THE EIGHTH YUGOSLAV MATERIALS
RESEARCH SOCIETY CONFERENCE

YUCOMAT 2006

Programme
and
The Book of Abstracts

HERCEG NOVI,
September 4-8, 2006

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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CONFERENCE PROGRAMME

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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 4-8, 2006, 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 4th, at 09.00 and end on Friday, September 8th, 2006 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 3, from 8.00 to 19.00 and on Monday, September 4, 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 2006 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 3, 2006

08^{00}-19^{00}	Registration

Monday, September 4, 2006

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}-18^{45}	**Symposium A**
19^{00}-20^{00}	**Coctail Party**

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 5, 2006

09^{00}-12^{00}	**Second Plenary Session**
15^{00}-19^{00}	**Symposium B**
20^{30}-22^{00}	**Poster Session I** (Symposium A)

Wednesday, September 6, 2006

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

Thursday, September 7, 2006

09^{00}-13^{00}	**Third Plenary Session**
15^{00}-18^{15}	**Symposium D**
20^{30}-22^{00}	**Poster Session III** (Symposiums C, D and E)

Friday, September 8, 2006

09^{00}-12^{00}	**Symposium E**
12^{00}-12^{30}	**Awards and Closing**
	CLOSE OF CONFERENCE

FIRST PLENARY SESSION

Monday, September 4, 2006

Session I: 10^{00}-13^{00}
Chairmen: D. Raković, Z.Lj. Petrović, M. Zlatanović

10^{00}-10^{30} **ECOMATERIALS IN THE GLOBAL ECO-SOCIETY: PRESENT SITUATION AND FUTURE PROSPECTS**
O. Umezawa[1], K. Halada[2], Y. Shinohara[2]
[1]Dept. of Mechanical Engineering and Materials Science, Yokohama National University, Hodogaya, Yokohama, Japan, [2]National Institute for Materials Science, Tsukuba, Ibaraki, Japan

10^{30}-11^{00} **CASTING HIGH-TEMPERATURE SUPERCONDUCTORS ATOMIC LAYER-BY-LAYER**
I. Božović
Brookhaven National Laboratory, Upton, NY, USA

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

11^{30}-12^{00} **NUMERICAL MODELING OF RF MAGNETRON SPUTTERING WITH METALLIC OR DIELECTRIC TARGET**
T. Makabe, T. Yagisawa
Keio University, Yokohama, Japan

12^{00}-12^{30} **OPTICAL PROPERTIES OF InAs/AlAs SELF-ASSEMBLED QUANTUM DOTS**
J.M. Calleja[1], D. Sarkar[1], H.P. van der Meulen[1], J.M. Becker[2], R.J. Haug[2], K. Pierz[3]
[1]Departamento de Física de Materiales, Universidad Autónoma de Madrid, Madrid, Spain, [2]Institut für Festkörperphysik, Universität Hannover, Hannover, Germany, [3]Physikalisch-Technische Bundesanstalt Braunschweig, Braunschweig, Germany

12^{30}-13^{00} **THE FORMATION OF CHRYSOTILE NANOTUBES UNDER HYDROTHERMAL CONDITIONS**
D. Suvorov, B. Jančar
»Jožef Stefan« Institute, Ljubljana, Slovenia

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

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

Session I: 15^{00}-18^{45}
Chairmen: I. Božović, S. Milonjić

15^{00}-15^{15} **INTEGRATION OF TOP-DOWN AND BOTTOM-UP METHODS: GENERATING TEMPLATES FOR NANOWIRE DEVICES**
M.A. Morris
Dept. of Chemistry, University College Cork, Cork, Ireland

15^{15}-15^{30} **PROCESSING OF NANOSTRUCTURED MATERIALS THROUGH METASTABLE TRANSFORMATION**
I. Amato, B. DeBenedetti
Politecnico di Torino, Torino, Italy

15^{30}-15^{45} **ELECTROCHEMISTRY AND DYNAMIC IONOGRAPHY OF SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS**
M.V. Kuznetsov, Yu.G. Morozov
Institute of Structural Macrokinetics and Materials Science Russian Academy of Sciences (ISMAN), Chernogolovka, Moscow region, Russia

15^{45}-16^{00} **Ba-HEXAFERRITE NANOPARTICLES PREPARED BY HYDROTHERMAL SYNTHESIS**
M. Drofenik[1,3], A. Žnidaršič[2], M. Kristl[1], D. Lisjak[3]
[1]Faculty of Chemistry and Chemical Engineering, University of Maribor, Slovenia, [2]Iskra Feriti d.o.o., Kolektor group, Ljubljana, Slovenia, [3]Jožef Stefan Institute, Ljubljana, Slovenia

16^{00}-16^{15} **PULSE PLASMA PROCESSING IN CARBON CONTAINING ATMOSPHERE FOR POSSIBLE SURFACE TREATMENT OF WIND TURBINE STEEL**
M. Zlatanović[1], N. Popović[2]
[1]Faculty of Electrical Engineering, Belgrade, Serbia,
[2]Nuclear Science Institute Vinča, Belgrade, Serbia

16^{15}-16^{30} **TRIBOLOGICAL BEHAVIOR OF CHROMIUM OXIDE PLASMA SPRAYED COATING ON MILD STEEL**
A. Koutsomichalis[1], N.M. Vaxevanidis[1] G. Petropoulos[2], E. Koubou[1], M. Makrigianni[1], A. Mourlas[3], S.S. Antoniou[3]
[1]Hellenic Air-Force Academy, Faculty of Aerospace Studies, Dekelia Air Force Base, Greece, [2]University of Thessaly, Department of Mechanical and Industrial Engineering, Pedion Areos, Volos, Greece, [3]Laboratory of ICE and Tribology, Technical Education Institute of Piraeus, Egaleo, Greece

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

17^{00}-17^{15} **COMPARISON BETWEEN DIFFERENT $LiFePO_4$ SYNTHESIS ROUTES**
D. Jugović[1], N. Cvjetićanin[2], M. Mitrić[3], S. Mentus[2], D. Uskoković[1]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]Faculty of Physical Chemistry,University of Belgrade, Belgrade, Serbia, [3]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia

17^{15}-17^{30} **LOW-TEMPERATURE SYNTHETIC ROUTE FOR CARBIDE POWDER PREPARATION FROM BORIC ACID – CITRIC ACID GEL PRECURSOR**
Dj. Kosanović[1], B. Matović[2], S. Bošković[2], V. Dondur[3], Lj. Milovanović[2], B. Babić[2]
[1]Magnohrom, IRC, Kraljevo, Serbia, [2]Institute of Nuclear Sciences Vinča, Belgrade, Serbia, [3]Faculty of Physical Chemistry, Belgrade, Serbia

