe-Mn-Si foils. These Al-rich eutectic alloys based on Al-Fe-Si and Al-Fe-Mn when roll cast and appropriately processed to give a fine and regular dispersion of intemetallic particles, can provide very fine grain sizes and good combinations of strength and ductility. These characteristics have been responsible for the alloy's success in replacing CP aluminum for applications in thin sheet and foil gauges. Current applications range from 7 micron foil, household and packaging foil to highly formable 100 micron fin stock for automotive radiators and to ordinary sheet gauges required for severe press-forming operations. The objective was to obtain an opinion about the possible role of alloying elements on the electrochemical behavior and mechanical properties of these commercial materials (foils) produced by cold rolling of twin roll cast strips.

P.S.B.12.

STRUCTURE AND DYNAMIC MECHANICAL BEHAVIOUR OF LIQUID-CRYSTALLINE SIDE-CHAIN POLYURETHANES

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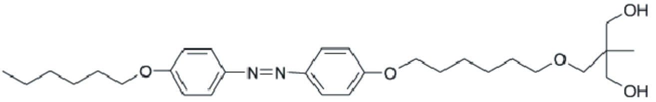
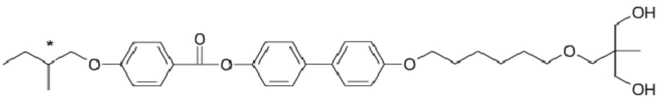
Relations between the structure and thermal physical behaviour of linear ordered polyurethanes with mesogenic groups in side chains were investigated. Polyurethanes were based on two diols (differing in structure of the mesogenic group)

D1



D2



and three commercial diisocyanates (4,4'-methylenedi(phenyl isocyanate) (MDI), 4,4'-hexamethylenediisocyanate (HexMDI) and 2(4)-methyl-1,3-phenylene diisocyanate (TDI)). Six polymers were prepared at stoichiometric mole ratio of hydroxy (OH) and isocyanate (NCO) groups. Molecular weight distributions and their averages of all polymers were determined by the GPC; solutions of polymers in THF were used for measurements. The DSC was used for investigation of the influence of structure on thermal phase behaviour of neat diols and polyurethanes in bulk state. Main attention was devoted to the dynamic mechanical measurements made in a broad temperature and frequency range. For both neat diols the crystalline and liquid-crystalline phases were found; as expected, generally higher transition temperatures were detected for D2 diol in comparison with diol D1. Both polymers prepared from diols and the stiffest MDI diisocyanate exhibit thermal behaviour typical for amorphous structure with the glass transition temperature, T_g, located at 55 °C (D1/MDI) and 79 °C (D2/MDI); this means that stiff MDI does not allow ordering of side-chains mesogens. Polymers with the most flexible HexMDI show only semicrystalline behaviour (no T_g was detected) with the crystal/isotropic state melting temperature at 80°C (D1/HexMDI) and 110°C (D2/HexMDI). In this case the best ordering of mesogens was achieved. The most complex thermal and mechanical behaviour was found for polymers based on TDI, for which the glass transition temperature and mesophase melting temperatures were detected; while for D1/TDI polymer only one type of mesophase was formed, for D2/TDI sample two mesophase melting temperatures were found.

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P.S.B.13.

RELAXATION BEHAVIOUR OF POLYURETHANES WITH MESOGENIC GROUPS IN SIDE CHAIN

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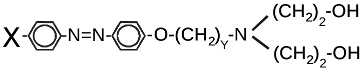
Thermotropic polyurethanes with mesogenic groups in the side chains were prepared from three commercial diisocyanates of various flexibility (4,4'-hexamethylenediisocyanate (HexMDI), 4,4'-methylenedi(cyclohexyl isocyanate) (HMDI) and 2(4)-methyl-1,3-phenylene diisocyanate (TDI)) and six diols based on diethanolamine derivates



All samples were made at stoichiometric ratio of reactive - isocyanate and hydroxy groups. The polymerization proceeded in dry nitrogen to the full conversion of reactive groups. The diols differ by the end substituents X (X=H, phenyl, OC_8H_{17}) and by the length of aliphatic spacer Y (Y=5 or 6). Dynamic mechanical measurements were performed with a Rheometric System IV apparatus in the parallel plate mode in the temperature interval 25 – 200 °C and frequency range 0.1 – 100 rad/s. Dielectric measurements of complex permittivity were performed with Hewlett-Packard LF Impedance Analyzer 4192A in the temperature range 25 – 200 °C and in the frequency region 5 Hz – 10 MHz. The rate of cooling and heating experiments was in both cases 2 °C/min. For characterization of thermal transitions the Perkin-Elmer DSC-2 instrument was used; heating and cooling rate was 10 °C/min. Thermal, mechanical and dielectric behavior of polymers depends on both, a type of diisocyanate and structure of used diol, especially on the change of end side-chain substituent X bound to the mesogenic group. The samples with the simplest end group, X=H, exhibit only an amorphous behavior (e.g. the WLF equation describes the temperature position of dielectric and mechanical functions). For other two X substituents, beside the T_g transition also the formation of mesophases was found. For these polymers the dielectric and mechanical properties exhibit more complex behavior in heating regime than in cooling one. The most complex thermal behavior was found for polyurethane prepared from diol with $X=OC_8H_{17}$ and TDI. Presence of mesophases in all polymers can be well observed in temperature dependences of the dielectric strength, the shape of dielectric and mechanical functions on frequency and on temperature dependencies of relaxation times.

Acknowledgement: The authors thank the Grant Agency of the Academy of Sciences of the Czech Republic (grant No. IAA4112401) and of the Ministry of Education of the Czech Republic (project ME 691).

P.S.B.14.

STRUCTURE AND PHYSICAL BEHAVIOR OF NETWORKS FROM POLY(OXYPROPYLENE)DIOL, DIISOCYANATE AND TRIMETHYLOLPROPANE PREPARED BY ONE- AND TWO-STAGE PROCESS. EFFECT OF CHEMICAL CLUSTERS

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The effect of the initial ratio of components and of one- or two-stage process of formation of polyurethane networks prepared from poly(oxypropylene)diol (PD), 4,4'-diisocyanato-diphenylmethane (MDI) and trimethylolpropane (TMP) on their extraction, swelling, SAXS, photoelastic and dynamic mechanical behavior was investigated. The networks were prepared at various ratios of hydroxy (OH) to isocyanate (NCO) groups, $r_{\mathrm{HT}} = [\mathrm{OH}]_{\mathrm{TMP}}/(0.5[\mathrm{NCO}]) = 1 - 1.5$, by a one- or two-stage process (in the first step $[\mathrm{OH}]_{\mathrm{PD}}/[\mathrm{NCO}] = 1/2$) up to the full conversion of NCO groups. Due to decreasing reactivity of OH groups on TMP non-uniform distribution of hard (TMP-MDI-TMP) segments (chemical clusters) was developed in both network series. SAXS experiments proved that one-stage networks exhibit more heterogeneous structure than two-stage ones. As expected, the weight fraction of the gel w_{g} and equilibrium modulus G_{e} decrease with increasing deviation from stoichiometry; the G_{e} and w_{g} values of one-stage networks at constant r_{HT} are always higher than those of two-stage networks. The frequency – temperature (f–T) superposition of both components of the complex compliance J^* ($= J' - iJ''$) was performed and the horizontal shift factor $\log a_T$ satisfied the WLF equation for all networks. From the dependence of superimposed storage J'_{p} and loss J''_{p} compliances on reduced frequency $f{\cdot}a_T$, three contributions could be determined from the Cole-Cole distribution; each process was characterized by the relaxation strength ΔJ_i, relaxation time τ_i and distribution broadness b_i. The broadness b and strength ΔJ of the high and medium frequency process ($i = 1,2$), which correspond to the glass-rubber transition, are roughly independent of r_{HT} and the preparation method. The τ_3 and ΔJ_3 values of the low-frequency process in networks prepared by two-stage process are always greater than those in networks prepared by the one-stage process. Network structure was described theoretically using theory of branching processes taking into account substitution effect on TMP. Such parameters as gel point conversion, sol/gel fractions, number, size and functionality of chemical clusters, crosslinking density, concentration of elastically active network chains, equilibrium shear modulus, etc. were calculated for one- and two-stage process of network formation and compared with experimental results.

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P.S.B.15.

GAMMA IRRADIATION OF ORIENTED POLYOLEFINS.
I. GEL CONTENT STUDY

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Being a system of organic molecules with covalent bonds, the most important processes in "passing" of gamma radiation through polymers are excitation and ionization. Such events result in creating free active molecules with electron deficiency (radicals), breaking bonds and creating new once. Obviously, there are two competitive processes – the first one results in creating a three dimensional net through out the polymer (gel); the second one breaks the polymer's macromolecules into smaller ones and introduces defects within the polymer system. This work shows how uniaxial orientation influences gel production in several gamma irradiated polyolefins: LDPE, LLDPE, HDPE and iPP. Since there are not many results of this kind on oriented polymers, these are going to help better understanding the dependency of gel production on orientation, in gamma irradiated polyolefins.

P.S.B.16.

THE PROPERTIES OF DANGLING CHAIN-NETWORKS PREPARED BY CYCLOTRIMERIZATION OF TELECHELIC DIISOCYANATES

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A good knowledge of the molecular structure of polymer networks allows relating the properties with different molecular parameters. The polyurethane networks with increasing amount of dangling chains had potentially good energy absorption properties. In our work such irregular structure in crosslinked materials was obtained by partial substitution of the diol with a monohydroxy component during the preparation of isocyanate terminated precursore. The poly(urethane-isocyanurate) networks with controlled architecture of pendant chains were prepared in the undiluted state by two-stage technique. Network precursors were synthesized from aromatic diisocyanate (2,4-TDI), α,ω-dihidroxypoly(oxypropylene) (PPD 2000), and an aliphatic low-molecular-weight monool component diethyleneglycolmonomethylether with a stoichiometric excess of isocyanate groups (OH/NCO=r=0.5). Long telechelic chains in the initial mixture contained mainly the difunctional molecules with reactive NCO groups at both ends, and small amount of monofunctional chains with a single reactive terminal NCO group located in one of its end (depending on the ratio of OH groups from monool component). The networks were prepared by end-linking a mixture of long chains bearing terminal reactive groups in the presence of cyclotrimerization catalyst (Polycat 41). After crosslinking the difunctional chains formed mainly elastically active network chains while monofunctional chains remained as pendant molecules. The influence of dangling chains on the mechanical and thermal properties of obtained damping elastomers (model irregular networks) was analyzed. The properties of networks were determined by swelling, extraction, differential scanning calorimetry, IR spectroscopy, thermogravimetry, dynamic-mechanical spectroscopy, and stress-strain measurements. Independently of mechanical testing, the fractions of dangling and elastically active network chains were evaluated using a theory of branching processes with cascade substitution.

P.S.B.17.

STRAND DYNAMICS IN ELASTOMER BLENDS

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Numerous observations in extension tests evidence that commercial elastomer materials as rubber blends, vulcanizates reinforced with carbon bleck and silica etc. demonstrate a pronounced time-dependent response which may be associated with their viscoelastic properties. The time-dependent response of elastomers and rubbery polymeric materials has attracted essential attention in the past decade, which may be explained by their high industrial importance but also the new application of rubber-like materials in electronics, photonics, medicine and views to their biological importance. According to statistical - mechanical theory of elastomer networks, micro - motion of segments is confined to the neighborhood of some mean configurations by surrounding macromolecules which suppress their fluctuations. In this contribution we develop the model of such motions as dynamics of segment strands, accounting the influence of several levels of mobility and interactions types, characteristics for elastomer blends.

P.S.B.18.

OXIDATIVE CHEMICAL POLYMERIZATION OF 4-AMINO-3-HYDROXY-NAPHTHALENE-1-SULFONIC ACID AND ITS SALTS

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The new functional homopolymeric materials were synthesized by oxidative chemical polymerization of 4-amino-3-hydroxy-naphthalene-1-sulfonic acid (AHNSA) and its salts, using ammonium peroxodisulfate as an oxidant, in water at room temperature. Polymerization products obtained from AHNSA, AHNSA hydrochloride, mono-sodium AHNSA, and di-sodium AHNSA were characterized by elemental analysis, gel-permeation chromatography, infrared spectroscopy and conductivity measurements. New substitution patterns shown by IR spectroscopic analysis combined with MNDO-PM3 semi-empirical quantum mechanical calculations revealed N─C coupling reactions as dominant, where C belongs to unsubstituted AHNSA ring. Naphthoquinonoid and benzenoid structures were observed by IR spectroscopy. Influence of pH on AHNSA oxidative chemical polymerization mechanism was examined.

P.S.B.19.

MICROSCOPIC STUDIES OF THE GC/POLY-NiTMHPP/NAFION ELECTROCHEMICAL NITRIC OXIDE SENSOR

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The purpose of this work was to establish the useful range of coverage with modifying polymer and to control Nafion layer uniformity in nanometric scale. Glassy carbon (GC) discs were modified with a layer of nickel(II) tetrakis 3-methoxy-4 hydroxyphenyl porphyrin (poly-NiTMHPP) of different loading (Γ) between 0.6 and 10 nmol/cm^2. The topography and the thickness of the films were determined by means of contact mode AFM. The surface roughness (RMS) for poly-NiTMHPP layer with loading of 0.6; 5.0 and 10.0 nmol/cm^2 were equal 2.79; 3.55 and 8.40 nm, respectively. The RMS and the thickness of Nafion layer were 1.47 nm and ca 90 nm. SEM and optical microscopy observations were used for the comparative studies in large scale. The optimal value of Γ for the sensor was found to be in the range of 6-8 nmole of poly-NiTMHPP per cm^2.

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P.S.B.20.

STRUCTURAL, ELECTRONIC AND OPTICAL PROPERTIES OF SOME PHENYL OLIGOMERS

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Various structural, electronic and optical properties of P2P to P6P phenyl oligomers are calculated using molecular mechanics, semiempirical quantum mechanic and ab-initio, Linear Combination of Atomic Orbitals (LCAO) methods, and compared with existing experimental and calculated data. The obtained relations, and identification of the underlying mechanisms governing them, enable spectroscopic identification of different molecules and their conformations and production of materials with desired characteristics. The interesting opportunity of adjusting material performances by an external influence, to achieve outputs interesting for practical purposes, is also established exploring obtained interdependences of phenyl oligomers properties.

P.S.B.21.