17^{30}-17^{45} **PRODUCTION OF TITANIUM ALUMINIDES VIA REACTION BETWEEN TiO_2-Al-Ca**
A. Kamali[1], S.M.M. Hadavi[2], H. Razavizadeh[1]
[1]IUST University of Iran, Tehran, Iran, [2]Maleke Ashtar University of Iran, Iran

17^{45}-18^{00} **MICROSTRUCTURAL PROPERTIES OF PZT THIN FILMS DEPOSITED ON $LaNiO_3$-COATED SUBSTRATES**
K. Vojisavljević[1], M. Počuča[1], Z. Branković[1], G. Branković[1], T. Srećković[1], D. Vasiljević-Radović[2]
[1]Center for Multidisciplinary Studies of the Belgrade University, Belgrade, Serbia, [2]IHTM – Institute of Microelectronic Technologies and Single Crystals, Belgrade, Serbia

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K. Djuriš[1], G. Branković[1], Z. Branković[1], M. Počuča[1], D. Poleti[2]
[1]Center for Multidisciplinary Studies of the Belgrade University, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

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M. Stevanović[1], N. Ignjatović[1], Z. Nedić[2], D. Miličević[3], D. Uskoković[1]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]Faculty of Physical Chemistry, Belgrade, Serbia, [3]The Vinča Institute of Nuclear Sciences, Laboratory for Radiochemistry and Physics, Serbia

18^{30}-18^{45} **PREPARATION OF BASALT GLASS AND BASALT – BASE CASTINGS**
D. Čikara, D. Kalaba, B. Nedeljković, Lj. Savić
Faculty of Technical Sciences, University of Pristine, Serbia

SECOND PLENARY SESSION

Tuesday, September 5, 2006

Session II: 09^{00}-12^{00}
Chairmen: R.A. Andrievski, D. Suvorov, M. Davidović

09^{00}-09^{30} **A NEW ASPECT IN THE COMPUTATIONAL NANOMATERIAL SCIENCE: ODD ELECTRONS IN MOLECULAR CHEMISTRY, SURFACE SCIENCE, AND SOLID STATE MAGNETISM**
E.F. Sheka
Peoples' Friendship University of the Russian Federation, Moscow, Russia

09^{30}-10^{00} **EXCHANGE BIAS IN MAGNETIC CORE/SHELL NANOPARTICLES**
Ò. Iglesias, A. Labarta, X. Batlle
Departament Física Fonamental, Universitat de Barcelona, Barcelona, Spain

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

10^{30}-11^{00} **HIGH EFFICIENCY OF LUTETIUM SILICATE SCINTILLATORS, Ce-DOPED LPS AND LYSO CRYSTALS FOR MEDICAL APPLICATIONS**
B. Viana[1], A. Bessière[1], L. Pidol[1,2], A. Galtayries[3], P. Dorenbos[4]
[1]LCAES-ENSCP, Paris Cedex 05, France, [2]Saint Gobain, Nemours, France, [3]LPCS-ENSCP, Paris Cedex 05, France, [4]RTG, IRI, DUT, JB Delft, The Netherlands

11^{00}-11^{30} **PHOTOPHYSICS OF FULLERENE-DOPED NANOSTRUCTURES: OPTICAL LIMITING, HOLOGRAM RECORDING AND SWITCHING OF LASER BEAM**
N.V. Kamanina
Vavilov State Optical Institute, St. Petersburg, Russia

11^{30}-12^{00} **NANOPARTICLES GENERATION IN CdSSe DOPED SILICA GLASS**
S. Mekhlouf, N. Ollier, A. Boukenter, Y. Ouerdane
Laboratoire Traitement du Signal et Instrumentation, UMR CNRS 5516, Saint-Etienne, France

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

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATION

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

15^{00}-15^{15} **HIGH SURFACE AND HIGH NANOPOROSITY BORON NITRIDE ADAPTED TO HYDROGEN SEQUESTRATION**
B. Bonnetot[1], S. Miljanić[2], L. Laversenne[1], C. Goutaudier[3]
[1]Laboratory for Multimaterials and Interfaces UMR CNRS 5615, University of Lyon 1, Villeurbanne Cedex, France, [2]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia, [3]Laboratory for Hydrazines and Processes UMR CNRS 5615, University of Lyon 1, Villeurbanne Cedex, France

15^{15}-15^{30} **CHARACTERIZATION OF NEW COMPOUNDS FROM THE $RM_3(BO_3)_4$ FAMILY BY OPTICAL SPECTROSCOPY METHODS**
M.N. Popova
Institute of Spectroscopy RAS, Troitsk, Moscow Region, Russia

15^{30}-15^{45} **NEGATIVE REFRACTION AND LEFT-HANDEDNESS IN 2D ARCHIMEDEAN LATTICE PHOTONIC CRYSTALS**
R. Gajić[1], R. Meisels[2], F. Kuchar[2], Dj. Jovanović[1], K. Hingerl[3]
[1]Institute of Physics, Belgrade, Serbia, [2]Institute of Physics, University of Leoben, Leoben,, Austria, [3]Christian Doppler Laboratory, Institute for Semiconductors and Solid State Physics,University of Linz, Linz, Austria

15^{45}-16^{00} **DESIGN CONSIDERATIONS FOR NONMAGNETIC SEMICONDUCTOR- BASED SPIN FILTERS**
J. Radovanović[1], V. Milanović[1], Z. Ikonić[2], D. Indjin[2]
[1]Faculty of Electrical Engineering, Belgrade, Serbia, [2]Institute of Microwaves and Photonics, School of Electronic and Electrical Engineering, University of Leeds, Leeds, UK

16^{00}-16^{15} **THE ACTIVITY OF IRON-CONTAINING ZEOLITIC MATERIALS FOR THE CATALYTIC OXIDATION IN AQUEOUS SOLUTIONS**
M. Milojević[1], V. Dondur[1], Lj. Damjanović[1], V. Rakić[2], N. Rajić[3], A. Ristić[4]
[1]Faculty of Physical Chemistry, Belgrade, Serbia; [2]Faculty of Agriculture, Belgrade-Zemun, Serbia; [3]Faculty of Technology and Metalurgy, Belgrade, Serbia; [4]National Institute of Chemistry, Ljubljana, Slovenia