STRUCTURE AND PHYSICAL BEHAVIOR OF LIQUID-CRYSTALLINE POLYBUTADIENE-DIOLS WITH VARIOUS MESOGENS IN THE SIDE CHAINS

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Liquid-crystalline polybutadiene-diols (LCPBD's) with the comb-like architecture were prepared by reaction of the thiol with the double bonds of PBD. For modification we have synthesized the thiols with mesogenic group in the side chain of the structure 4`-(mercaptohexyloxy)biphenyl-4-carbonitrile (I) and 5-[4-(4-octyloxyphenylazo)phenoxy]-pentane-1-thiol (II). Thiol I was synthesized by alkylation of 4`-hydroxybiphenyl-4-carbonitrile with 1,6-dibromohexane. The prepared bromine derivative was used for alkylation of thiourea and hydrolysis of the obtained thiuronium salt yielded to the thiol. The initial substance for synthesis of the thiol II was 4-acetamidophenol. Phenolic group was alkylated by octylbromide and after hydrolysis of acetamido-group the alkylation by 1.5-dibromopentane followed. The synthesized bromine derivative was converted to thiuronium salt by reaction with thiourea and after hydrolysis gave thiol II. After synthesis and purification the thiols were crystalline powders with melting temperatures T_{mI} =53 °C and T_{mII} =102 °C; LCPBD's with various initial molar ratios of thiols to double bonds of PBD (or monomers in PBD), R_0, in the range from 0.15 to 1, were prepared. The telechelic HO-terminated polybutadiene - Krasol LBH 3000 ($M_n \cong 2500$ and $f_n=2$) and the initiator - 2,2'-azobis(2-methylpropionitrile) (ABIN) were used at radical reaction; the reaction proceeded in toluene solution (1mol PBD in 1l of toluene) at constant ratio of initiator to thiol - $5x10^{-2}$ mol ABIN/thiol at temperature 60 °C for 48 h. The experimentally obtained degree of modification, R_e, after the reaction and purification, was determined from elemental analysis - from the amount of sulfur bounded in LCPBD's. The R_e value was determined also from ^{1}NMR spectroscopy. The physical properties were investigated by differential scanning calorimetry and dynamic mechanical spectroscopy. It was found that with increasing R_e ratio the glass transition temperature of LCPBD's, T_g, and temperature of liquid-crystalline transitions increase. With increasing degree of side chains also the change in enthalpy at LC transition increases. The LC transitions could be detected also in dynamic mechanical behavior of LCPBD's. ^{1}H NMR spectroscopy proved that with increasing R_0 the amount of hydrogenated double bonds in LCPBD's increases. ^{1}NMR spectroscopy also proved that the functionality of LCPBD's does not change with modification.

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P.S.B.22.

KINETICS OF ISOTHERMAL DEHYDRATION OF HYDROGEL OF POLY(ACRYLIC ACID)

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Kinetics of isothermal dehydration of the equilibrium swollen poly(acrylic acid) hydrogel was investigated. Isothermal dehydration curves at temperatures: 306, 324, 345 and 361 K were determined by thermo-gravimetric analyzerTA instruments, Inc. model SDT 2960. The kinetic parameters of the investigated dehydration process (the activation energy (Ea), and pre-exponential factor (A)), were determined from the thermogravimetric curves using following methods: Austin Ricket (AU), Johnson-Meht-Avramy (JMA) and method of stationary point (ST). Ranges within which particular method is valid (denoted α) and determined values of Ea and pre-exponential factor 1 are shown in Table 1. Determined results presented at Table 1, implies that the used methods could applied in wide range of the investigated dehydration process. Determined values of the kinetics parameters obtained using different methods shows high degree of conformity one with each others, which in turn implies there's validity. The obtained values of kinetics parameters obtained from isothermal experiments are compared with the ones obtained under the non-isothermal experiments. A possible mechanism of the isothermal dehydration of the hydrogel of poly(acrylic acid) was established and discussed. This mechanism explains differences in the values of the kinetics parameters determined using isothermal and non-isothermal methods.

Table 1. Kinetics parameters of iso-thermal dehydration of poly(acrylic acid) hydrogel

Method	α	Ea (kJ/mol)	$A \cdot 10^{-6}$ (min^{-1})
AS	0.05-0.80	47.5	2.13
JMA	0.05-0.92	48	2.08
ST	0.01-1.0	48.3	4.22

P.S.B.23.

COMPARING OF SWELLING KINETICS OF POLY(ACRYLIC ACID) HYDROGEL IN DISTILLED WATER AND PHYSIOLOGICAL SOLUTION

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A hydrogel of crosslinked poly(acrylic acid) with well-defined structural properties was synthesized and well characterized. Swelling kinetics of poly (acryl acid) hydrogel was investigated and compared for distilled water and physiological solution, at temperature range from 25 °C to 45°C. It was found that in physiological solution equilibrium swelling degree is significantly reduced compared to the same in distilled water. It was shown that investigated processes in both mediums were not controlled by so called Fickian type of diffusion. It was found that the process of swelling in distilled water could be described as first order for significant part of the swelling process (swelling degrees higher than 50% of equilibrium swelling degree), while the swelling process in physiological solution could be best described as second order kinetics for the most of the swelling process. The swelling kinetic parameters, activation energy (E_a) and pre-exponential factor (A), were determined. A swelling mechanism was suggested and discussed.

P.S.B.24.

STYRENE BUTADIENE /CHLOROSULPHONATED POLYETHYLENE RUBBER BLEND REINFORCED BY HIGH-STRUCTURED CARBON BLACK

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The vulcanization is a cross-linking process that prevents permanent deformation of polymer material under load and ensures elastic recovery on removal of the load. The curing conversion denotes the extent of the crosslinking reaction and is determined by measuring the rubber compound properties during network formation. The most practical method to measure the curing behavior is based on dynamical measurement of the isothermal torque vs. time at a given strain using a die rheometer. The prediction of the curing state is usually determined by employing a rheometer, in which the kinetics is described by the torque variation during vulcanization of rubber compounds. The curing is the final step in tire manufacturing whereby a rubber goods is formed to the desired shape. In the press, heat is transferred to the tire from the surfaces, which are maintained at high temperatures, inducing the crosslinking of the rubber macromolecules, thereby converting them to a elastomeric material. The process of network formation in rubber compound is optimized to achieve an crosslink density, which ensure the required properties of elastomeric materials. In the case of truck tires, which are traditionally filled with carbon black, the main contribution to the rolling resistance is the hysteresis loss of the tread compound. Furthermore, another important parameter is the retreadability. To reach this goal, the heat build-up of the tire body has to be reduced. Blends based on functionally active rubbers are reported to be more compatible due to crosslinking reaction by the functional groups. The objective of this research was to study the elastomeric materials for truck tires based on rubber blends. Different types of styrene butadiene/chlorosulphonated polyethylene rubber blend (SBR/CSM) reinforced by high-structured carbon black were analyzed. The size of filler primary primary particles was either 20-25 nm or 60 nm. In prepared compounds the chlorinated polyethylene rubber acts as a allylic chlorine donor (functionally active rubber). Blends were prepared by using a laboratory-size two-roll mill. Sulphur, magnesium oxide, tetramethylthiuram disulfide, N-cyclohexyl-2-benzothiazol sulfenamide or its combination were used as curing agents. The effects of rubber blend ratio and carbon black content on the curing characteristic and mechanical properties (such as stress/strain behavior, Young's modulus, tensile strength, elongation at break, abrasion and hardness) were estimated. The mechanical properties were measured on an Instron tensile test machine. The samples after heat aging were also investigated. 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.25.

ELECTROCHEMICAL BEHAVIOUR OF A COMPOSITE Rh/TiO_2 LAYER FORMED POTENTIODYNAMICALLY ON TITANIUM SURFACE

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Potentiodynamic polarizations of mechanically polished titanium electrode in a diluted solution of rhodium(III) chloride in 0.1 M perchloric acid was performed, resulting in a simultaneous formation of both Rh and TiO_2 films. The morphology of obtained Rh/TiO_2 composite film followed the morphology of titanium support, as evidenced by SEM technique. This composite surface was examined in potential region of both hydrogen and oxygen underpotential deposition, and some differences were evidenced in comparison to bulk polycrystalline rhodium electrode. Oxygen reduction on composite Rh/TiO_2 layer was studied in both alkaline and acidic water solutions using dc voltammetry combined with the rotating disk technique, and high electrocatalytic efficiency was evidenced.

P.S.B.26.

INFRA-RED AND DIELECTRIC PROPERTIES OF $SrTiO_3$: Nd

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Far-infrared reflection spectra and results of dielectric measurements of SrTiO3 single crystal doped by Nd are presented in the paper. Dielectric investigations were conducted in the temperature range from 25 K to room temperature for the test frequency 1MHz. The numerical analysis of the far-infrared reflection spectra is made using a fitting procedure based on factorized form of the dielectric function. The results for SrTiO3: Nd are compared with those for pure crystal. The lowest-frequency phonon mode is found to be strongly influenced by presence of neodium ions in SrTiO3 single crystal.

P.S.B.27.

PHOTORESIST ASHING WITH THE FERRITE-CORE INDUCTIVELY COUPLED PLASMAS FOR THE APPLICATION TO THE LOW-K DIELECTRICS DEVICES

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In order to fully take advantage of copper interconnects in semiconductor devices, low-k dielectric materials must be used to reduce interelectrode capacitance. However, standard ashing process using O_2 plasmas in the conventional asher can damage the low-k layer through oxidation, resulting in the higher capacitance and thus defeating the purpose of using such a film. In the present work, we report the characteristics of ashing process by using the inductively coupled plasma (ICP) system with a ferrite-core. By varying the process parameters such as gas flow ratio and bias power, we have changed the ashing rate and low-k material (SiOCH) etch rate. The PR to low-k material etch selectivity of above 50 with minimal damage of low-k material was obtained. The unprecedentedly high value of PR-to-low k material selectivity was caused by using the ferrite-core ICP, in which higher plasma density could be obtained than the conventional ICP. A damage to low-k dielectrics during the ashing process was evaluated by using Fourier Transform Infrared Spectroscopy (FTIR) and by a relief etch with HF solution.

P.S.B.28.

GROWTH AND THERMAL ANNEALING OF GaN/ZnO/Si STRUCTURES PREPARED BY THE RF MAGNETRON SPUTTERING

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The growth and properties of GaN films have been intensively studied over the last few years due to their potential applications in optoelectronic devices as well as in high-power and high temperature electronic devices. However, the production of high quality GaN is complicated by the lack of a lattice-matched and industrially usable substrate material. In this study, we deposited the high-quality GaN thin film on ZnO/Si(001) substrates at room temperature by the RF magnetron sputtering method and investigated the effect of thermal annealing on the structural and optical properties. XRD and SEM coincidentally indicated that the thermal annealing up to the temperature of 900 did not significantly change the structural properties of the films. However, photoluminescence (PL) spectra showed that the UV emission became stronger and the strong and broad green emission appeared by thermal annealing at 900 . We have discussed the possible mechanisms.

P.S.B.29.

CRYSTAL-FIELD STRENGTH PARAMETER AS A GUIDE FOR THE ANALYSIS OF THE LOCAL ENVIRONMENT AROUND THE RARE EARTH IONS IN GLASSES AND IN CRYSTALLINE COMPOUNDS

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Rare earth ions posses numerous electronic transitions over a very large energy domain and, in particular, in the visible spectral range accessible easily by the routine spectroscopic techniques. The local environment around the R^{3+} ion embedded in a solid media depends on the point symmetry site of this ion in the host lattice. The most suitable R^{3+} ion is Eu^{3+} ion. Europium, configuration $4f^6$, exhibits very nice emission spectra in crystalline compounds as well as in glasses. This ion posses $^7F_0$ and $^5D_0$ levels, respectively ground level and the first excited level. Under UV or different laser excitations no splitting is expected for the crystal field levels with J=0 . So, the number of lines observed for the $^5D_0 \rightarrow {}^7F_0$ transition is a direct information on the number of sites in the studied compound, but the impurity phases can be detected too. Due to these two 0-0 levels, even the emission spectra available at room temperature can be analysed and the energy level scheme deduced from $^5D_0 \rightarrow {}^7F_J$ (J=0-4) transitions. Following the evolution of the $^5D_0 \rightarrow {}^7F_1$ electronic transition via two rank crystal-field parameters (cfp) in the series of C-type RE_2O_3 oxides, as well as in the series of a ternary system Na_2O-WO_3-P_2O_5 of various glass compositions, a slight modification of the local symmetry is evidenced. Concerning C-type oxides doped with Eu^{3+} one can notice that the crystal-field strength parameter N_v increases when the ionic radius of the matrix cation decreases. In fact, the larger dopant ion plays a role in the sense of pressure and modifies the metal-ligand distances and, by the same way, the N_v. We have to underline that in crystalline compounds the N_v is almost the same between 300 and 77 K. A small energy shift of few cm^{-1} for some electronic lines can be neglected. In contrast, in a glass series, when the samples are cooled to 77 K, a total $^7F_1$ splitting exhibits an increase of ≈ 20-23 % for all studied compounds. So, for one glass composition in Na_2O-WO_3-P_2O_5 series the $^7F_1$ splittings of 242 and 292 cm^{-1} are obtained at room and liquid nitrogen temperatures, respectively. This kind of variation has never been observed in the case of crystalline compounds. This increase is directly connected to the abrupt change in the local environment around the rare earth ion. The crystal-field variation could be correlated to the shortness of the metal-oxygen distances produced by the pressure when cooling. However, the emission spectra display comparable features at both temperatures with prominent $^5D_0 \rightarrow {}^7F_2$ transition and quite similar to the emission spectra obtained in C-type $RE_2O_3 : Eu^{3+}$. In all glasses containing O^{2-} ions comparable emission spectra have been obtained with the most intense $^5D_0 \rightarrow {}^7F_2$ transition. We can then say that the emission spectra are like "a finger print" for such oxygen-based glasses. In other glasses, e.g. fluoroindate glasses, the most intense transition is $^5D_0 \rightarrow {}^7F_1$ one. In that case the rare earth ion is linked to fluorine ions and we have to keep in mind that M-F vibronic modes are more localized than M-O. The decay life times of $^5D_1$ and $^5D_0$ levels are given, too.

P.S.B.30.

BIOLOGICAL MATERIAL AND INFORMATION

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Information sent by biological materials in the environment is determined by the morphology and by the physiological activity of an assembly. The information sent by a biological system (a plant leaf) can be connected with the luminescence spectra emitted by the leaf. The quantity of information being emitted is specific for biological materials. The change of the information will condition the increase of our knowledge on the changes in a biological material.

P.S.B.31.

HIGH PRESSURE AND EMISSION SPECTRA OF Eu^{3+} IN L-$EuBO_3$

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The effects of high pressure on the emission spectra of Eu^{3+} activated L-$EuBO_3$ were considered at room temperature up to 100kbar. The position of five 0-2 lines in $^5D_0 \rightarrow {}^7F_2$ transition region were determined. The pressure has not the same effect on all these lines. In four of them high pressure induces red shift with different shift rates: +0.0022nm/kbar, +0.0035nm/kbar, +0.0034nm/kbar and +0.0027nm/kbar, respectively. On the last one, contrary to mentioned before, high pressure induced blue shift with shift rate - 0.0034nm/kbar. Possible reasons for mentioned pressure' effect on the 0-2 line positions was considered. The emission spectra of L-$EuBO_3$ at liquid nitrogen temperature are compatible with two local environments for the rare earth ion. These spectra are in disagreement with the structure previously determined. New structural investigation has been performed and the centric P-1 space group with two crystallographic sites for R^{3+} ion instead of acentric P1 space group is established. At higher temperatures (above 12 K) the energy transfer between two sites is very efficient due to phonons. In the low temperature experiment a transfer from the higher energy site is quenched giving the possibility to identify its energy level scheme and a lifetime measurement.

P.S.B.32.

DIAGNOSTICAL METHOD FOR ELECTRIC FIELD DETERMINATION IN TRANSFORMER OIL APPLYING KERR EFFECT

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Increased voltage levels (above 300 kV), and increased implementation of gas insulated high voltage substations (GIS), triggered unexpected failures of the dielectric systems of high voltage devices connected to a GIS. Paper presents an original method suitable for measurement of ultra fast voltage transients and electric field distribution in liquid dielectrics (nonsecond time domain). Comparison of experimental (Computerized Laser Tomography) and numerical approach (FDM), confirmed that experimental approach is accurate enough to be used in initial design of many oil-immersed dielectric system. Investigation of switching phenomena in GIS proved existence of the very high and very fast over voltages during switching operations. Sparking phenomena during switching of disconnects can produce very high and very fast transient voltages (FT) on the system bus.

P.S.B.33.

THE INFLUENCE OF HEAT TREATMENT AND Ni-Cr PROTECTIVE LAYER ON Ti_3Al CYCLIC OXIDATION

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The influence of 80Ni-20Cr (at.%) metallic coating on the cyclic oxidation behavior of a Ti-25Al-11Nb (at.%) alloy was investigated using scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and atomic force microscopy (AFM). Cyclic oxidation tests were carried out in air at 600 and 900^oC for 120h. The oxidation rate was determined by plotting the mass gain per unit surface area of the specimen versus exposure time. It was found that 80Ni-20Cr coating was very effective in protecting Ti_3Al from cyclic oxidation. The mass gain of coated specimen at 600^oC was the lowest at the final oxidation stage, indicating that the higher the oxidation temperature the thicker was oxidation layer. This phenomenon was accelerated during oxidation without coating when TiO_2 based scales tends to spall during cooling resulting in the poor oxidation resistance.

P.S.B.34.

FRACTURE SURFACE ANALYSIS OF Ti_3Al –BASED INTERMETALLICS PRODUCED BY POWDER METALURGY AND STANDARD MELTING AND CASTING PROCESSES

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This paper describes the metodology and results of a quantitative analysis of the fracture surfaces for three different Ti_3Al intermetallics (pure Ti_3Al, Ti_3Al-Nb, Ti_3Al-Nb-Mo). Performing compression tests in the temperature range from 20 to 750˚C, it has been noted that the ductility of specimens increases with the increase in the test temperature, which reflects on the fracture suface characteristics of all materials. Scanning electron microscopy (SEM) and optical microscopy (OM) were used for the characterization of the fracture profile and surface. An attempt was made towards an evaluation and comparation of used individual methods (profilometry and image analyse), for the estimation of the fracture modes. It was found out that the correlation between these methods exists. Results obtained from these aanalysis exibited that the minimum ductility level corresponds to transgranular brittle mode of fracture at room and elevated temperatures of Ti_3Al alloy. In the case of Ti_3Al-Nb and Ti_3Al-Nb-Mo alloys, ductile fracture mode appears in different fraction throughout the whole temperature interval, increasing their ductility compared to the pure Ti_3Al, as an effect of the presence of the retained β phase.

P.S.B.35.

ELECTROCATALYTIC ACTIVITY OF NANO-SIZED EBONEX/Pt FOR UNDERPOTENTIAL DEPOSITION OF HYDROGEN

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Platinum is still the most used catalyst in a variety of applications since it possesses the best catalytic activity among all pure metals.

One of the possibilities to enhance the activity of platinum is to increase the surface area of the catalyst by dispersing it on a proper support. Carbon is the most widely used catalyst support because it has extremely high surface area, but with big disadvantage at the high anodic potentials because of its lack of stability.

This work is related to the investigation of the possibility for application Magneli phases titanium oxides that is non-stoichiometric mixture of titanium oxides with formula Ti_nO_{2n-1} ($4 \leq n \geq 10$), registered name EBONEX, as a supportive material for a deposition of nano-sized platinum, as it has a very good combination of electrical conductivity and high corrosion resistance in acid and alkaline solutions.

Characterization of EBONEX, as porous electrochemical capacitors that is frequency dependent, is done by cyclic voltammetry. The total specific capacitance is divided into meso and microporous specific capacitance by analysing the dependence of it on the potential scan rate.

Nano-sized EBONEX/Pt catalyst is tested for underpotential deposition of hydrogen in 0.5 mol dm^{-3} $HCLO_4$ aqueous solution in the temperature range from 275 K to 318 K, using steady-state and potentiodynamic methods.

P.S.B.36.

COMPARATIVE THERMODYNAMIC PREDICTING IN Al-Co-Me (Me=Ti, Mo) SYSTEMS

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Alloys based on the Al-Co-Me (Me = Ti, Mo) systems are of practical interest as the constituents in the production of Ni-based super alloys, surgical implants, heat-resistant and corrosion-resistant protective coatings. In spite of this fact, thermodynamic study of such multicomponent systems has not yet been completely reported in the literature, while there are a lot of articles dealing with the thermodynamics of the constituent binary systems. Having in mind such problems, it is anticipated that most of the thermodynamic data of ternary and multicomponent systems will come from theoretical calculations rather than from direct experimentation. The main reasons are experimental difficulties, especially the high investigation temperatures required. Therefore, the results of comparative analysis of thermodynamic predicting in ternary systems Al-Co-Ti and Al-Co-Mo are presented in this paper. Characteristic thermodynamic properties, including integral and partial molar quantities at the temperature of 2000K, have been calculated using different thermodynamic predicting models and compared mutually.

P.S.B.37.

THERMODYNAMICS AND SURFACE PROPERTIES OF LIQUID Ga-In ALLOYS

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The Ga-In phase diagram is of the simple eutectic type, with the eutectic point occurring at 15°C. Such low-melting Ga-In alloys are of the great importance in the production of contact alloys, and nowadays are the base for ternary alloys of Ga-In-Me (Me = Ge, Sb, Bi, Tl, Sn, etc.) type, applied in the production of different semiconducting elements and devices.

The results of thermodynamic and surface properties investigations of liquid Ga-In alloys are presented in this paper. Thermodynamic investigation was done by Oelsen calorimetric measurements. Based on the obtained enthalpy isotherm diagram, the values for the activities, activity coefficients, partial and integral molar quantities were determined in the temperature interval 400-600K. The mixing behaviour of Ga-In system has been investigated by the Quasi-Chemical Approximation (QCA) in the frame of the Quasi-Lattice Theory (QLT) combined with a statistical mechanical theory. Assuming the order energy parameters as temperature dependent, various thermodynamic quantities are calculated at different temperatures. Thermodynamic properties of Ga-In system deviate positively from the Raoult's law. The energetic of mixing in liquid alloys has been analysed through the study of surface properties (surface tension and surface composition) and microscopic functions (concentration fluctuations in the long-wavelength limit and chemical short-range order parameter). Theoretical results agree with the corresponding literature data and support a demixing tendency in Ga-In liquid alloys.

P.S.B.38.

CORRELATION BETWEEN STRUCTURAL RELAXATION AND CRYSTALLIZATION PROCESS AND CHANGE IN MAGNETIC PERMEABILITY OF THE $Fe_{89,8}Ni_{1,5}Si_{5,2}B_3C_{0,5}$ AMORPHOUS ALLOY

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The differential scanning calorimetry method was used for investigating the crystallization process of the $Fe_{89,8}Ni_{1,5}Si_{5,2}B_3C_{0,5}$ amorphous alloy. It was shown that the examined alloy crystallizes in three stages. The first crystallization stage occurs at 815 K, the second at 830 K and the third at 880 K. Temperature dependence of the relative magnetic permeability change was investigated by the modified Faraday method in the temperature region from room temperature up to 900 K. It has been established that the Curie temperature is about 650 K for this alloy during first heating up to 690 K. The magnetic permeability increases by 14,3 % after the first heating up to 690 K. The alloy loses ferromagnetic features in the temperature region from 703 K to 733 K during second heating up to 830 K. During further heating up to 830 K the alloy has got ferromagnetic features again and magnetic permeability increases. After second heating up to 830 K the magnetic permeability has decreased upon consequente cooloing. The permeability decrease is 47 % in reference to start value. The alloy maintains ferromagnetic features in the whole temperature region during the third heating up to 900 K.

P.S.B.39.

RAMAN SPECTROSCOPY OF $Hg_{1-x}Mn_xSe$ ALLOYS: PART II

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In Part I of 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.

In Part II we expand our investigation to Raman spectroscopy. We registered two-mode behavior of long wavelength optical phonons and described it by modified Genzel's model. Except modes from the center of Brillouin zone, in Raman spectra there are some of forbidden modes originated from the edge of zone, as well as mode that correspond to a local density of states. Modes of unalloyed α-MnSe are registered, too.

P.S.B.40.

LIGHT RESPONCE OF ZnS PLANAR LUMINOFORS AS A FUNCTION OF EXCITATION FREQUENCY

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In this work a construction of planar luminofors, their main electrical and optical characteristics were analyzed. Light responses of thick film polymer bonded ZnS luminofors as a function of impulse excitation were measured. Different shapes, various intensities and pulse frequencies were applied to find a region of highest efficiency in power / light conversion. The impulse intensity was increased to the edge of luminescence degradation in active material. The results obtained were compared to sinusoidal responses measured previously. Based on that analysis an optimization in choosing the electroluminescent material vs. emitted light wavelength, applied voltage shape and excitation frequency were done. ZnS luminofors obtained by screen printing and sputtering technique were mutually compared. Advantages, disadvantages and the device stability vs. ambient conditions variations were also analyzed.

P.S.B.41.

MAGNETISM OF THE COMPOUNDS IN THE Hf-Co PHASE SYSTEM

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Magnetization M as a function of the applied field H in the range $0 \text{ Oe} < H < 50000 \text{ Oe}$ was measured at low temperature T = 5K, using SQUID magnetometer, for $HfCo_2$ and Hf_2Co intermetallic compounds. Both samples show paramagnetic behaviour with a weak ferromagnetic contribution, which is due to impurities. The values of the mass susceptibilities χ have been deduced from the measurements. In addition, calculations using FP-LAPW WIEN 97 program package were performed, trying to support the experimental results.

P.S.B.42.

STRUCTURAL ANALYSIS OF BORON DOPED GLASS-LIKE CARBONS

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Glass-like carbon samples containing boron are produced via three different procedures. Boron was introduced into the glassy carbon precursor (phenol-formaldehyd resin) in order to avoid commonly used high temperature doping process and also to obtain the samples of glass-like carbons with boron uniformly distributed throughout the bulk of a material. Specimens containing different amounts of boron (0.4, 1.2 and 4.0 wt%) treated under different temperature conditions shows that degree of structural ordering depends both on boron amount and the procedure used. Differences between specimens produced via different procedures indicate that boron occupies different positions in the structure of glass-like carbon.

P.S.B.43.

SURFACE PROPERTIES OF GLASSY CARBON

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Surface characteristics of three different forms of glassy carbon (powder, plate and broken plate) were investigated. The quality of the silver deposit on glassy carbon materials was studied as a function of the immersion time from the aqueous $AgNO_3$ solution and as a function of the concentration of $AgNO_3$ solution. The amount of oxygen functional group on glassy carbon samples as well as specific surface area were determined by Boehm's method, TPD, BET method and SEM. Results obtained by TPD show that number of carboxyl groups decreases by silver deposition and the number of thermo stable groups increases. It was therefore concluded that carboxyl groups are responsible for silver deposition on glassy carbon surface. However, the total amount of functional groups as well as carboxyl groups is higher than amount of silver deposit, thus not all carboxyl groups have influence on silver deposition.

P.S.B.44.

THERMODYNAMICS AND STRUCTURAL ANALYSIS OF SOME Ag-In-Sn ALLOYS

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In this paper, the results of various methods for thermodynamic predictions and characterization of Ag-In-Sn alloys are presented. The investigated samples are chosen from section with molar ratio In :Sn=1:1, and structural analysis of these alloys were done by DTA, XRD and SEM analysis. Partial and integral molar quantities were determined in the temperature range of 1000 – 1423 K, based on Kohler, Muggianu, Hillert and Toop methods.

P.S.B.45.

PROPERTIES AND EFFICIENCY OF Pt/Al_2O_3 CATALYST APPLIED IN A SOLID FUEL THERMO-ACCUMULATING FURNACE

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For household heating purposes, a prototype of a solid fuel thermo-accumulating furnace has been developed. In order to achieve higher combustion efficiency, a Pt/Al_2O_3 catalyst, in the form of 3±0,3 mm spheres, has been applied, providing further combustion of flue gases within the furnace. Experimental investigation of the catalyst influence to the transformation of CO into CO_2 has been done for different operation regimes and positions of catalyst. Paper presents selected results regarding CO emission during wood and coal combustion. Investigations suggest a considerable effect of catalyst and a very strong influence of catalyst position to CO emission reduction. The microstructure of the catalyst beads, characterized by selective chemisorption of CO and surface area measurements (BET), has been presented in the paper and compared to the structure of beads after being used in the furnace.

P.S.B.46.

DUCTILE FRACTURE PREDICTION OF STEAM PIPELINE STEEL

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Frequent failures of the equipment components exposed to elevated temperatures, such as steam pipelines, make it necessary to pay particular attention to the analysis of the materials used for manufacture of the equipment. Considering the conditions to which steels used for manufacture of the steam pipelines are exposed, the micromechanism of their destruction in exploitation is exclusively the ductile one. In order to make an estimation of the level of the damage that occurs in exploitation, in this paper a combined experimental and numerical procedure has been developed based on micromechanical or local approach to the fracture mechanics of metallic materials. After the analysis of the results obtained for micromechanical criterion of failure for virgin steel and that used in the steam pipeline, the proposal for prolongation of the working life of tested steel for the steam pipelines until the next overhaul is given.

P.S.B.47.

ELECTRON, HOLE, AND EXCITON STATES IN COUPLED SELF-ASSEMBLED QUANTUM RINGS

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The stacks of self-assembled quantum rings were recently fabricated and analyzed [1]. In this paper, we study the electron and hole states in stacks of three vertically coupled InGaAs/GaAs quantum rings as they depend on the dimensions of the rings and the spacer thickness. The geometry of the rings is modeled by toroids of the rectangular cross section and the finite strain distribution is taken into account. The 8-band **k**.**p** model is adopted to compute the single particle states. The blue shift observed experimentally is explained to arise from the strain distribution which acts opposite to quantum mechanical coupling, thereby increasing the transition energy. For the case of alloying between the dot and matrix material, good agreement between our theoretical and recent experimental [1] results is found.

[1] D. Granados, J. M. Garcia, T. Ben, and S. I. Molina, Appl. Phys. Lett. **86**, 071918 (2005).

P.S.B.48.

NOVEL ANALYTICAL MODEL OF HFET CURRENT - VOLTAGE CHARACTERISTICS

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In this paper the new analytical model of current – voltage characteristics of a Heterostructure Field Effect Transistor (HFET), is presented. Proposed model includes HFET carrier mobility model, as well as HFET electric field model. Temperature influence is included in the model too. The model is relatively simple, and at the same time, it describes very good complex HFET physics. In the new model, most of the parameters have a clear, physical meaning. This model is suitable for the design and simulation of different types of HFETs. The results derived from simulations based on the proposed model are in very good agreement with the already known experimental data and theoretically obtained results, available in literature.

P.S.B.49.

FIRST PRINCIPLE CALCULATIONS OF ALKALI HYDRIDE ELECTRONIC STRUCTURES

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The detailed electronic structures of LiH, NaH, KH, RbH and CsH are calculated using the Full Potential Linearised Augmented Plane Waves (FP-LAPW) method, and results are compared to the existing experimental and calculated data. The obtained densities of states (DOS) and the charge distributions of the aforementioned compounds show some common features, but also some clear differences. In the light of these findings we have elaborated some selected experimental results and discussed several theoretical approaches frequently used for the description of various alkali hydride properties.