16^{15}-16^{30} **ADSORPTION POSSIBILITIES OF ZSM-5 ZEOLITES TOWARD ATMOSPHERIC AND WATER POLLUTANTS**
V. Rac[1], V. Rakić[1,3], Lj. Damjanović[2], V. Dondur[2], A. Auroux[3]
[1]Faculty of Agriculture, Beograd-Zemun, Serbia, [2]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia, [3]Institut de Recherches sur la Catalyse, Villeurbanne Cedex, France

16^{30}-16^{45} **STRUCTURAL INVESTIGATION OF Ba^{2+} AND Sr^{2+} DIPHYLLOSILICATE DOPED WITH Yb^{3+} IONS**
B. Nedić[1], V. Dondur[1], A. Kremenović[2], R. Dimitrijević[2]
[1]Faculty for Physical Chemistry, Belgrade, Serbia, [2]Faculty for Mining and Geology, Belgrade, Serbia

16^{45}-17^{00} **INVESTIGATION OF INTERACTION OF $(PO_4)/(WO_6)_3$ - LATTICE COMPONENTS OF KEGGIN`S ANION WITH CATIONS IN ALKALI-EARTH SALTS OF 12-TUNGSTOPHOSPHORIC ACID**
S. Uskoković-Marković[1], Ph. Colomban[2], U.B. Mioč[3], M.R. Todorović[4]
[1]Faculty of Pharmacy, Belgrade, Serbia, [2]Laboratoire de Dynamique Interaction et Reactivité, UMR 7075 CNRS & Université Pierre et Marie Curie, Thiais, France, [3]Faculty of Physical Chemistry, Belgrade, Serbia, [4]Faculty of Chemistry, Belgrade, Serbia

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

17^{30}-17^{45} **PHOTOTHERMOELASTIC RESPONSE OF MULTILAYER SOLIDS**
S. Galović, M. Popović, D. Čevizović
The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia

17^{45}-18^{00} **ELECTRON STRUCTURE, LUMINESCENCE PROPERTIES AND VALENCE STATE OF $Ca_3Ga_2Ge_4O_{14}$ AND $R.E._3Ga_5O_{12}$ GARNET CRYSTALS**
I.D. Shcherba[1,*], D. Uskoković[2], L.V. Kostyk[3], V.M. Uvarov[4], L.O. Dobrjans'ka[3], A.J. Senkievicz[4]
*[1]Institute of Techniques, Pedagogical of Academy, Krakow, Poland, *Permanent address: Lviv National University by Ivan Franko, Lviv, Ukraine, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia, [3]Lviv National University by Ivan Franko, Lviv, Ukraine, [4]Institute of Physics Metals, Kyiv, Ukraine*

18^{00}-18^{15} **THE INFLUENCE OF RARE-EARTH ADDITIVES (La, Dy and Sm) ON THE MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF**

DOPED $BaTiO_3$ CERAMICS
V. Paunović[1], M. Miljković[2], Lj. Vračar[1], Lj. Živković[1]
[1]Faculty of Electronic Engineering, University of Niš, Niš, Serbia, [2]Laboratory for Electron Microscopy, University of Niš, Niš, Serbia

18^{15}-18^{30} **CHANGES OF STRUCTURE AND PROPERTIES OF OLIGOPHENYLENES UNDER SELECTED EXTERNAL INFLUENCES**
I. Radisavljević, D. Marjanović, N. Novaković, N. Ivanović
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

18^{30}-18^{45} **MICROMECHANICAL ANALYSIS OF CONSTRAINT EFFECT ON FRACTURE INITIATION IN STRENGTH MIS-MATCHED WELDED JOINTS**
M. Dobrojević[1], M. Rakin[2], N. Gubeljak[3], M. Zrilić[2], A. Sedmak[4]
[1]Energoprojekt, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Serbia, [3]Faculty of Mechanical Engineering, University of Maribor, Slovenia, [4]Faculty of Mechanical Engineering, University of Belgrade, Serbia

18^{45}-19^{00} **INVESTIGATION OF POSIBILITIES OF SUPSTITUTION OF TUNGSTEN CARBIDE WITH BORON CARBIDE CERAMICS**
D. Kalaba, D. Čikara
Faculty of Technical Sciences, University of Pristine, Serbia

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

Wednesday, September 6, 2006

Session I: 09^{00}-13^{00}
Chairman: J.M. Calleja, J. Nedeljković

09^{00}-09^{15} **RAMAN SCATTERING BY THE LONGITUDINAL OPTICAL PHONONS IN InN NANOCOLUMNS AND COMPACT LAYERS**
S. Lazić[1], J.M. Calleja[1], M.A. Sánchez-García[2], J. Grandal[2], E. Calleja[2], F. Agullo-Rueda[3], A. Trampert[4]
[1]Dept. Física de Materiales, Universidad Autónoma de Madrid, Cantoblanco, Madrid, Spain, [2]Dept. De Ingeniería Electrónica, ETSIT, Universidad Politécnica de Madrid, Madrid, Spain, [3]Instituto de Ciencia de Materiales de Madrid, CSIC, Cantoblanco, Madrid, Spain, [4]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany

09^{15}-09^{30} **UPCONVERSION OF RARE EARTH DOPED Y_2O_3 NANOPARTICLES**
A. Bessière, C. Mathieu, F. Pellé, B. Viana
Chimie de la Matière Condensée de Paris - CNRS-UMR 7574, ENSCP, Paris Cedex 05, France

09^{30}-09^{45} **ORGANIC–INORGANIC NANOCOMPOSITES: PREPARATION AND CHARACTERIZATION**
M. Špírková, J. Brus, A. Strachota, M. Šlouf, B. Strachotová
Institute of Macromolecular Chemistry AS CR Prague, Czech Republic

09^{45}-10^{00} **STRUCTURAL CHARACTERIZATION AND LUMINESCENCE PROPERTIES OF NANOCRYSTALLINE SCANDIUM OXIDE PREPARED BY COMBUSTION SYNTHESIS**
R. Krsmanović[1], O. Lebedev[1], A. Speghini[2], M. Bettinelli[2], S. Polizzi[3], G. Van Tendeloo[1]
[1]EMAT, University of Antwerp, Antwerp, Belgium, [2]Dipartimento Scientifico e Tecnologico, Università di Verona and INSTM, UdR Verona, Verona, Italy, [3]Dipartimento di Chimica Fisica, Università di Venezia and INSTM, UdR Venezia, Venezia - Mestre, Italy

10^{00}-10^{15} **RADIATION STIMULATED PROPERTIES OF NON-STOICHIOMETRICAL OXIDE BULK AND NANO-CRYSTALS**
N. Kulagin
Kharkiv National University for Radioelectronics, Kharkiv 5, Ukraine