P.S.B.50.

ELECTRICAL AND OPTICAL SIGNAL ANALYSIS OF PULSE POWERED GLOW DISCHARGE SYSTEM

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The voltage and current waveforms of the nitrogen and nitrogen/hydrogen glow discharges used for plasma nitriding 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 contains the information on normal glow, hollow cathode discharge and arcing. We also performed the recording of dynamic parameters at low pressure and static voltage-current characteristic in order to obtain information for generator and chamber modeling. The influence of the glow spreading time over the cathode surface on the pulse plasma nitriding process was investigating by surface treatment of one-meter long cylinders in cold wall vacuum chamber. The non-homogeneity of the discharge current density resulted in different diffusion zone depths at the bottom and the top of the cylinders. The use of bipolar pulse plasma and auxiliary high voltage pulses was recommended in the case of surface treatment of very long workpieces in cold wall vassals. Also, optical spectroscopy analysis was performed for different cathode configurations and with process parameters variations.

P.S.B.51.

CHARACTERISATION OF BIMETALLIC ZEOLITES: Cu,FeZSM-5, Cu,MnZSM-5 and Fe,MnZSM-5. ADSORPTION BEHAVIOUR

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The transition metal ion-exchanged zeolites, and particularly, Cu and Fe exchanged ZSM-5 have been shown to exhibit high activities for the adsorption of pollutant gases, such are nitrogen oxides. It was proven that metallic ion species act as active sites for their adsorption and consequent conversion. A state of Cu or Fe ions is strongly dependent on the method of ion exchange and on the pre-treatment of as-prepared materials. CuZSM-5 zeolites express high activities in NO_x decomposition, while FeZSM-5 exhibits remarkable stability and resistance to poison. In this work, we investigated the characteristics of bimetallic ZSM-5 zeolites: Cu,FeZSM-5, Cu,MnZSM-5 and Fe,MnZSM-5, and particularly, their adsorption behaviour towards N_2O. The adsorption behaviour towards to other known pollutant gases: CO and n-hexane was investigated.

ZSM-5 (Si/Al = 40) zeolite was home synthesized. Consecutive ion exchange method for metal incorporation into this structure has been applied. The samples were characterized by XRD and temperature programmed reduction (TPR) performed in $5\%H_2/Ar$ stream. Specific areas were determined by nitrogen adsorption and calculated using BET equation. The acidic character of the active sites was estimated by microcalorimetry of ammonia. Temperature-programmed desorption (TPD) of NH_3 was used as a complementary method to study the acidity of investigated samples. Adsorption capabilities of these materials towards N_2O, CO and n-hexane were tested. The heats of adsorption were measured in a heat-flow calorimeter of the Tian-Calvet type, linked to a glass volumetric line. Both thermal effects and volumetric isotherms were detected.

Metallic sites were proven as active centres for the adsorption. The influence of the incorporation of a second metal ion into the structure was investigated and discussed: the results concerning NH_3 adsorption have proven the change of acid sites distribution of the investigated samples, in comparison with corresponding single-metallic samples. The change of active sites distribution influenced the possibility of N_2O, CO and n-hexane adsorption. FTIR experiments of N_2O or CO adsorption were also performed. Additionally, possibility of co-adsorption of these two gases was checked.

P.S.B.52.

PHOTOACOUSTIC PROPERTIES OF THICK NiO FILMS

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Thick nickel oxide (NiO) films were produced using the thick film screen-printing method. They were sintered at different temperatures between 900°C and 1100°C. The photoacoustic phase and amplitude specter were measured as a function of the modulating frequency of red laser light using a transmission detection configuration. Thermal diffusivity, D_T, the coefficient of minority carrier diffusion, their mobility and life time were calculated, for samples sintered at various temperature, using a fitting procedure between experimental phase and amplitude diagrams and a theoretical Rosencwaig-Gersho thermal piston model. It was shown that the thermal diffusivity for the measured samples increased with the sintering temperature and application of the photoacoustic contact lens method could control the quality of the technological procedure.

P.S.B.53.

HIGH PRESSURE AND OPTICAL PROPERTIES OF LMA:Mn^{2+}

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Effect of high pressure on optical properties of LMA: Mn^{2+} (LMA – $LaMgAl_{11}O_{19}$: Mn^{2+}) was considered. The experiment has been performed at room temperature from 0 up to 100kbars. High pressure induces change in position of the emission maxima toward longer wavelengths. Also the fluorescence lifetime measurement for $^4T_1 \rightarrow {}^6A_1$ transition has been done. Red shift and change of the lifetime with pressure are theoretically considered.

P.S.B.54.

ELECTRONIC STRUCTURE OF TIN OXIDE FILMS

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We present experiment results of electronic structure investigations of SnO_2 films by emission spectroscopy and X-ray photoelectron spectroscopy methods wherein OK emission spectra for these materials are reported for the first time. Two tin oxide films, 250 and 700 nm think, have been synthesized and studies. The valence band of SnO_2/Ag, SnO_2/1MlAg, SnO_2/SiO_2, and SnO2/Si films has been investigated. The O 2p electron band shifts toward the upper edge of the valence band when oxygen vacancies increase, but, at the same time, the distance on the binding energy scale from the O 2p band centered to the Fermi level remains constant. The O 2p valence band is broader on the higher binding energy side for oxides having more oxygen vacancies.

P.S.B.55.

UTILLIZATION OF FLY ASH IN DENCE CERAMIC COMPOSITES: ECOTECHNOLOGICAL AND ECONOMICAL BENEFITS

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Every year, about 6 to 7 million tons of fly ash are produced in thermal power plants in Serbia. Only a small part is utilized, mostly by concrete industry. The remainder is placed in dumps with negative consequences for the safety of the environment. Use of fly ash as a raw material for dence ceramic composites e.g. ceramic tiles production can increase the ash utilization, and also reduce the cost of production by substitution of expensive and rare traditional raw materials. This investigation included characterization of the materials, optimization of compacting pressure, sintering temperature and the raw mixture composition, synthesis of dense ceramic elements in laboratory, as well as trials under industrial conditions. Dence ceramic elements produced with fly ash as a raw material had properties comparable to those produced from traditional materials, and also proved to be resistant to biological and chemical corrosion.

P.S.B.56.

EQUILIBRIUM AND KINETIC STUDIES OF HEAVY METAL IMMOBILISATION BY HYDROXYAPATITE

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Sorption capacities and kinetics of toxic heavy metals sorption by synthetic, well-characterized, hydroxyapatite (HAP) was studied using the batch technique. Initial concentration of Pb^{2+}, Zn^{2+}, Cd^{2+} and Sr^{2+} solutions, obtained from their nitrate salts, was $2\cdot10^{-3}$ mol/dm^3 for kinetic experiments. The effect of initial metal concentration (10^{-4}-10^{-2} mol/dm^3 for Zn^{2+}, Cd^{2+} and Sr^{2+} and 10^{-4}-$5\cdot10^{-2}$ mol/dm^3 for Pb^{2+}) on the amounts of retained heavy metals was examined in order to calculate sorption capacities. Initial pH values, in all batches were adjusted to 5.0 ±0.1. Suspensions of HAP and individual metal solutions were equilibrated on a horizontal shaker, at the solid to solution ratio of 1:200, at room temperature (20 ± 1^{o}C). The suspensions were filtrated and analyzed for residual heavy metal concentration, final pH and the amount of Ca^{2+} released into the solution at different time intervals (from 5 minutes up to 2 days) for kinetic and at 24 h for equilibrium studies. Sorption of all examined metals was followed by Ca^{2+} release from crystal lattice of HAP, indicating ion-exchange or dissolution-precipitation mechanisms. The isotherm data were found to be well fitted by linear Langmuir equation. The sorption of Pb^{2+} was found to be the most rapid in respect to other cations (for equilibrium, a contact time of approximately 30 minutes was required for Pb^{2+} and 24 hours for Cd^{2+}, Zn^{2+}, and Sr^{2+}). In order to determine the sorption mechanisms and rate constants, two most widely used kinetics models in sorption processes (pseudo-first and pseudo-second order equations) have been applied to experimental data. According to correlation coefficients and calculated values of equilibrium concentrations, the pseudo-second order model was found to be more appropriate, suggesting that the rate limiting step in heavy metal sorption on HAP involves valence forces through sharing or exchange of electrons between the sorbent and sorbates.

P.S.B.57.

POINTS OF ZERO CHARGE OF DIFFERENT CARBIDES

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Points of zero charge, pH_{PZC}, of various samples of NbC, WC, SiC and TiC powders were investigated using a batch equilibration method. The examined powders were both laboratory prepared (NbC and WC via SHS method, while SiC was sol-gel derived) and commercial ones (WC, TiC and laser derived SiC). The applied solid/liquid ratio ranged from 0.1 to 0.3 g/20ml. Aqueous solution of KNO_3 (10^{-3}-10^{-1}mol/L) was used as a background electrolyte. For all investigated carbides except TiC, the points of zero charge were found to range from 3.2 to 4.4. The pH_{PZC} values were not affected by the KNO_3 concentration, indicating its nonspecific nature vis-à-vis studied carbides. However, TiC exhibited different behavior in contrast to other powders, giving no defined plateau (final pH vs initial pH values). As more pronounced plateau had not been obtained also with increased solid/liquid ratio, it was concluded that such a behaviour could be attributed to the hydrolysed TiC surface. The pH_{PZC} values were correlated with the physicochemical properties of investigated powders.

P.S.B.58.

SALTS OF 12-TUNGSTOPHOSPHORIC ACID AS POTENTIAL SOLID ELECTROLYTES IN FUEL CELLS

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Heteropolyacids (HPAs) with superionic proton conductivity of (1-100)$\cdot 10^{-3}$ S/cm at room temperature, are generally promising materials for application in different electrochemical devices.

In this communication we have investigated the insoluble salts of 12-tungstophosphoric acid (WPA) as potential solid electrolytes in fuel cells, due to their high proton conductivity and less sensitivity to humidity and temperature than the HPAs themselves. The characteristics of $Cs_3WPA\cdot 8H_2O$, $K_3WPA\cdot 10H_2O$ and $BaHWPA\cdot 13H_2O$ with proton conductivities of: $5.7\cdot 10^{-4}$, $1.3\cdot 10^{-3}$, $1.6\cdot 10^{-4}$ S/cm respectively at room temperature, were studied by the methods of thermal analyses, IR and impedance spectroscopy.

Proton conductivity and stability of these compounds were investigated under various humidity conditions. Obtained results suggested that absorbed or crystalline water have an important role in the mechanism of proton conductivity and its values. However, investigations of conductivity in the function of temperature show that operating temperature is limited below 100 ^{0}C.

The fuel cells based on some of these compounds as electrolyte are successfully demonstrated but some additional investigations are necessary.

P.S.C.1.

Co AS CATALYST FOR IMPROVED HYDROGEN SORPTION OF MECHANICALLY MILLED MgH_2

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Magnesium-based composites have received much attention as potential low-weight hydrogen storage materials. However, its applications are hindered by the too slow absorption/desorption kinetics, especially regarding the MgH_2 dissociation. The methods for improving kinetic properties of the magnesium-base alloys can be grouped into three categories, namely: multi-component alloying, depositing catalytic metals on the surface of Mg and synthesizing active Mg by chemical reaction. Alloying or mixing Mg or MgH_2 with various additives (metals, intermetallics and oxides) to enhance the hydriding properties is well known method. For example, the addition of 3d metals, especially addition of Ni, Fe, V or 3d metal oxides facilitated the hydrogen desorption. The addition of Co improves the sorption properties of Mg, while the effect on the decomposition of MgH_2 has not been already reported.

In this paper, we present a systematic study of the dehydrogenating properties of nanostructurated, mechanically milled MgH_2 catalyzed by Co. Ball milling of MgH_2-Co blends with different weight ratios and with different milling energy was performed under Ar in a Spex 8000 mixer/mill. The microstructural characterization was carried out by X-ray diffraction and scanning electron microscopy. Thermal stability and hydrogen desorption properties were investigated by DSC. Structural investigations showed strong dependence of dispersion of the catalytic particles on desorption properties, while DSC results suggests a complex desorption behaviour, characterized by more then one peak. These peaks, related to the catalyst dispersion, can be explained by the decomposition of non catalyzed MgH_2, by decomposition of catalyzed MgH_2 and by decomposition of formed ternary hydride.

P.S.C.2.

SYNTHESIS AND CHARACTERIZATION OF SINGLE-WALLED CARBON NANO-HORNES

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Single-walled carbon nano-horns (SWNHs) are highly convoluted single-walled graphene sheets. In 1999 S. Ijima et al., who first discovered the presence of carbon nanotubes in the soot produced by arc discharge between graphite electrodes, found this new type of carbon nanostructure produced by CO_2 laser ablation of graphite at room temperature without any metal catalyst. The material is synthesized in spherically symmetric particles from which nano-horns are protruding. SWNHs, which can be also synthesized by arc discharge carried out at atmospheric pressure in different gas environments, including air are interesting for applicative purposes owing to their single walled nature and to the possibility of scaling up the synthesis method which does not require any catalyst. Potential applications in gas storage in particular CH_4 adsorption, and as catalyst support in fuel cells electrodes have been already explored.

Single-walled carbon nano-horns (SWNHs), have been synthesized in a self-designed device able to stabilize and homogenize the electric arc conditions by a feedback control of the anode advancement and by rotating the two electrodes with respect to each-other. The system operates at atmospheric pressure in a wide range of environments, both liquid and gaseous. By changing the operating conditions which include the applied voltage, the electrode size and the discharge environment, the process can be optimized to produce different kind of carbon nanostructures ranging from multiwalled carbon nanotubes to nanohorns whose synthesis is favoured by operating the system at high power and in a gaseous environment.

SWNHs have been synthesized by arching two graphite electrodes in air and collecting the nanopowders outside the plasma on a cylindrical collector.

SWNHs obtained were analysed by TEM, SEM-FEG and X-Ray diffraction.

P.S.C.3.

CHARACTARIZATION AND ISOLATION OF CARBON NANOTUBES

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An efficient purification procedure for multi – walled carbon nanotubes (MWNTs) synthetised by the chemical vapour deposition method (CVD) was disscused. The process involves ultra – sonification, heat treatment, oxidation, acid treatment of conjugated co-polymer based composite (poly(m-phenylenevinylene-co-2,5-dioctyloxy-p-pheylenevinylene) (PmPV). MWCNs, after purification, have been characterized by electron microspy, ICP, thermo-gravimetric analysys and ESR. One of the efficient purification methods was oxidation in air at temperature around 750^0C. Owing to the small difference in reactivity between MWNTs and nanoparticles, pure MWNTs were obtained in the risk of burning off 99 wt% of the sample after prolonged oxidation. Another purification method was based liquid-phase oxidation using $KMnO_4/H_2SO_4$ solution. Electron microscopy images showed that the residual carbon sample contained exclusevly pure nanotubes, but that the tubes appeared to be severly damaged. Here we report a method of purifying MWNTs, which could effectively remove metal particles, amorphous carbon and carbon nanocapsules. The yield could approach 50%. The method is non-destructive, increases the processibility of the nanotubes and select certain tube diameters. In summary, measurements show bulk morphological changes in the composite veryfing that MWNTs nucleate PmPV crystallization. In addition to this increase in crystallinity, a new highly ordered crystalline phase appears in the composite. This strongly indicates the formation of highly ordered polymer layer at nanotubes surface. The good agreement suggests that the simple method presented above, descriping the formation of crystalline coating at the composite interface is suitable to describe the polymer-nanotube crystallization interaction.