10^{15}-10^{30} **SYNTHESIS AND LUMINESCENT PROPERTIES OF $CaSiO_3:Eu^{3+}$ NANOPOWDER**
Ž. Andrić[1], M.D. Dramićanin[1], B. Viana[2], E. Antic-Fidancev[2], M. Mitrić[1], A. Bessiere[2]
[1]Institute of Nuclear Sciences "Vinča", Belgrade, Serbia, [2]Laboratoire de Chimie de la Matière Condensée de Paris (ENSCP), Paris cedex 05, France

10^{30}-10^{45} **N-TYPE SILICON ELECTRON MOBILITY AND ITS RELATIONSHIP TO THE KINK EFFECT FOR NANO-SCALED SOI NMOS DEVICES**
M. Sarajlić[1], R. Ramović[2]
[1]IHTM-Center for Microelectronic Technologies and Single Crystals, Belgrade, Serbia, [2]School for Electrical Engineering, Belgrade, Serbia

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

11^{15}-11^{30} **NANO-GRAPHITE BY LOW ENERGY PURE SHEAR MILLING**
N. Jović[1,a], M.Vittori Antisari[1], A. Montone[1], E. Piscopiello[2], C. Alvani[1], L. Pilloni[1]
[1]Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy, [2]Materials and Technology Unit, ENEA C.R. Brindisi, Brindisi, [a]p.a. INN Vinča, Department of Material Sciences, Belgrade, Serbia

11^{30}-11^{45} **CHARACTERIZATION OF SURFACE MODIFIED CARBON CRYOGEL**
B.M. Babić[1], S.S. Milovanović[1], N.V. Krstajić[2]
[1]Vinča, Institute of Nuclear Sciences, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

11^{45}-12^{00} **INFLUENCE OF STRUCTURAL TRANSFORMATIONS ON ELECTRIC AND MAGNETIC PROPERTIES OF $Fe_{81}B_{13}Si_4C_2$ AMORPHOUS ALLOY**
A. Maričić[1], D.M. Minić[2] , M. Spasojević[1], R. Simeunović[1]
[1]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia, [2]Faculty of Physical Chemistry, Belgrade, Serbia

12^{00}-12^{15} **PHASE COMPOSITION AND MAGNETIC PROPERTIES OF MULTIPHASE MELT-SPUN $Nd_{4.3}Fe_{76.2}B_{19.5}$ ALLOY**
V. Ćosović[1], A. Grujić[1], J. Stajić-Trošić[1], V. Spasojević[2], N. Talijan[1]
[1]Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia, [2]Institute of Nuclear Sciences Vinča, Belgrade, Serbia

12^{15}-12^{30} **INFLUENCE OF INDIUM SUBSTITUTION ON THE STRUCTURAL AND MAGNETIC PROPERTIES OF Zn-FERRITES**

M.M. Maletin[1], V.V. Srdić[1], E.G. Moshopoulou[2]
[1]Department of Materials Engineering, Faculty of Technology, Novi Sad, Serbia, [2]Institute of Materials Science, NCSR "Demokritos", Athens, Greece

12^{30}-12^{45} **RIETVELD REFINEMENT OF $Ca_{0.7}La_{0.3}MnO_3$ AND $Ca_{0.7}La_{0.3}Mn_{0.8}Ce_{0.2}O_3$ PEROVSKITE STRUCTURES**

J. Dukić, S. Bošković, B. Matović
Institute of Nuclear Sciences "Vinča", Materials Science Laboratory, Belgrade, Serbia

12^{45}-13^{00} **CHARACTERIZATION OF SYNTHESIZED PEROVSKITE La(Ti-Mg-Fe)O_3 OBTAINED IN PLANETARY BALL MILL**

S. Petrović[1], A. Terlecki-Baričević[1], Lj. Karanović[2], M. Zdujić[3], V. Drobnjak[1]
[1]ICTM, Dept. Catalysis and Chemical Engineering, Belgrade, Serbia, [2]Faculty of Mining and Geology, Laboratory for Crystallography, Belgrade, Serbia, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia

THIRD PLENARY SESSION

Thursday, September 7, 2006

Session III: 09^{00}-13^{00}
Chairmen: A. Montone, Dj. Koruga, S. Mentus

09^{00}-09^{30} **NANODIAMOND: ULTIMATE CARBON MATERIAL**
E. Ōsawa
NanoCarbon Research Institute, Kashiwa-no-Ha, Kashiwa, Chiba, Japan

09^{30}-10^{00} **HYDROGEN IN NANOSTRUCTURES**
R.A. Andrievski
Institute of Problems of Chemical Physics, Russian Academy of Sciences
Chernogolovka, Moscow Region, Russia

10^{00}-10^{30} **PREPARATION AND CHARACTERIZATION OF BINARY OXIDE CATALYSTS CONTAINING CERIA COUPLED WITH GROUP III (B, Al, Ga, In) OXIDES**
T. Yuzhakova[1], B. Bonnetot[2], V. Rakic[1], C. Guimon[3], A. Auroux[1]
[1]Institut de Recherches sur la Catalyse, CNRS, Villeurbanne, France, [2]Laboratoire des Multimatériaux et Interfaces, UCB Lyon 1, Villeurbanne, France, [3]L.P.C.M., Université de Pau et des Pays de l'Adour, Pau, France

10^{30}-11^{00} **REACTION WITH HYDROGEN OF MICRO AND NANO COMPOSITES BASED ON Mg HYDRIDES**
A. Montone
Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy

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

11^{30}-12^{00} **NANOTECHNOLOGY BEYOND MINIATURIZATION: INSPIRATION FROM BIOLOGY**
F.T. Hong
Dept. of Physiology Wayne State University, Detroit, Michigan, USA

12^{00}-12^{30} **A UNIFIED DECOHERENCE-BASED MODEL OF MICROPARTICLES IN A SOLUTION**
J. Jeknić[1], M. Dugić[2], D. Raković[3], M. Plavšić[4]
[1]Department of Physics, Faculty of Science, Niš, Serbia, [2]Department of Physics, Faculty of Science, Kragujevac, Serbia, [3]Faculty of Electrical Engineering, Belgrade, Serbia, [4]Faculty of Technology and Metallurgy, Belgrade, Serbia

12^{30}-13^{00} **EFFECT OF HYPERBRANCHED VEGETABLE OIL POLYOLS ON PROPERTIES OF FLEXIBLE POLYURETHANE FOAMS**
Z.S. Petrović, I. Javni, X. Jing
Kansas Polymer Research Center, Pittsburg State University, Pittsburg, KS, USA

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

SYMPOSIUM D: COMPOSITES

Session I: 15^{00}-18^{15}
Chairmen: Z.S. Petrović, M.M. Stevanović, S. Bošković

15^{00}-15^{15} **HIGH PRESSURE SINTERING OF SILICON NITRIDE BASED COMPOSITES**
V.S. Urbanovich[1], M. Vlajić[2], V.D. Krstić[2], A.V. Chuevsky[1], S.S. Turbinsky[1], Ch. Zhou[2]
[1]Joint Institute of Solid State and Semiconductor Physics, National Academy of Sciences of Belarus, Minsk, Belarus, [2]Centre for Manufacturing of Advanced Ceramics and Nanomaterials, Queen's University, Kingston, Ontario, Canada

15^{15}-15^{30} **ANALYSIS OF MICROMECHANICAL PROPERTIES OF PARTICULATE COMPOSITE MATERIAL SiO_2-HDPE**
D. Stojanović[1], P.S. Uskoković[1], I. Balać[2], V. Radojević[1], R. Aleksić[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Faculty of Mechanical Engineering, University of Belgrade, Belgrade

15^{30}-15^{45} **MULTILAYERS COMPOSITE MATERIALS WITH NON-USUAL POISSON'S RATIOS**
E-H. Harkati[1], Z. Azari[2], Ph. Jodin[2], A. Bezazi[3]
[1]Department of Civil Engineering, University of Tebessa, Algeria, [2]Mechanical Reliability Laboratory, Paul Verlaine Metz University and National School of Engineering of Metz, France, [3]Centre for Materials Research and Innovation, University of Bolton, UK

15^{45}-16^{00} **THERMOFORMING PROCESS ANALYSIS OF WOVEN FABRIC REINFORCED THERMOPLASTIC COMPOSITES**
M.T. Abadi
Aerospace Research Institute, Ministry of Science, Research and Technology, Tehran, Iran

16^{00}-16^{15} **THEORETICAL-EXPERIMENTAL INVESTIGATION AND COMPARATIVE MODELLING OF CUTTING FORCE IN CUTTING OF FIBRE REINFORCED PLASTIC**

G. Petropoulos[1], P. Davim[2], N. Vaxevanidis[3], I. Ntziantzias[1], A. Koutsomichalis[3]
[1]University of Thessaly, Department of Mechanical and Industrial Engineering, Pedion Areos, Volos, Greece, [2] University of Aveiro, Department of Mechanical Engineering, Campus Santiago, Portugal, [3]Hellenic Air-Force Academy, Faculty of Aerospace Studies, Dekelia Air Force Base, Greece

16^{15}-16^{30} **SINTERING CHARACTERISTICS OF TUNGSTEN COPPER COMPOSITE MATERIALS**
H. Azimi, S.M. Hadavi, E. Ahmadi
A. M. T. Research Center, Tehran, Iran

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

17^{00}-17^{15} **Al-PILLARED MONTMORILLONITE WITH INCORPORATED TRANSITION METALS OXIDE (Co, Ni); PHYSICOCHEMICAL AND MAGNETIC PROPERTIES**
S. Sredić[1], M. Davidović[2], S. Zec[2], D. Jovanović[4], U.B.Mioč[3]
[1]Institute of Mining, Prijedor, Republic of Srpska, [2]Institute of Nuclear Sciences, Belgrade, Serbia, [3]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia, [4]IHTM, Center of Catalysis and Chemical Engineering, Belgrade, Serbia

17^{15}-17^{30} **INTERPRETING XPS C1S BINDING ENERGIES IN FLUORINE CONTAINING NANOPARTICLES**
E.A. Hoffmann[1], Z.A. Fekete[1], Lj.S. Korugic-Karasz[2]
[1]Department of Physical Chemistry, University of Szeged, Szeged, Hungary, [2]Department of Polymer Science and Engineering, University of Massachusetts, Amherst, USA

17^{30}-17^{45} **THE INFLUENCE OF GAMMA RADIATION ON THE GLASS TRANSITION OF HYDROXYAPATITE/POLY L-LACTIDE COMPOSITE**
D. Miličević[1], S. Trifunović[1], N. Ignjatović[2], D. Uskoković[2], E. Suljovrujić [1]
[1]Vinca Institute of Nuclear Sciences, Belgrade, Serbia, [2]Institute of Technical Sciences of Serbian Academy of Sciences and Arts, Belgrade, Serbia

17^{45}-18^{00} **FATIGUE CHARACTERIZATION OF HONEYCOMB SANDWICH PANELS**
B. Keskes[1], A. Abbadi[2], J. Gilgert[2], Z. Azari[2], N. Bouaouadja[1]
[1]Département d'Optique et Mécanique, Université de SETIF, Algérie, [2]LFM Université de Metz ENIM Île du Saulcy, Metz cedex, France

18^{00}-18^{15} **DIELECTRIC AND FERROELECTRIC PROPERTIES OF $BaTi_{1-x}Sn_xO_3$ MULTILAYERED CERAMICS**
S. Marković[1], M. Mitrić[2], N. Cvjetićanin[3], Č. Jovalekić[4], D. Uskoković[1]
[1]Institute of Technical Science of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]The Vinča Institute of Nuclear Science, Belgrade, Serbia, [3]Faculty of Physical

Chemistry, Belgrade, Serbia, [4]*Center for Multidisciplinary Studies, University of Belgrade, Belgrade, Serbia*

SYMPOSIUM E: BIOMATERIALS

Friday, September 8, 2006

Session I: 09^{00}-12^{00}
Chairmen: F.T. Hong, M.B. Plavšić

09^{00}-09^{15} **FROM MICRO TO NANO COMPOSITE BIOMATERIALS CALCIUM PHOSPHATE/BIORESORBABLE POLYMERS**
N. Ignjatović, D. Uskoković
Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia

09^{15}-09^{30} **RELEVANCE OF POLARON/SOLITON-LIKE TRANSPORT MECHANISMS IN CASCADE RESONANT ISOMERIC TRANSITIONS OF Q1D-MOLECULAR CHAINS**
G. Keković[1], D. Raković[1], D. Davidović[2,3]
[1]Faculty of Electrical Engineering, Belgrade, Serbia, [2]Vinca Institute, Belgrade, Serbia, [3]School of Electrical and Computer Engineering, RMIT, Melbourne, Australia