P.S.C.4.

COMPARATIVE ANALYSIS OF λ≈9µm GaAs/AlGaAs QUANTUM CASCADE LASERS WITH DIFFERENT INJECTOR DOPING

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The aim of this work is to report design issues, experimental realization of λ≈9µm GaAs/$Al_{0.45}Ga_{0.55}As$ quantum cascade laser (QCL) based on double-longitudinal optical phonon (2LO) depopulation mechanism [1] as well as experimental and theoretical comparison of its output characteristics with standard GaAs/$Al_{0.45}Ga_{0.55}As$ QCL based on triple quantum well active region [2]. Both structures are analyzed under the different injector doping conditions.

The layer structures grown with solid source molecular beam epitaxy comprise 36 or 48 stages of a three and four quantum well active region design [2,3] with different doping levels, embedded in a symmetrically grown plasmon enhanced waveguide (see [4] for details). Several samples with different doping levels (4-10x10^{11}cm^{-2}) have been grown. Optimized arsenic fluxes were used for the growth of the active region layers and the waveguide layers [4]. From the samples ridge waveguide lasers were fabricated by standard optical lithography and dry etching (ECR-RIE). For characterization, 1 and 2 mm long devices with cleaved facets were mounted epi-side up on copper heat sinks and installed in a He flow cryostat. Measurements were performed in pulsed mode using HgCdTe detectors and a Fourier transform infrared spectrometer. A fully self-consistent analysis was employed to simulate the electron transport at different temperatures. The field-current density characteristics were extracted and good agreement between theoretical and experimental I-V curves was found. Whilst threshold currents of reference structure and 2LO structure exhibit similar values at 80 K, maximum operation temperatures of ~300K and ~260K for reference and new structure, respectively, were found.

[1] A. Mirčetić, D. Indjin, V. Milanović, P. Harrison, Z. Ikonić, R. W. Kelsall, M. Giehler, R. Hey, H.T.Grahn, *Materials Science Forum*, **494**, 25 (2005).
[2] H. Page, C. Backer, A. Robertson, G. Glastre, V. Ortiz, and C. Sirtori, *Appl. Phys. Lett.* **78**, 3529 (2001).
[3] A. Mircetic, D. Indjin, Z. Ikonic, P. Harrison, V. Milanovic, R.W.Kelsall, *J. Appl. Phys, 97*, 084506 (2005).
[4] S. Höfling, R. Kallweit, J. Seufert, J. Koeth, J. P. Reithmaier, A. Forchel, *J. Cryst. Growth* **278**, 775 (2005).

P.S.C.5.

MECHANICAL OSCILLATIONS AND CHARGE CARRIERS IN NANOSTRUCTURES

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The Green's functions technique suitable for broken symmetry structure analysis is developed. With help of this new technique the phonon subsystem was analyzed in ultrathin films and in cylindrical nanotubes with finite height. The most interesting results of mentioned analyses are spatial dependence of thermodynamical characteristics, the existence of phonon gap and extremely low specific heat and thermal conductivity at low temperatures. This promises wide application of films and finite nanotubes in technology.

The same technique was applied to investigation of electron subsystems in rectangular nanostructures all dimensions as well as in simple and full nanotubes. The most interesting conclusion of these analyses is presence of autoreduction effect being the consequence of non-isomorphe transition configuration – momentum space. This effect represents a qualitative difference between nano and macroscopic structures. The skin effect is present in all types of nanostructures except nano-parallelepiped where antiskin effect takes place. The last is quite understandable, since in nano-parallelepiped nodes are on boundaries.

P.S.C.6.

OPTICAL PROPERTIES OF SIMPLE BILAYER POLYMER LIGHT EMITTING DIODE

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In this paper, optical properties of bilayer OLED device based on MEH-PPV (2-methoxy,5-(2′-ethyl-hexoxy)-1,4-phenylene vinylene) and Alq_3 (tris(8-hydroxyquinolinato) aluminum) are explored. Numerical method solving 1D model based on drift-diffusion, continuity and Poisson equations extended by boundary condition in treatment of internal organic interface is used. Obtained space charge densities were employed in the emissive singlet exciton continuity equation resulting in the singlet exciton distribution and the emission zone profile. For simulation of light emission in a layered medium dipole methods were utilized. Electroluminescence spectra of OLED are considered taking dominant interference effects into account. Exciton quenching near electrodes, allowing nonradiative decay to play dominant role, is treated throught effective emission zone narrowing.

P.S.C.7.

CHARACTERISTICS OF INDIUM OXIDE ROD-LIKE STRUCTURES SYNTHESIZED USING METALORGANIC CHEMICAL VAPOR DEPOSITION

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Indium oxide (In_2O_3) is a technologically important transparent semiconducting oxide material and thus used in various fields such as photovoltaic devices, electro-optical devices, and sensors for oxidizing gases. In the present work, we report the growth of In_2O_3 structures on Si substrates using a simple reaction of a triethylindium (TEI) and oxygen (O_2) mixture. We have investigated the structural properties of products with varying the process variables such as substrate temperature, deposition time, and bubbler temperature. We demonstrated the synthesis of one-dimensional (1D) In_2O_3 arrays by metalorganic chemical vapor deposition method. Side-view scanning electron microscope (SEM) image showed that the 1D structures consisted of rod-like structure vertically aligned on the substrate. Top-view SEM image revealed that the 1D materials have triangular cross sections with acute angles. From the top view, we revealed that the side length of the triangular cross section was in the range of 100-900 nm. X-ray diffraction analysis showed that both the In_2O_3 film and 1D structure had preferentially grown along the [111] direction. TEM studies indicated that the 1D structure possessed single-crystalline cubic structure. We suppose that the synthesis of 1D materials in the present case consists of several growth phases, such as nucleation, thin film formation and rod-like structure elongation.

P.S.C.8.

STUDY OF TIN OXIDE ONE-DIMENSIONAL NANOSTRUCTURES GROWN BY THERMAL EVAPORATION OF Sn POWDERS

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Tin oxide (SnO_2), an important and inexpensive semiconductor with a wide band gap (E_g=3.62 eV, at room temperature), is well known for its potential applications in gas sensors, transparent conducting electrodes, transistors, flat display devices and solar cells. While semiconductor crystals can be obtained in the nanometer length scale in various geometries, the one-dimensional (1D) variants warrant special attention because the anisotropy in quantum confinement potentials can be used to produce unusual optical, magnetic, and electronic properties. Accordingly, various structural and morphological forms of 1D SnO_2 materials have been fabricated over the past several years. In this paper, we report an approach, in which we have employed a thermal evaporation of Sn powders and produced the 1D SnO_2 nanomaterials. We have investigated the structural morphology with varying the process variables such as substrate temperature. We have characterized the products with scanning electron microscopy (SEM), X-ray powder diffraction (XRD), transmission electron microscopy (TEM), and photoluminescence (PL) spectroscopy. Typical XRD pattern indicated that the reflection peaks corresponded to the rutile tetragonal SnO_2 structure. We have discussed the possible growth mechanisms. A room temperature PL measurement showed that there was an apparent broad emission PL band, with the dominant emission peak located at a wavelength of around 590-600 nm. The visible light emission is known to be related to crystal defects or defect levels within the band gap of SnO_2, associated with O vacancies or Sn interstitials that have formed during growth.

P.S.C.9.

SYNTHESIS AND CHARACTERIZATION OF THE FeOOH/PMMA NANOCOMPOSITE

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Colloidal dispersions consisting of FeOOH nanorods with average diameter of 20-30 nm and different lengths were synthesized using acid hydrolysis of $FeCl_3$ solutions. After surface modification with oleic acid FeOOH nanorods were incorporated in poly(methyl methacrylate). The FeOOH nanorods were characterized using structural techniques (transmission electron microscopy and X-ray diffraction). The influence of inorganic phase on the thermal properties of PMMA matrix was examined using thermogravimetric and differential scanning calorimetry. Significant improvement of the thermal stability was found as well as increase of the glass transition temperature for samples with low content of FeOOH (<5 wt.-%).

P.S.C.10.

SYNTHESIS AND CHARACTERIZATION OF TiO_2/PMMA NANOCOMPOSITE

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The 45-Å TiO_2 nanoparticles were synthesized using acidic hydrolysis of $TiCl_4$ and surface modified with 6-palmitate ascorbic acid (6-PAA). Polymethyl methacrylate (PMMA) was synthesized by solution polymerization in toluene in the presence of 6-PMMA-TiO_2 nanoparticles. The obtained nanocomposite was characterized using spectroscopic techniques (IR and reflection spectroscopy) in order to understand interaction between polymer matrix and nanofiller. Thermal characterization of nanocomposite (TGA and DSC) revealed significant improvement of thermal stability of polymer (40-80^{0}C) as well as shift of the glass transition temperature towards higher values for 20-30^{0}C.

P.S.C.11.

NONAQUEOUS SYNTHESIS AND CHARACTERIZATION OF CRYSTALLINE TITANIA NANOPARTICLES

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Titania nanoparticles were synthesized in the reaction between $TiCl_4$ and benzyl alcohol at sligthly elevated temperature, 75° C. XRD measurements of obtained nanoparticles, prove anatase crystalline structure with crystalline domain of ~ 6 nm. Material was also characterized by TEM, and spectrophotometric measurements (UV/VIS absorption, fluorescence and FTIR). Nanoparticles can be dispersed in organic solvents (THF, toluen) and in water. After excitation with UV light at 365 nm (above band gap energy), titania nanoparticles exibit extensive room temperature band edge photoluminescence at 422 nm, with quantum yield of about ~ 0.25 %. When excitation energy was below TiO_2 band gap (600 nm, 560 nm, 540 nm), Anti-Stokes photolumenescence with well resolved peaks from 400-550 nm was observed.

P.S.C.12.

RADIOLYTIC FABRICATION OF Ag-PVA NANOCOMPOSITES

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The Ag-PVA nanocomposite films with different contents of inorganic phase were prepared by gamma radiolytic reduction of Ag^+ ions in aqueous PVA solution followed by solvent evaporation. The 5-10 nm Ag nanoparticles are homogenously distributed throughout PVA matrix. Absorption spectra of the Ag-PVA solutions revealed the presence of surface plasmon absorption band at 413 nm which is shifted towards longer wavelengths in the film. Molecular structure and supermolecular structure were investigated by IR spectroscopy and XRD. Non-isothermal crystallization behavior and thermal properties of the Ag-PVA nanocomposites were investigating by DSC and TGA, respectively. Significant changes of the PVA matrix upon incorporation of the Ag nanofiller were found and explained in terms of immobilization of polymer chains in the presence of the Ag nanoparticles.

P.S.C.13.

SYNTHESIS AND CHARACTERIZATION OF CdS/PMMA COMPOSITE

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The submicronic CdS particles were synthesized in reaction between $Cd(NO_3)_2$ and Na_2S and surface modified with castor oil. The hydrophobic CdS powders were combined in appropriate ratio with PMMA dissolved in xilole. The AFM revealed the presence of 200-350 nm CdS particles well dispersed in PMMA matrix. The obtained composite was characterized using spectroscopic techniques (IR and reflection spectroscopy) in order to understand interaction between polymer matrix and CdS filler. Thermal characterization of CdS/PMMA composite (TGA and DSC) revealed significant improvement of thermal stability of polymer (20-30^{0}C) as well as shift of the glass transition temperature towards higher values for 2 to 3^{0}C.

P.S.C.14.

ELECTROCHEMICAL DEPOSITION OF MAGNETIC NANOCONTACTS WITH A LARGE MAGNETORESISTANCE

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Morphologies of electrochemically obtained Fe – Fe, Co – Co and $Ni_{81}Fe_{19}$ – $Ni_{81}Fe_{19}$ magnetic nanocontacts were examined by the SEM technique. The type of ballistic magnetoresistance (BMR effect) was observed in these nanocontacts. The electrodepositions were performed in photolithographically patterned thin film microstructures with a micrometer gap that is closed to form a nanocontact. The obtained magnetic nanocontacts showed a very large ballistic magnetoresistance (more than 100 %). Morphologies of these nanocontacts were very different. Fe – Fe nanocontacts were very developed denditic structures formed from a very large number of small spongies. Co – Co nanocontacts were very rough, while $Ni_{81}Fe_{19}$ – $Ni_{81}Fe_{19}$ nanocontacts were "as bridge". It was shown that it is not possible to find some correlation between morphologies of nanocontacts and a very large the BMR effect.

P.S.C.15.

SEGMENTED THERMISTORS PRINTED BY NTC NANOMETRIC PASTE AND APPLIED IN VOLUME AIR-FLOW SENSORS

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An investigation path starting with $(MnCoFe)_3O_4$ nanometric powder preparation, NTC thick-film characterization, realization and optimization of new planar thermistor geometries to custom design thermistors and their application for temperature and volume airflow sensors was recently determined. The aim was that custom designed segmented NTC thermistors printed and sintered on alumina fit the diameter of the air guide, integrate the airflow on the cross section and serve as planar heat absorbers or emitters. Their resistivity was as low as 1.5 kΩ, surface value 75 x 12 mm and thickness 35 μm. Two types of volume airflow sensors were formed: indirectly heated and self-heated. A pair of segmented thermistors were placed in the air guide and connected to differential branches of the Wheatstone bridge. A heater was placed in the middle between the thermistors for the indirectly heated type, while for the self-heated type the same thermistors were self-heated by a constant current source. First the thermistors` responses vs. the airflow (calibration curves) were measured, and then thermistors` responses in time (inertia) to fast airflow changes from the minimum to the maximum. The results obtained could be applied in air conditioning for air guide flow regulation.

P.S.C.16.

LOW TEMPERATURE SYNTHESIS OF NANOCRYSTALLINE $ZnFe_2O_4$ POWDERS

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Recently, the interest in nanocrystalline spinel ferrite powders has considerably increased as they exhibit unusually high magnetization and also can be sintered at relatively low temperatures to fully dense material with a fine grain structure. Crystalline $ZnFe_2O_4$ nanoparticles with crystallite size of about 5 nm are synthesized by coprecipitation and microemulsion techniques. The effect of synthesis conditions and calcinations temperature on the phase composition and particle size has been investigated. The as-synthesized and calcined nanopowders are characterized with X-ray powder diffraction, low-temperature nitrogen adsorption and scanning electron microscopy.

P.S.C.17.

SORPTION OF FERRIC AND FERROUS IONS ON SILICA

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Sorption of ferric and ferrous ions on silica samples has been studied at different pH (1.3 to 5.5), ion concentrations ($1x10^{-5}$ to $1x10^{-2}$ mol dm^{-3}), and three ionic strengths (NaCl) under conditions that do not provide formation of polynuclear species in the solution. Two silica samples were used: a commercial silica gel and a silica gel obtained from colloidal dispersion prepared in authors' Laboratory. Kinetic investigations have shown that the sorption is a fast process.

The sorption isotherms are of high-affinity type. All sorption isotherms are similar in shape and the extent of sorption increases with increasing solution pH. A mechanism of the investigated ion sorption on silica was proposed.

P.S.C.18.

FERRICOXYCHLORIDE AND HEMATITE NANOCRYSTALS: SYNTHESIS AND PHASE TRANSFORMATION

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A synthetic procedure based on thermal hydrolysis of iron (III) chloride solutions for the preparation of hematite (α-Fe_2O_3) and ferricoxychloride (FeOCl) colloids consisting of nanoparticles (NPs) is described. Transmission electron microscopy indicated that both kinds of colloids consist of particles smaller than 10 nm. X-ray diffraction measurements revealed transformation of FeOCl NPs into the α-Fe_2O_3 NPs after a few months. Transformation process was explained in terms of redissolution – recrystallization process. UV-vis spectroscopy was used for precise determination of the band gap of α-Fe_2O_3.

P.S.C.19.

PREPARATION AND CHARACTERIZATION OF POLY(VINYL CHLORIDE)/ BENTONITE NANOCOMPOSITES VIA MELT BLENDING METHODS

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Polymer /Clay nanocomposites, where nanoscale clay sheets are dispersed in a polymer matrix, have attracted considerable interest both scientifically and commercially. These nanocomposites show dramatic increases in tensile strength, heat and solvent resistance, ionic conductivity, optical properties as well as decreases in gas permeability and flammability when compared to the polymer matrix.

In this wok, PVC/bentonite nanocomposites were conducted by direct blending method. Samples were prepared with PVC of intrinsic viscosities varying from 0.55-1.6 and three different clay loads. Bentonite was modified before preparing nanocomposite. The nanostructure of the resulting materials was characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscope (TEM), and differential scanning calorimeter (DSC). The differences in the morphologies of PVC/bentonite nanocomposites prepared by using different molecular masses of PVC were discussed. Thermal stability of the nanocomposites was improved simultaneously for varied clay loading compared to PVC. The addition of bentonite greatly changed the morphology structure of the nanocomposite.

P.S.C.20.

COMPARISON OF STRUCTURE AND MORPHOLOGY OF NANOSIZED WTi/Al AND WTi/Si SYSTEMS

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Structure and morphology have been investigated for sputtered WTi thin films on polycrystalline aluminium and single silicon substrates. Phase composition and grain size were determined by X – ray Diffraction (XRD), while surface morphology, agglomerates dimension and mean surface roughness were investigated by Scanning Tunneling Microscopy (STM). The diffractograms of WTi thin films on both used substrates have compared at different deposits thickness. All of diffractograms had the peak situated on $2\theta = 38 - 42^\circ$ which correspond of W(110), Ti(101) and $W_3O(012)$ phases. However, for WTi thin films on silicon at thicknesses lower than 150 nm existed additional peak at position of $2\theta = 65 - 74^\circ$ which correspond to Ti(103) and $W_3O(123)$ phases. The influence of used substrates has reflected to different phase composition WTi/Al and WTi/Si systems at thickness under 150 nm. Other parameters as: grain size, agglomerates dimension and mean surface roughness at observed thickness had higher values for films deposited on aluminium than films on silicon. Different values of these parameters have caused by different structural and morphological features of used substrates.

P.S.C.21.

MAGNETIC DYNAMIC OF Zn,Mn FERRITE NANOPARTICLE ANSAMBLES

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DC magnetization and AC susceptibility of ultrafine Zn,Mn ferrites with the average crystallite size in the range 13-28 nm, have been measured using MPMS XL-5 SQUID magnetometer. Magnetization vs. temperature/field data indicate superparamagnetic behavior of studied samples. Obtained dependences of T_{max} (H) (maximum in ZFC magnetization branch), $H_C(T)$ (coercivity vs. temperature) and remanence/saturation ratio value M_R/M_S, as well as the maximum in FC magnetization confirm the existence of inter-particle interactions. Asymmetric hysteresis loops and differences in coercive fields, H_{C-}(FC)–H_{C-}(ZFC) are discussed by both the core/shell model of nanoparticles and spin canting. The real part of AC susceptibility (χ') at different frequencies is analysed. A shift of maximum in χ' to lower temperature with decreasing frequence (*f*) was found, i.e. there is a frequence dependence of T_{max}. This dependence was investigated by utilizing several theoretical models.

P.S.C.22.

MAGNETIC PROPERTIES OF NANOSTRUCTURED $SiO_2:Eu^{3+}$ POWDERS

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$SiO_2:Eu^{3+}$ nanoparticles with several europium concentrations (3%, 6% and 15%) were prepared by hydrothermal synthesis. TEM microscopy and light scattering showed that very narrow distribution of particle sizes in the range of 5-10 nm was obtained, and x-ray diffraction showed that all samples were amorphous. Magnetic susceptibility vs. temperature measurements show behaviour typical for Eu^{3+} ion with the plateaux below 60 K, and growth of mass susceptibility with Eu concentration. The splitting of ZFC and FC branches increases with the europium concentration, which indicates the presence of interparticle interactions. At the temperatures below 40 K contribution of paramagnetic impurities obeying Curie low was observed. Heat treatment of the samples at 823 and 1073 K increases magnetic susceptibility, indicating the growth of particles. Small peak arising at 70 K indicates presence of ferromagnetic EuO after heating.

P.S.C.23.

MAGNETIC PROPERTIES OF NANOSIZED γ-Fe_2O_3

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A solid-state displacement reaction between $FeCl_3 \cdot 6H_2O$ and NaOH was induced during mechanochemical treatment, resulting in ultrafine γ-Fe_2O_3 powders. In order to obtain different particles size, powders were heated at the same temperature for a different time. The mean crystallite sizes of the particles were determined from the XRD line-broadening measurements using the Scherrer equation. It was found that the mean particle size is in the range of 10-20 nm, depending on heating time. DC magnetic measurements, conducted in zero fields cooled (ZFC) and field cooled (FC) regimes, show bifurcation between the ZFC and FC branches for all the samples. The maxima in ZFC branches represent the blocking temperatures T_B of nanoparticles. It was found that T_B increases with the size of the particles and decreases with the increase of the magnetic field. M(H) measurements at several temperatures show superparamagnetic behavior of the samples at the temperatures above T_B which could be described by the Langevine function.

P.S.C.24.

MODELLING OF A PLASMA ETCHER FOR CHARGING FREE PROCESSING OF NANOSCALE STRUCTURES

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For technologies beyond 45 nm in integrated circuit production, one needs to develop rectors that are based on fast neutral etching to avoid charging induced damage. The data that are required consist of the data for charge transfer of ions leading to generation of fast neutrals. We have compiled the data based and we have normalized the charge transfer data for several rare gases and we have shown the efficiency of conversion of ions into fast neutrals in the gas phase. The effectiveness of theis process that was first proposed by our group has already been tested and verified by samukawa and coworkers and by Economou and coworkers.

P.S.C.25.

PHYSICAL AND MECHANICAL PROPERTIES OF ZIRCONIA AND ALUMINA-BASED NANOCOMPOSITES SINTERED AT HIGH PRESSURES

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Effect of different sintering regimes of ZrO_2 (3 mol. % Y_2O_3)-20 wt. % Al_2O_3 nanopowder at pressures from 1 to 4 GPa and temperatures from 300 to 1200 ^{o}C on density, phase composition, microstructure, microhardness, fracture toughness of nanocomposites are studied. Not monotone change of indicated characteristics with increase of temperature and pressure sintering are disclosed. Fields with different character of fracture are revealed on *PT*-diagram. The ways of increase of hardness and ductility of nanocomposites sintered at high pressures are discussed.

P.S.C.26.

THE EFFECT OF HIGH PRESSURE AND HIGH TEMPERATURE ON PHASE COMPOSITION AND STRUCTURE OF AMORPHOUS SILICON NITRIDE NANOPOWDER AND NANOCOMPOSITES BASED ON AMORPHOUS SILICON NITRIDE

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Composites based on silicon nitride and titanium nitride possesses the high level of physical and mechanical characteristics. They are prospective as materials for cutting tool. It is known that high pressure sintering of TiN nanopowder allows to keep the nanostructure of initial powder and to reach high degree of its densification. Effect of high pressures of 3 and 4 GPa and temperatures from 1000 to 1600 ^{o}C on density, microhardness and phase composition of samples sintered from amorphous silicon nitride nanopowder and Si_3N_4/TiN nanocomposites with 20 and 40 wt. % TiN is studied. It is shown the possibility to obtain nanocomposites with different phase composition and hardness by changing the temperature and pressure of sintering. The samples with α-Si_3N_4, β-Si_3N_4 and TiN in amorphous Si_3N_4-matrix are obtained.

P.S.C.27.

INFLUENCE OF THE DC CURRENT ANNEALING TREATMENT ON MAGNETOTRANSPORT PROPERTIES IN SOFT-MAGNETIC ALLOYS WITH AMORPHOUS PRECURSORS

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The very high sensitivity of excellent soft-magnetic properties on grain size of nanocrystalline alloys obtained from amorphous precursors underlines the importance of optimization of the annealing parameters. Alternative heating techniques such as current annealing (CA) is especially interesting as a thermo-magnetic sample treatment due to the simultaneous Joule effect and application of a magnetic field induced by current flow.

Multistep CA treatments were performed on FINEMET-type alloys as well as on novel Fe-based amorphous alloys with a large supercooled liquid region in order to optimize their magnetotransport properties. On-line and post-annealing electrical resistivity measurements, DSC, XRD and Mössbauer spectroscopy were used for characterization of structural changes evolved during CA treatments.

Results on improvement of magnetoresistance and magnetoimpedance effects by CA in ribbons and wire shaped samples with structural relaxed amorphous as well as precipitated nanocrystalline structure were presented. Significant improvement of MI-response after CA up to value $\Delta Z/Z \approx 50\%$ was recorded at frequencies 300 kHz (or 3 MHz) for wire (or ribbon) form samples respectively. The highest MI-element sensitivity is found for low magnetic field intensity where values of about 8 %/kA/m for wire shaped samples of FINEMET alloy were attained.

P.S.C.28.

SYNTHESIS OF $MnFe_2O_4$ NANOPARTICLES BY MECHANOCHEMICAL REACTION

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Influence of long term milling in planetary ball mill of a mixture $MnCO_3$ and α-Fe_2O_3; MnO_2 and α-Fe_2O_3 powders on the reaction synthesis of nanosized $MnFe_2O_4$ ferrites was studied. Mechanochemical reaction leading to the formation of the $MnFe_2O_4$ spinel phase was followed by X-ray diffraction. The spinel phase was first observed after 10 h of milling and its formation was completed after 20 h in the case of $MnCO_3$-α-Fe_2O_3 mixture. The synthesized $MnFe_2O_4$ ferrite has a nanocristalline structure with a crystallite size of about 8nm. Thermal treatment of the as-milled powder at 600°C and 800°C for 2 h led to the formation very good $MnFe_2O_4$ crystalline phase.

P.S.C.29.

ELECTROREDUCTION OF OXYGEN ON NANO-STRUCTURED C/Pt CATALYST IN ACID SOLUTIONS

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Considerable effects have been observed for the specific surface area of carbon support on the fundamental properties of Pt/C catalysts, such as metal particle size and catalytic activity for the oxygen reduction reaction (ORR). Pt/C catalysts were prepared by a modified polyol synthesis method in an ethylene glycol (EG) solution at different carbon supports with specific surface areas ranging from 180 to 600 m^2 g^{-1}. Transmission electron microscopy (TEM) images show that the mean particle size of the catalyst increases from 2.6 nm to 3.6 nm by decreasing the specific surface area of carbon support. With a decrease in the platinum particle size, the specific activity decreases and the Tafel slope increases, and the oxygen coverage at any electrode potential in the Tafel region increases. Effect of electronic states and surface crystallography of the platinum particles on the catalytic properties have also been discussed.

P.S.D.1.

INTERACTION OF MATERIALS IN OPTICAL FIBER SENSORS

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Optical fibers are increasingly popular nowadays, especially in the field of optical fiber sensors, telecommunications and computer nets. One of the earliest fiber optic sensors was the reflective sensor, which can take many forms – multifiber, twin-fiber or single-fiber with a directional Y coupler. Materials used for construction of optical fiber sensor systems play a central role in determining the ultimate performance in terms of sensitivity, selectivity, cost benefit and suitability for use in the operating environment. This paper deals with technical aspects of intensity modulated optical fiber sensors (reflective modulation) and presents experimental results of effectiveness of coupling of optical fibers depending on the type of material of the reflection surface.

P.S.D.2.

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

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Unidirectional carbon fibres and carbon /epoxy composites with two groups of PAN based carbon fibres, differing in breaking strain and in crystallite orientation, 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. Tensile modulus dependences on tensile strain of carbon fibres deduced from monofilament tensile tests. Analytical expressions for tensile modulus-tensile strain and compression modulus-compression strain dependences, in performed tests, were deduced for tested carbon fibres and for composites with two groups of carbon fibres. The orientation of crystallites in carbon fibres was assessed by X-Ray diffraction and it was correlated with established modulus-strain dependences.

P.S.D.3.

MODIFICATION OF DYNAMIC PROPERTIES OF THE SBR RUBBER COMPOSITES WITH SILICA FILLERS

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Silica fillers are used in the rubber compsites to modify and improve dynamic-mechanical properties. In the rubber reinforcement background, the non-linear effects at small dynamic strains, known as Payne effect, has been studied for the silica-filled styrene-butadiene rubber (SBR), with focus on the influence of different kind of silica tretment, strain and temperature. Analysis by different methods has shown that the surface area, surface chemisty and structure depend on the origin of the silica and its treatment conditions. It was found that these parameters of silica directly influence the level of the dynamic properties: storage modulus (G'), loss modulus (G'') and tanδ in the rubber matrix.

P.S.D.4.

THE APPLICATION OF DSC METHOD IN MONITORING THE RETICULATION PROCESS OF AQUEOUS POLYURETHANE SYSTEMS

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The DSC method has been employed to monitor the kinetics of reticulation of aqueous plyurethane systems without catalysts, and with the commercial catalyst of zirconium (KAT®XC-6212) and the highly selective manganic catalyst.

Among polyol components the acrylic emulsions were used for reticulation in this research, and as suitable reticulation agents the water emulsible aliphatic polyisocyanates based on hexamethylendoisocyanate with the different contents of NCO-groups were employed. On the basis of DSC analysis, applying the methods of Kissinger, Freeman-Carroll and Crane-Ellerstein the pseudo kinetic parameters of the reticulation reaction of aqueous systems were determined.

The temperature range of the examination was from 50ºC to 450ºC with the heat rate of 0.5º C/min.

The decrease of the activation energy and the increase of the standard deviation point to the catalytic action of the selective catalysts of zirconium and manganic. The impact of the catalysts on the decrease of the activation energy is the strongest when using the catalysts of manganic and applying all the three afore-said methods. The least aberrations among the stated methods in defining the kinetic parameters were obtained by using the manganic catalyst.

P.S.D.5.