09^{30}-09^{45} **THE MONOCRYSTALLINE PHOTORECEPTOR OF *EUGLENA GRACILIS* FROM A PHYSICISTS POINT OF VIEW**
C. Gruenberger, R. Ritter, I.C. Gebeshuber
Institut fuer Allgemeine Physik, Technische Universitaet Wien, Wien, Austria

09^{45}-10^{00} **CENTRIOLE – CYTOSKELETON MIMICRY FOR NANOMATERIAL SELFCONTROL**
Dj. Koruga, N. Mišić, L. Matija, J. Simić
Molecular Machines Research Center, Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia

10^{00}-10^{15} **OSTEOGENIC EFFECTS OF ADDED FLAVONOID EXTRACT IN IMPLANTS COMBINED OF HAp/PLLA AND BONE FRAGMENTS**
S. Najman[1], V. Savić[1], Lj. Djordjević[2], P. Vasiljević[2], I. Jovanović[1], N. Ignjatović[3], M. Plavšić[4], D. Uskoković[3]
[1]Medical Faculty, University of Niš, Serbia; [2]Department of Biology with Ecology, Faculty of Science and Mathematics, University of Niš, Serbia; [3]Institute of Technical Science of SASA, Belgrade; [4]Faculty of Technology and Metallurgy, Belgrade

10^{15}-10^{30} **ALGINATE MICROBEADS AS CELL SUPPORT FOR CARTILAGE TISSUE ENGINEERING: BIOREACTOR STUDIES**
A. Osmoković[1], D. Bugarski[2], B. Bugarski[1], B. Obradović[1]
[1]Faculty of Technology and Metallurgy, Belgrade, Serbia, [2]Institute for Medical Research, Belgrade, Serbia

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

11^{00}-11^{15} **NON-MAGNETIC MATERIALS BEHAVIOUR ON NANOTESLA SCALE**
Dj. Koruga[1], S. Mihajilović[2], V. Lesić[2], P. Sremac[2], L. Matija[1]
[1]Molecular Machines Research Center, Faculty of Mechancal Engineering, University of Belgrade, Belgrade, Serbia, [2] National Geomagnetic Institute, Grocka, Serbia

11^{15}-11^{30} **A Cu^{2+} PROBE OVER RANITIDINE AND NIZATIDINE OR *In Silico vs.* EXPERIMENTALLY OBTAINED COMPLEXATION OF DRUGS**
B.J. Drakulić[1], S.P. Sovilj[2]
[1]Department of Chemistry-ICTM, University of Belgrade, Belgrade, Serbia, [2]Faculty of Chemistry, Belgrade, Serbia

11^{30}-11^{45} **TRANSPORT OF DRUGS IN POLY(2-HYDROXYETHYL METHACRYLATE) AND POLY(2-HYDROXYETHYL METHACRYLATE-CO-ITACONIC ACID) HYDROGELS. DIFFUSION AND RELEASE STUDIES**
S.Lj. Tomić[1], M.M. Mićić[2], J.M. Filipović[1], E.H. Suljovrujić[2]
[1]Faculty of Technology and Metallurgy, Belgrade University, Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, Belgrade, Serbia

11^{45}-12^{00} **HETEROPOLY COMPOUNDS AS BIOACTIVE AGENTS**
S. Uskoković-Marković[1], M.R. Todorović[2], U.B. Mioč[3], I. Holclajtner-Antunović[3], B. Krstić[4], N. Dukić[4]
[1]Faculty of Pharmacy, Belgrade, Serbia, [2]Faculty of Chemistry, Belgrade, Serbia, [3]Faculty of Physical Chemistry, Belgrade, Serbia, [4]Faculty of Agriculture, Zemun, Serbia

POSTER SESSION I

Tuesday, September 5, 2006, 20^{30}-22^{00}

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

P.S.A.1. **SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS OF $Cr_{2-x}Ti_xO_3$**
M.L. Chernega, M.V. Kuznetsov
Institute of Structural Macrokinetics and Materials Science RAS, Chernogolovka, Russia

P.S.A.2. **THE EFFECT OF AN APPLIED ELECTRIC FIELD ON SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS IN Ba-Fe-O-SYSTEM**
S.M. Busurin, M.V. Kuznetsov, Yu.G. Morozov
Institute of Structural Macrokinetics and Materials Science RAS, Chernogolovka, Russia

P.S.A.3. **THE INFLUENCE OF CHARGING EFFECTS ON THE SiO_2 ETCHING PROFILE EVOLUTION IN FLUOROCARBON PLASMAS**
B. Radjenović[1], M. Radmilović-Radjenović[2], Z.Lj. Petrović[2]
[1]Laboratory of Physics, Vinča Institute of Nuclear Sciencies, Belgrade, Serbia,
[2]Institute of Physics, Belgrade, Serbia

P.S.A.4. **PARTICLE-IN-CELL MODELLING OF A NEUTRAL BEAM SOURCE FOR MATERIAL PROCESSING IN NANOSCALE STRUCTURES FABRICATION**
M. Radmilović-Radjenović[1], Z.Lj. Petrović[1], Ž. Nikitović[1], A. Strinić[1], V. Stojanović[1], A. Nina[1], B. Radjenović[2]
[1]Institute of Physics, Belgrade, Serbia, [2] Vinča Institute for Nuclear Sciences, Belgrade, Serbia

P.S.A.5. **GXRD ANALYSIS OF TiN COATINGS DEPOSITED ON ION IMPLANTED STAINLESS STEEL**
D. Peruško, M. Mitrić, N. Bibić, S. Petrović, M. Popović, M. Novaković, I. Radović, M. Milosavljević
Institute of Nuclear Sciences"Vinča", Belgrade, Serbia

P.S.A.6. **ION BEAM SPUTTER DEPOSITION OF Ni THIN FILMS: INFLUENCE OF ENERGETIC PARTICLES ON STRUCTURAL EVOLUTION**
N. Popović[1], N. Bundaleski[1], Ž. Bogdanov[1], B. Goncić[1], S. Zec[2], M. Zlatanović[3]
[1]The Vinča Institute of Nuclear Sciences, Atomic Physics Laboratory, Serbia, [2]Material Science Laboratory, Belgrade, [3]Faculty of Electrical Engineering, Belgrade, Serbia

P.S.A.7. **NANO-STRUCTURED TiN THIN FILMS DEPOSITED BY SINGLE ION BEAM REACTIVE SPUTTERING**
Ž. Bogdanov[1], N. Popović[1], B. Goncić[1], Z. Rakočević[1], M. Zlatanović[2], S. Zec[3]
[1]The Vinča Institute of Nuclear Sciences, Atomic Physics Laboratory, Belgrade, Serbia, [2]Faculty of Electrical Engineering, Belgrade, Serbia, [3]The Vinča Institute of Nuclear Sciences, Material Science Laboratory, Belgrade, Serbia

P.S.A.8. **EQUIVALENT CIRCUITS OF UNIPOLAR PULSED PLASMA SYSTEM FOR ELECTRICAL AND OPTICAL SIGNAL ANALYSIS**
I. Popović, M. Zlatanović
Faculty of Electrical Engineering, Belgrade, Serbia

P.S.A.9. **PLASMA ASHING FOR THE APPLICATION TO THE LOW-K DIELECTRICS DEVICES**
J.W. Lee, H.W. Kim
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.A.10. **CATALYST-FREE GROWTH OF TIN OXIDE ONE-DIMENSIONAL NANOSTRUCTURES ON SILICON SUBSTRATES**
S.H. Shim, H.W. Kim
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.A.11. **FORMATION OF GAS PHASE BORON AND CARBON CONTAINING MOLECULAR SPECIES AT HIGH TEMPERATURES**
J. Radić-Perić
Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

P.S.A.12. **PREPARATION OF ZrO_2 AND Al_2O_3 THIN-FILMS ON STAINLESS STEEL BY SPRAY PYROLYSIS**
T. Novaković[1], N. Radić[1], B. Grbić[1], P. Stefanov[2], T. Marinova[2]
[1]IChTM-Department of Catalysis and Chemical Engineering, Belgrade, Serbia, [2]Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, Sofia, Bulgaria

P.S.A.13. **NANOSIZE POWDERS OF REFRACTORY COMPOUNDS FOR OBTAINING OF FINE-GRAINED CERAMIC MATERIALS**
I. Zalite, J. Grabis
Institute of Inorganic Chemistry of the Riga Technical University, Salaspils, Latvia

P.S.A.14 **SOL-GEL ELABORATION AND OPTICAL FEATURES OF Eu^{3+}-DOPED CdS NANOCRYSTALS IN SiO_2**
J. Planelles[1], E. Cordoncillo[1], P. Escribano[1]**,** B. Julián[2], C. Sanchez[2], P. Aschehoug[2], B. Viana[2], F. Pellé[2]
[1]Dpto. Química Inorgánica y Orgánica, Universitat Jaume I, Castellón, España,
[2]Chimie de la Matière Condensée, CNRS-UMR 7574, Paris, France

P.S.A.15. **REDUCTION OF NANOMETRIC MAGNETITE POWDER**
Lj. Vulićević[1], N. Ivanović[2], A. Maričić[1], N. Popović[2], M. Mitrić[2], M. Srećković[3], Ž. Tomić[4]
[1]Technical Faculty Čačak, Čačak, Serbia, [2] Institute for Nuclear Sciences "VINČA", Belgrade, Serbia, [3]Faculty of Electrical Engineering, Belgrade, Serbia, [4]IRITEL A.D, Belgrade, Serbia

P.S.A.16. **STRUCTURAL CHARACTERIZATION OF Nb AND La DOPED NANOSTRUCTURED TITANIA POWDERS AND COATINGS**
M.M. Maletin, R.R. Djenadić, Lj.M. Nikolić
Department of Materials Engineering, Faculty of Technology, Novi Sad, Serbia

P.S.A.17. **SYNTHESIS OF $MgFe_2O_4$ NANOPARTICLES BY MECHANOCHEMICAL PROCEDURE**
P. Osmokrović, Č. Jovalekić, A.S. Nikolić, M.B. Pavlović
Faculty of Electrical Engineering, Belgrade, Serbia

P.S.A.18. **MECHANOCHEMICAL SYNTHESIS OF ZnO AND ZrO_2 NANOPARTICLES AND INHIBITING EFFECT OF $CaCl_2$ AND NaCl ON PARTICLE AGGLOMERATION**
A. Čeliković, Lj. Kandić, D. Uskoković
Institute of Technical Science of the Serbian Academy of Sciences and Arts, Belgrade, Serbia

P.S.A.19. **ADSORPTION OF SOME WEAK ORGANIC ELECTROLYTES FROM AN AQUEOUS SOLUTION ON SILICA**
S.K. Milonjić[1], L.K. Zhigunova[1,2], V.Lj.Pavasović[3]
[1]The Vinča Institute of Nuclear Sciences, Belgrade, Serbia, [2]International Independent University of Environmental and Political Sciences, Moscow, Russia, [3]The Faculty of Agriculture, Zemun, Serbia

P.S.A.20. **COLLOIDAL PROCESSING OF TIRON STABILIZED ALUMINA SUSPENSIONS**

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

P.S.A.21. **EXPERIMENTAL AND THEORETICAL CHARACTERIZATION OF THE 3D-DOPANTS BIAS ON THE H DESORPTION OF Mg HYDRIDES**
A. Montone[1], J. Grbović Novaković[1,a], E.Bonetti[2], L.Pasquini[2], M. Celino[1], F. Cleri[1]
[1]Materials and Technology Unit, ENEA C.R. Casaccia, Roma, Italy, [2]Department of Physics, University of Bologna and CNISM, Bologna, [a]p.a. INN Vinča, Department of Material Sciences, Belgrade, Serbia

P.S.A.22. **INFLUENCE OF TRIBOPHYSICALLY ACTIVATION ON MASS CHANGES OF CORDIERITE DURING SINTERING PROCESS**
N. Djordjević[1], S. Mentus[2], Lj. Pavlović[1]
[1]Institute for Technology of Nuclear and Other Mineral Raw Materials, Belgrade, Serbia, [2]Faculty of Physical Chemistry, Belgrade

P.S.A.23. **EXPERIMENTAL SPRAY POWDERS PRODUCED FROM USED HARDMETAL BY VARIOUS MECHANICAL METHODS**
R. Tarbe[1], S. Zimakov[1], P. Peetsalu[1], P. Kulu[1], V. Mikli[2]
[1]Tallinn University of Technology/Department of Materials Engineering, Tallinn, Estonia; [2]Centre for Materials Research, Tallinn, Estonia

P.S.A.24. **THE LOW TEMPERATURE AEROSOL SYNTHESIS OF YAG:Ce $^{3+}$ NANOSTRUCTURES: COMPARATIVE STUDY OF THE XRPD MICROSTRUCTURAL PARAMETERS**
Lj. Kandić[1], L. Mančić[1], G. del Rosario[2], O. Milošević[1]
[1]Institute of Technical Sciences of Serbian Academy of Sciences and Arts, Belgrade, Serbia, [2]University Rey Juan Carlos I, Tulipan s/n. Móstoles, Madrid, Spain