POTENTIALS OF FCC UNIT CELL IN PREDICTIVE MODELING OF THE MECHANICAL PROPERTIES OF SPHERE REINFORCED PARTICULATE COMPOSITES AND SOLIDS WITH SPHERICAL VOIDS

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The elastic constants of sphere reinforced particulate composites, as well as solids with spherical voids were computed through the finite element analysis of the three-dimensional periodic cubic unit cells, containing identical spheres distributed in a face centered cubic (FCC) array. Three types of materials were studied: rigid spheres and spherical voids in an elastic matrix and a typical composite made of glass spheres in an epoxy resin. The results obtained for considered unit cells were compared with recent ones from more complex unit cell model (containing 30 non-overlapping identical spheres randomly distributed) which is considered as very close to the "exact" solution to the problem. Additionally, FCC unit cell model results were also compared with those obtained with three classical analytical models: the Mori-Tanaka mean-field analysis, the generalized self-consistent method and Torquato's third order approximation.

P.S.D.6.

EARLY DAMAGE DETECTION IN COMPOSITE TUBES BY USING EMBEDDED OPTICAL FIBERS

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Filament-wound cross-ply glass / epoxy composite tubes were manufactured with embedded optical fibers as intensity-based sensors for damage detection purposes. The possibility of real time monitoring of early damage in tubes under internal pressure using embedded intensity-based optical fiber sensor was evaluated by comparison with extensometer and pressure sensor. It could be seen that optical fiber sensor exhibit signal decrease in accordance with extensometers and pressure sensors, with longer live than extensometer and breakage before the end of the pressure increase. The proposed system demonstrates the feasibility of early damage detection in composite tubes under internal pressure loading typically encountered in the industry environment.

P.S.D.7.

X-RAY DIFFRACTION ANALYSIS OF ORDINARY PORTLAND CEMENT CLINKER BASED ON FLY ASH

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Fly ash (FA) from "Nikola Tesla" thermal power plant was used as a raw mixture component for the synthesis of Ordinary Portland Cement (OPC) clinker, together with the limestone from the "Novi Popovac – Holcim" cement factory. Based on chemical composition of these components, the correct mixture proportioning of raw mixture was carried out. As a referent sample, the standard raw mixture from the factory was used. Both mixtures (the referent and the ash mixture) were sintered under the same conditions on various temperatures, with various annealing time. Obtained clinkers were examined by XRD. The industrial OPC clinker sample, analyzed also by XRD, was used as a control sample.

P.S.D.8.

STRUCTURAL AND DIELECTRIC PROPERTIES OF $BaTi_{1-x}Sn_xO_3$ CERAMICS

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In this paper, the effect of Sn contents and the sintering temperature on the structure, microstructure and dielectric poperties of $BaTi_{1-x}Sn_xO_3$ materials have been investigated. The $BaTi_{1-x}Sn_xO_3$ (BTS) ceramic powders, with different tin content (x = 0-1) were prepared by using the commercial powders $BaCO_3$, TiO_2 and SnO_2, by solid state reaction. After milling in ethanol, during 24 hours, starting BTS powder mixtures were calcined at 1100 °C for 2 hours. The BTS ceramic powders were pressed into pellets 8 mm in diameter and 2 mm in thickness. The pellets were sintered at 1370 and 1420 °C, respectively, for 5 hour in air. The structural investigations of the sintered BTS samples were done at room temperature using an X-ray diffraction, IR and Raman spectroscopy measurements. The microstructure of these materials was investigated by SEM and EDX methods. The BTS ceramics were electroded with silver pastes and dielectric properties were studied as a function of sintering temperatures and tin contents, too. The dielectric measurements were done at 1 kHz from -40 to 160 °C.

P.S.D.9.

INFLUENCE OF COOLING CONDITIONS AND AMOUNT OF RETAINED AUSTENITE ON THE FRACTURE OF AUSTEMPERED DUCTILE IRON

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The SEM-analysis of fractures from tensile tests of thick austempered ductile irons (dia. 160 mm) shows different fracture behaviour (crack propagation) depending on the retained austenite in the matrix. The results show ductile fractures only in retained austenite sections areas. The low content of retained austenite only brittle fracture without any plastic deformation occurs. The content of retained austenite determines the amount of ductile fracture in the microstructure.

P.S.E.1.

NANO DESIGN OF BIPHASIC CALCIUMPHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLIDE, AS COMPOSITE BIOMATERIALS FOR HARD TISSUE RECONSTRUCTION

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Composite biomaterials have enormous potential for natural bone tissue reparation, filling and augmentation. Composite biomaterials used today are available in the form of blocks, thin layers, paste, gels, powder etc. The powder or injectable paste, which may play different roles when applied in an organism, have been used for fixing various damage in maxillofacial surgery, but also for filling up cavities in hard and soft tissues.

This paper investigates possibilities of synthesizing calciumphosphate/poly-DL-lactide-co-glycolide (BCP/DLPLG) composite biomaterial formed as powder suitable for preparing injectable gels or pastes. BCP/DLPLG composite biomaterial was produced in form of spherical nanogranules of nanosized BCP covered by a DLPLG layer.

Characterization was performed with wide-angle X-ray structural analysis (WAXS), differential scanning calorimetry (DSC), atomic force microscopy (AFM) and infrared spectroscopy (IR).

BCP/DLPLG composite biomaterial was synthesized in the form of nanosized spherical granules by modified two-step emulsion process. Each nanosized particle of BCP is coated with amorphous DLPLG polymer.

P.S.E.2.

PROCESSING OF BIPHASIC CALCIUMPHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLIDE COMPOSITE BIOMATERIALS THROUGH COLD AND HOT PRESSING

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Biphasic calcium phosphate/poly-dl-lactide-co-glycolide (BCP/DLPLG) is a ceramic/polymer composite, whose application as a resorbable biomaterial for the substitution and repair of hard bone tissue is widely promising in orthopedic, oral, maxillofacial and reconstructive surgery. In this research we obtained BCP/DLPLG composite biomaterial as blocks by cold and hot pressing..

Structural changes occurring during cold and hot pressing in the material, were studied by wide-angle X-ray structural analyses (WAXS) and infrared (IR) spectroscopy. Using differential scanning calorimetry (DSC) the influence of hot pressing on the properties of composite biomaterial was analyzed. Surface microstructure was analyzed by scanning electron microscopy (SEM) and mechanical properties and density of blocks after pressing were determined by compressive strength.

BCP/DLPLG composite biomaterial was synthesized in the form of blocs through cold and hot pressing. By increasing the pressure and pressing temperature, blocks' density increases, their porosity decreases and their compressive strength increases. All changes recorded in the composite originate from DLPLG, because the BCP phase in the studied temperature range is stable.

P.S.E.3.

XRD ANALYSIS OF CALCIUM PHOSPHATE AND BIOCOMPOSITE CALCIUM PHOSPHATE / BIORESORBABLE POLYMER

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Composite biomaterials based on calcium phosphate ceramics are of interest for biological application and bone tissue repair because of high bioactivity degree. Structural and microstructural parameters are very important for synthesis and characterization of composites materials. Quantitative and qualitative content, crystallite size of phases as well as degree of crystallinity have great influence on composites quality, their application and bone tissue repair. The X-ray diffractometry was employed in order to investigate three samples: biphasic calcium phosphate (BCP) as a compound of hydroxyapatite (HAp) $Ca_{10}(PO_4)(OH)_2$ and β-tricalcium phosphate (β-TCP) (β-$Ca_3(PO)_4)_2$; biocomposite calcium phosphate / poly-D,L-lactide-co-glycolide (BCP/DLPLG) obtained by precipitation in solvent – non - solvent system and biocomposite calcium phosphate / poly-D,L-lactide-co-glycolide (BCP/DLPLG) obtained by mechanochemical treatment.. We have determined quantitative content of BCP as well as crystallite dimension by Rietveld method. Results showed high degree of crystallinity of investigated materials. Quantitative x-ray analysis conformed higher content of HAp than β-TCP, as it was expected. The unit cell parameters are in agreement with literature data.

P.S.E.4.

SYNTHESIS AND RHEOLOGICAL CHARACTERIZATION OF CALCIUM PHOSPHATE / POLY -(D,L-LACTIDE-CO-GLYCOLIDE) BIOCOMPOSITE PASTES

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The field of injectable calcium phosphate pastes and cements has become very attractive in recent years. Vigorous research activity is encouraged by their importance for the cement augmentation procedure to treat bone fracture fractures. Rheological properties of biocomposite pastes play an important role in the process of pastes injectibility and infiltration into the bone cavities. In this investigation biphasic calcium phosphate (BCP) were incorporated into poly-D,L-lactide-co-glycolide (PLGA) by precipitation in solvent-non-solvent system to produce biomaterial for potential medical application. The obtained biocomposite were characterized by infrared spectroscopy. Composite powders were dispersed in physiology solutions to prepare pastes with different content of solids. The objective of this study was to examine the effects of liquid-to-powder ratio and temperature on BCP/PLGA paste rheological properties. Dynamic rheological measurements were applied to determine dynamic storage modulus (G') as a measure of elastic behavior and dynamic loss modulus (G") as a measure of viscous behavior of the material. In addition, complex viscosities (η^*) of the investigated pastes were also recorded. The storage and loss moduli, as well as complex dynamic viscosities increased with the increase in the content of nano powder of composite biomaterials BCP/PLGA in pastes. The obtained results indicate that liquid phase in pastes enhances their flowability but increase in the content of water contributes to the reduction in strength.

P.S.E.5.

RADIOLOGICAL AND CLINICAL ASSESSMENT OF THE RESTORATION OF ALVEOLAR BONE DEFECTS TREATED WITH BIPHASIC CALCIUM PHOSPHATE/POLY-DL-LACTIDE-CO-GLYCOLID COMPOSITE

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Removal of cystic and periapical processes is associated with the reorganization of all their supportive structures (connective elements and alveolar bone). Numerous materials and techniques were used in order to prevent resorption and collapse of the alveolar bone inner walls. This study aims at radiological and clinical evaluation of treatment outcomes of alveolar defects induced by the enucleation of large cystic processes restaurated with biphasic calcium phosphate/poly-DL-lactide-co-glycolyd (BCP/PLGA) composite. In order to evaluate the regeneration and reparation of restored defects radiological methods of radiotransparency were used as well as the measurement of optical density. Clinical assessment of the healing was done based on the condition of regenerated tissue. Clinical examination results indicated adequate closing of the flaps and presence of well formed regeneration tissue without central soft tissue depression after removal of cystic processes and implantation of BCP/PLGA into the produced bone defects. Radiological assessment results indicated the disappearance of radiotransparency and increase of the value of relative optical density of alveolar bone compared to controls. Synthetic BCP/PLGA composite belongs to the group of biomaterials which facilitates healing of soft tissues without central depression. This composite accelerates alveolar bone rehabilitation and production of new bone tissue at the site of enucleated cystic process, and owing to its osteoconductive effect it will perhaps be the material of choice in bone tissue replacement.

P.S.E.6.

STRUCTURE ANALYSIS AND OSTEOCONDUCTIVITY ASSESSMENT OF HYDROTHERMALY SYNTHESIZED CALCIUMHYDROXYAPATITE

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Biocompatibility of calciumhydroxyapatite enables his use in medicine while evaluation of osteoconductive potential opens new possible areas of application. The aim of this study was to analyze structure of hydrothermaly synthesized calciumhydroxyapatite and assess his osteoconductivity. Microstructure characteristics of calciumhydroxyapatite at different hierarchical structure levels were analyzed by SEM and BET methods. Methodology by Slotte and Lundgren which comprises healing of calvaria bone defects in rabbits in order to evaluate osteoconduction was modified and used. Histomorphometrical measurements of implanted samples included linear measurements of the regenerated bone, evaluation of tissue components and interfaces between non-mineralized or mineralized tissue and bone substitute particles. Preliminary results showed good osteoconductive potential measured by the amount of regenerated bone in the defect area and good interface between evaluated samples and surrounding bone. Analysis of tissue elements and cell structure characteristics will give definitive confirmation of calciumhydroxyapatite biocompatibility and osteoconductivity.

P.S.E.7.

INVESTIGATION OF HeNe LASER THERAPY INFLUENCE ON BCP/PLGA OSSEOINTEGRATION

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We analyzed the efficiency of HeNe laser application in treatment of artificially caused bone defects in mandible of rats which were filled with biocomposite BCP/PLGA (bicalcium phosphate/polylactide–co-glycolide). Animals were divided in two separated groups. The first group (A) was the control one. In second group (B) the implantation site was submitted to HeNe laser irradiation. Animals were sacrificed after two, four, eight and twelve weeks after laser therapy. Histological samples were decalcified and submerged in paraphin blocs. Samples were colored with HE. Morphometrical analysis consisted of measuring of area fraction, area, integral optical density, mean density and density variation. Results showed beneficial effect of laser treatment in reparation of alveolar bone after two and four weeks. After eight and twelve weeks we couldn't notice beneficial laser effect on biocomposite osseointegration.

P.S.E.8.

HISTOLOGY ANALYSES OF ROOTREPLICA® USED AS PREIMPLANT TREATMENT OF EXTRACTED SOCKET: A CASE REPORT

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Bone resorption is a physiological process after tooth extraction. The quantity of bone is the main prerequisite for successful implant treatment. Using some bone substitute material to fill the extracted socket has been suggested in order to prevent bone resorption and good bone architecture for implant placement. Rootreplica® (Degradable Solutions AG, Switzerland) is pure ß-tricalcium phosphate coated with copolymers (PLGA), especially designed for filling extraction sockets.

Treatment with Rootreplica® after the extraction of a right second lower premolar due to vertical root fracture is presented in this paper. A copy of the root was made in accordance with the instructions of the manufacturer. Three months later, patient was prepared for implant treatment. After flape elevation, byopsy of bone from extracted area has been taken. The patient was then treated with a TE® ITI dental implant (Straumann, Switzerland). Rsult of histology analise showed good bone healing in area treated with Rootreplica®.

The presented case showed that the use of ß -tricalcium phosphate after tooth extraction ensured satisfactory bone healing and protected bone architecture for consequent implant treatment.

P.S.E.9.

SYNTHESES, CHARACTERIZATION AND MOLECULAR MODELING OF DIOXOMOLYBDENUM(VI) COMPLEXES WITH HETEROCYCLIC DITHIOCARBAMATES. *IN SILICO* MODELS FOR METAL –IMPLANT COATING WITHIN LIVING SYSTEMS

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A huge variety of nano-objects, allowing specific reactions at well-defined positions, can be generated using oxo molybdenum compounds based building blocks and fragments. On the other side, the use of suphur-based interfaces as metal-based organic materials is a new area with many potential applications in medicine, particularly as implants. In that respect, as precursors for building new materials with pronounced characteristics, in the present work five new dioxomolybdenum(VI) complexes of the general formula $[MoO_2(Rdtc)_2]$, have been prepared. Geometries predicted by the MO calculations are in excellent agreement with the reported crystal structure data, and therefore can be used as models for docking study between complexes and biomolecules. *In sillico* screening for complexes-protein interaction it will be able to predict behavior of such materials implanted in living systems.

P.S.E.10.

SYNTHESIS, CHARACTERIZATION AND CYTOTOXIC ACTIVITY OF Pt(II) AND Pd(II) COMPLEXES WITH 2-{(2*E*)-2-[2-(DIPHENYLPHOSPHINO)BENZYLIDENE]HYDRAZINO}-2-OXOACETAMIDE

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The complexes synthesized by reaction of $K_2[PdCl_4]$ or $K_2[PtCl_4]$ and the title ligand have a square planar geometry, with the polydentate organic ligand coordinated as a tridentate. The complexes were characterized by IR, ^{1}H- and ^{13}C-NMR spectroscopy, and for the Pd(II) complex X-ray crystal analysis was performed. Cytotoxic activity was evaluated against mouse melanoma B16 cells and MDA-361 breast cancer cells *in vitro*. Both complexes were active against both cell lines, the Pt(II) complex showing good selectivity for melanoma cells.

P.S.E.11.

PREPARATION AND CHARACTERIZATION OF POLY(2-HYDROXYETHYL METHACRYLATE/ITACONIC ACID) COPOLYMERIC HYDROGELS OBTAINED BY GAMMA IRRADIATION

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Hydrogels are polymers in three-dimensional network arrangement, which could absorb and retain large amounts of water and physiological fluids. The use of hydrogels as biomaterials has recently gained great importance due to their low toxicity and high biocompatibility. The main hydrogel application areas today include: (i) topical applications as wound dressings, (ii) drug delivery systems, (iii) transdermal systems, (iv) dental applications, (v) injectable polymers, (vi) implants, (vii) ophthalmic applications, and (viii) stimuli-responsive systems. Volume changes in hydrogels occur in response to changing environmental conditions such as temperature, pH, solvent composition and electrical stimuli. These materials have attracted much attention in pharmaceutical and biomedical field. Hydrogels containing pendant acidic or basic groups such as carboxylic acids, sulphonic acids, primary amines, or ammonium salts change ionization in response to change in the pH of surrounding medium giving them "intelligent" system capability.

Poly(2-hydroxyethyl methacrylate/itaconic acid) copolymeric hydrogels were prepared by solution copolymerization using gamma irradiation in a mixture of water/ethanol as solvent. The resulting polymers swelled in water at 25 ^{o}C to yield homogenous transparent hydrogels. These hydrogels were characterized in terms of swelling in the pH range of 2.20-7.40, compression-strain measurements, biotribology, morphology and thermal properties. The influence of itaconic acid on the swelling and the mechanical properties, as well as on the frictional properties, morphology and thermal properties of the resulting hydrogels were investigated. Copolymers containing small percent of itaconic acid resulted in hydrogels with satisfactory swelling and mechanical properties and can be considered as potential candidates for the transdermal systems and ophthalmic application.

P.S.E.12.

BIOMEDICAL NONWOVEN TEXTILE MATERIAL OF PROGRAMMED ACTION

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Biomedical nonwoven textile materials, especially activated materials of programmed properties are the subjects of the paper. These materials have important role in medicine and health care as well as in hygienic sector. Textile materials and products can be designed in such way to satisfy special demands and needs during operations, postoperative treatment, during treatment of wounds and burns, in providing sterile environment as well as for general needs of protection and making complete set of first aid. Modern medicine demands the production of materials of special or particular properties.

The results of chemisorptions antimicrobial modification of nonwoven textile material on the basis PP/viscose presented in this paper. Subject of paper includes adhesion procedure and low-temperature plasma for obtaining of biomedical textile materials and products of programmed properties so as their behavior in vitro conditions. The bacterial inactivation efficiencies of Ag^+, Cu^{++} ions and gentamicin sulfate was tested on *Staphilococcus aureus*, *Escherichia coli*, *Candida albicans*, *Pseudomonas aeruginosa*. The inactivation performance was seen to depend on parameters modification so as a function of condition and time.

P.S.E.13.

HYDROPHOBIZATION OF TEXTILE MATERIALS BY C_6F_6 and CF_3SF_5 PLASMAS

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Initially, low-pressure plasma application to textile materials was predominantly focused on improvement of wettability of fibres with highly hydrophobic nature in order to enhance adhesion, dyeing and printing properties. However, recent request for the production of hyper-hydrophobic technical textiles that should provide high water-repellency became a new challenge for many research groups worldwide. Fluorocarbon and hydrogen carbon plasmas are particularly suitable for the hydrophobization of textile materials since the generation of different free radicals that incorporate into the fibre surface and/or deposition of thin polymer films occur. In addition, plasma treatment leads to a significant morphological change of fibre surface due to etching processes imparting the so-called "Lotus Effect".

A treatment of textile materials is carried out using the low-pressure RF inductively coupled C_6F_6 and CF_3SF_5 plasmas. Argon is applied as a buffer gas. Wettability of textile materials is determined by measuring the wetting time and contact angle. The fibre surface morphology changes is assessed by AFM analysis.

P.S.E.14.

MATHEMATICAL MODELING OF INSULIN ARTIFICIAL STORE OBTAINING

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Artificial fibrous drug stores with a programmed and controlled drug release present novel fibrous materials, applied in medical and other fields. Polymer-based drug delivery systems have been considered for many applications to supplement standard means of medical therapeutics.

The objective of this study was to investigate the kinetic, phenomenon and theoretical mathematical model of insulin artificial store obtaining. Fibrous artificial store in form biomedical complex ion-exchange fiber – insulin was obtained through chemisorptions from the liquid insulin solution by the cation-exchange acrylic fibers. Researches in chemisorptions processes have proved that the rate of chemisorptions does not depend on the rate of chemical reaction, but on diffusion as a slowest stage of the process. On the basis of experimental results a mathematical model of diffusion-mediated chemisorptions of insulin from insulin water solution into cation-exchange fiber has been developed and presented in this paper.

Previous researches in chemisorptions processes have proved that this reaction depends on following parameters: accessibility of ionic groups, static ion-exchange capacity of fibers, which was increased by activating the cation-exchange groups with NaOH, concentration and pH of insulin water solution, temperature and chemisorptions duration. Also, previous results have shown that it is possible to obtain the insulin fibrous depot with significant amount of insulin even reaching the amount of 800 mg per g of fiber. Thus produced artificial deposit could be used as base of the advanced medical treatment of insulin depend diabetic.

P.S.E.15.

INFLUENCE OF FULENEROL $C_{60}(OH)_{24}$ ON ANTIOXIDANT STATUS OF ERYTHROCYTES DURING SINGLE APPLICATION OF ADRIAMICIN IN *IN VIVO* MODEL

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What has been investigated is the influence of fulenerol $C_{60}(OH)_{24}$ on antioxidant potential of eritrocites, function of cardiac muscle, as well as on the overall condition of the experimental animals during a single application of Adriamicin. The rats that were used as a model system were of Wistar breed, weighing between 180 and 250 grams, and aged around 3 months. The animals were divided into 5 groups: (0) control; (I) 8mg/kg of Adriamicin i.v. ; (II) 50 mg/kg of fulerenol + 8mg/kg of Adriamicin i.v.; (III) 100 mg / kg of fulerenol + 8 mg / kg of Adriamicin i.v. ; (IV) 200 mg / kg of fulerenol + 8 mg / kg of Adriamicin i.v. and (V) 100 mg / kg of fulerenol, whereas fulerenol had been applied intra peritoneal, thirty minutes before the application of Adriamicin. The experimental animals were sacrificed after seven days in urethane anesthesia. Functional investigations of heart were conducted by ECG, both before and after introducing the adrenalin into blood. The blood for the analysis was provided through heart puncture. Content of hemoglobin and hematocrit were specified, and the activity of glutathione peroxidase and glutathione reductase were specified from the fraction of eritrocites. Clinical pictures of the animals of the I and II group match the literature data. What was displayed were the general weakness, diarrhea, hair loss as well as extremely aggressive behaviour of the individual animals investigated.Heart frequency is 300 o/min on average within the controlled group. After the application of adrenalin via infusion pump, bradicardy is recorded after applying 2.041 μg of adrenalin within the group that had been taking Adriamicin only, whereas other groups recorded changes within the level of control. The values of hematocrite were significantly decreasing with I and II group, while only a slight fall was recorded with III, IV and V group, and which still was within the controlled range. The data stated here suggest the potential protective influence of fulerenol in Adriamicin application. This statement is also supported by values obtained from glutathione reductase and glutathione peroxides from eritrocites. The results show that application of fulerenol helps antioxidant potential of eritrocites, and that the activity of enzymes is not dose dependent on concentration of fulerenol. This leads to a hypothesis that fulerenol, when applied *in vivo,* acts as an antioxidant.

P.S.E.16.

COMPARATIVE EFFICIENCY OF FULLERENOL AND AMIFOSTINE IN PROTECTION OF HEMATOPOESIS AGAINST HARMFUL EFFECTS OF IONIZING RADIATION IN RATS

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In vitro studies have showed that fullerenol $C_{60}(OH)_{24}$ has high antioxidative potential, which leads to an assumption that it could protect living organisms against oxidative stress. Since the radiation injury is generally mediated by highly reactive oxygen free radical species, the aim of this study was to examine efficiency of fullerenol compared to that of the well known radioprotector amifostine, in protection of hematopoesis in irradiated rats.

Adult male Wister rats were irradiated by X-rays in a dose of 7 Gy. Fullerenol (100 mg/kg i.p.) and amifostine (300 mg/kg i.p.) were given 30 minutes before irradiation. Influence of ionizing radiation on hematopoesis, as well as the radioprotective efficiency of the protectors given, were evaluated by determining blood cell count during 28 days after irradiation. For this purpose the blood was taken from tail vein before and on the days 3, 7, 14, 21 and 28 after irradiation.

The results showed that in early period after irradiation the most significant changes were found in the leukocytes, and particularly in lymphocytes count. In unprotected animals significant decrease in the count of these cells were observed after 3rd post-irradiation day with further decrease on the day 7 after irradiation. Amifostine failed to protect against this radiation-induced decrease in leukocytes count. On the other hand, in animals protected with fullerenol this drop in the count of white blood cells was less pronounced and had no tendency to further decrease. Similar phenomenon was observed in thrombocytes count. An increase in the number of erythrocytes was observed in all three groups of animals, most probably due to compensatory response of bone marrow. This effect, however, was less pronounced in both protected group of animals than in the control group implying hemtoprotective effect of agents used.

Our results suggest that fullerenol might offer better protection of hematopoesis in early post-irradiation period than the standard radioprotector amifostine.

P.S.E.17.

DYNAMICAL PROPERTIES OF POLYMER MATERIALS FOR ENZYME IMMOBILIZATION

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Enzymes provide excellent conditions for design of modern synthetic processes, owing to specificity and selectivity of their catalytic action but also mild conditions and environmental friendly behavior by performance. But the reaction conditions of organic chemical processes in reactor are far from the biological environment in which enzymes perform in nature. So, enzymes can denature due to solvent effects and mechanical shear in reactors. Also separation of enzymes from substrates and products are difficult. Modern routs to improve enzyme performances in non - natural environment are based on immobilization. Immobilized biocatalysts play or will in the future play an important role in various industries like chemical and pharmaceutical industry biotechnology, medicine, agriculture and food industry. Thus, plenty of different immobilization strategies and technologies exist. In this contribution we considered immobilization in a polymer network. Here dynamical properties of the polymer are especially important due to their direct relations with transport processes in the system. We analyze, experimentally and theoretically, dynamic properties of alginates as accumulation and loss moduli, their scaling with frequency, their relation with structure and influences upon immobilizate formation

P.S.E.18.

NONLINEAR DYNAMICS OF BREWING YEAST CELL GROWTH IN ALGINATE MICRO-BEADS

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The nonlinear dynamics of breawing yeast cell growth in porous alginate matrices is considered experimentally and theoretically. The application of alginate matrices includes the reduction of internal mass transfer resistence and minimizes cell lakeage and the growth restriction due to interaction between matrices and cell membranes. The effects of bead diameters in the range 0.3-2.0 mm on yeast cell growth were investigated. The cell growth in porous alginate matrices is modeled using the Langevin equations with multiplicative noise for two scalar fields i.e. cell concentration and micro-environmental quality. Three micro-processes affected the dynamics of cell growth: micro-environmental quality changes due to nutrient diffusion into the micro-beads, cell lakeage and repulsive ineractions between boundary layes arond the cells which contribute to dynamics of cell growth as a nonlinear feed-back restriction.
The results of cell growth in alginate matrices study have indicated an optimal diameter of 0.5-0.6 mm for micro-beads. Immobilized cells in these beads were not restricted significantely by mass transfer of nutrients and by cell lakeage. The highest realized cell concentrations indicated the largest feed-beck restriction quantified by constitutive parameter b.

P.S.E.19.

MICROBIOLOGICAL METHOD'S USE IN DEGRADATION OF PETROLEUM TYPE POLLUTANT IN SURFACE WATER

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In purpose to find optimal degradation conditions for oil pollutants in surface waters numerous *in vitro* biodegradation experiments under different conditions have been performed. Paraffin type oils (from Stig oil field) have been treated with *Phormidium foveolarum* and *Achantes minutissima* bacterial cultures extracted as dominant micro organisms from wastewater canal of Oil Refinery Pančevo. Degradation process that lasted for three months was performed with two kinds of substratum (inorganic "KNOP", and organic "BUJON") and on light and in darkness. Blind probe experiment was also performed. Isolated extract's analysis revealed major groups like alkanes, aromatic compounds and alcohols, as well as organic acids. GC and GC-MS analysis was perform for further determination of *n*-alkanes, isoprenoide aliphatic alkanes, as well as cyclic and polycyclic alkanes. Obtained results have shown that experiments performed on daylight and with inorganic "KNOP" gave the best degradation results, while the experiments in darkness and with organic "BUJON" substratum were the worst.

P.S.E.20.

IN VITRO INTERACTION BETWEEN BONE MARROW CELLS AND BIOCOMPOSITE Hap/PLLA

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Bone tissue reconstruction and reparation is big challenge in medicine. Biocomposite materials based on hidroxyapatite are widely used in reparation of bone defects. Bone marrow cells have great potential of differentiation in different cells of mesenhim tissue. The aim of this study was to investigate interaction between bone marrow cells and biocomposites based on HAp/PLLA in *in vitro* conditions. In that purpose, bone marrow cells of Balb/c mice were seeded in tissue culture plates with HAp/PLLA platelets or tubes. Control culture was without HAp/PLLA. Cell cultures are incubated at 33°C and with 5% of CO_2. After 7 days they were analysed. The highest density was found in the control culture. Investigated biocomposite material HAp/PLLA shown suppresion efects on growth and proliferation of cells. Cultures which were incubated with biocomposite expressed changes of cell fenotipe like: larger vacuolisation of cells, excentric nuclei and larger number of azurophill granules. This changes show us intensive phagocytosis and degradation of biocomposite materials.

P.S.E.21.

SEM ANALYSIS BONE MARROW CELLS IN HAp/PLLA SUBKUTANEOUS IMPLANTS

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Considerable attention has been directed towards the development of composite biomaterials that could help in bone defect reparation, today. Hydroxiapatit (HAp) is a dominant constituent of bones and therefore is widely used in production of different composites. Combination of HAp with organic polymers can improve its biological characteristics. Synthetic polymer poly-L-lactide (PLLA) in combination with HAp is used as a substitute for fibers of connective tissue. Such composite has good characteristics of each of these biomaterials. The aim of this study was to analyze tissue reaction and changes of HAp/PLLA biocoposites after subcutaneous implantation by scenning electron-microscope (SEM). SEM analysis were done 2 and 8 weeks after subcutaneous implantation of Hap/PLLA rods loaded with bone marrow cells in subscapular space of BALB/c mice. The control was implantation of natural bone. Our results show that there is a significant difference in production of collagen fibbers and cell proliferation related to duration of an experiment. Also, it's shown biocomposite HAp/PLLA represents good microenvironment for developing and activity of bone marrow cells and haematopoiesis.

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