P.S.A.25. **RAPID SYNTHESIS AND CHARACTERIZATION OF $Li_{1+x}Cr_yMn_{2-x-y}O_4$**
I. Stojković[1], D. Jugović[2], M. Mitrić[3], N. Cvjetićanin[1], S. Mentus[1]
[1]Faculty of Physical Chemistry, Belgrade, Serbia, [2]Institute of Technical Sciences, Serbian Academy of Sciences, Belgrade, Serbia, [3]The Vinča Institute of Nuclear Sciences,Laboratory for Theoretical and Condensed Matter Physics, Belgrade, Serbia

P.S.A.26. **EFFECT OF HEAT TREATMENT ON THE FORMATION OF ε-Fe_2O_3 PHASE FROM HEMATITE NANOPARTICLES IN SILICA MATRIX**
M. Tadić[1], V. Spasojević[1], D. Marković[1], V. Kusigerski[1], M. Remskar[2]
[1]The "Vinča" Institute, Condensed Matter Physics Laboratory, Belgrade, Serbia, [2]Jožef Stefan Institute, Ljubljana, Slovenia

P.S.A.27. **DENSIFICATION BEHAVIOUR OF NANO-SIZE CeO_2**
D. Djurović[1,2], M. Zinkevich[1], S. Bošković[2], F. Aldinger[1]

[1]Max-Planck Institut für Metallforschung, Institut für Nichtmetallische Anorganische Materialien, Universität Stuttgart, Stuttgart, Germany, [2]Institute of Nuclear Sciences »Vinca«, Belgrade, Serbia

P.S.A.28. **FURTHER DEVELOPMENT IN KINETICS MODEL OF SiO_2 DISSOLUTION IN NaOH AQUEOUS SOLUTION - I**
M. Stanković[1], L. Pezo[1], B. Kovačević[1], M. Jovanović[2], D. Debeljković[3]
[1]Eng. Dept. Holding Institute of General and Physical Chemistry, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia, [3]Faculty of Mechanical Eng., Belgrade, Serbia

P.S.A.29. **FURTHER DEVELOPMENT IN KINETICS MODEL OF SiO_2 DISSOLUTION IN NaOH AQUEOUS SOLUTION - II**
M. Stanković[1], L. Pezo[1], B. Kovačević[1], M. Jovanović[2], D. Debeljković[3]
[1]Eng. Dept. Holding Institute of General and Physical Chemistry, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia, [3]Faculty of Mechanical Engineering, Belgrade, Serbia

P.S.A.30. **INTERACTION BETWEEN HYDROGEN MOLECULE AND THE WALL OF A CARBON NANOTUBE**
Z. Rajilić, S. Lekić, S. Njezić
Physics Department, Faculty of Science, Banja Luka, Bosnia and Herzegovina

P.S.A.31. **KINETIC STUDY OF THE SYNTHESIS OF POLY(CARBOSILOXANE) AND ALKYL SIDE-CHAINS CONTAINING POLY(SILOXANE) BY HYDROSILYLATION**
V.V. Antić[1], M.P. Antić[1,2], M.N. Govedarica[1], P.R. Dvornić[3]
[1]IChTM-Center for Chemistry, Polymer Department, Belgrade, Serbia, [2]Faculty of Agriculture, Zemun, Serbia, [3]Michigan Molecular Institute, Midland, MI, U.S.A.

P.S.A.32. **TESTING OF CATALYTIC ACTIVITY OF POLYURETHANE SYSTEMS**
B. Strachotová, A. Strachota, M. Špírková
IMC AS CR Prague, Czech Republic

P.S.A.33. **A TEMPLATING ROLE OF 3-METHYLAMINOPROPYLAMINE IN THE SYNTHESIS OF OPEN-FRAMEWORK PHOSPHATE-BASED MATERIALS**
S. Šajić, N. Rajić, Dj. Stojaković
Faculty of Technology and Metallurgy, Belgrade, Serbia

P.S.A.34. **FORMATION OF COPPER ELECTRODES WITH A VERY DEVELOPED SURFACE AREA BY ELECTRODEPOSITION**
N.D. Nikolić, Lj.J. Pavlović

ICTM-Institute of Electrochemistry, University of Belgrade, Belgrade, Serbia

P.S.A.35. **THE FORMATION OF NANOCRYSTALLINE STRUCTURE IN AMORPHOUS $Fe_{80}B_{20}$ ALLOY BY SEVERE PLASTIC DEFORMATION**
O.G. Rybchenko[1], G.E. Abrosimova[1], A.S. Aronin[1], S.V. Dobatkin[2], I.I. Zver'kova[1], D.V. Matveev[1], E.V. Tatyanin[2]
[1]Institute of Solid State Physics RAS, Chernogolovka, Moscow District, Russia, [2]Institute of Metallurgy and Materials Science RAS, Moscow, Russia

P.S.A.36. **FABRICATION OF SIC BY CARBOTHERMAL-REDUCTION REACTIONS OF SEPIOLITE**
A. Devečerski, A. Radosavljević-Mihajlović, A. Egelja, M. Pošarac, B. Matović
Institute of Nuclear Sciences Vinča, Materials Department, Serbia

P.S.A.37. **THE EFFECT OF THERMO-MECHANICAL PROCESSING ON THE PROPERTIES OF SOME Al-Fe-Si ALLOYS WITH HIGH Fe/Si RATIO**
K. Delijić, V. Asanović, D. Radonjić
University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montenegro

P.S.A.38. **MATHEMATICAL MODEL FOR MICROSEGREGATION OF Al-Cu5wt.%-Mg ALLOYS**
B. Zlatičanin[1], B. Radonjić[1], M. Filipović[2], S. Marković[2]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montenegro, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia

P.S.A.39. **DISTRIBUTION Zn DURING THE CRYSTALLIZATION $Al(OH)_3$ FROM CAUSTIC SODA SOLUTION**
D. Blečić[1], I. Nikolić[1], D. Dajković[2], M.A. Vukčević[1], V. Radmilović[3]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montengro, [2]Alumina Plant Podgorica, Podgorica, Montengro, [3]LBNL, NCEM, MS-72, University of California, 1 Cyclotron, Rd. Berkeley, CA, USA

P.S.A.40. **THE THERMAL PROPERTIES OF NANO-SIZED $KClO_4$**
A. Kamali[1], S.M.M. Hadavi[2], H. Razavizadeh[1], J.M. Baboee[1]
[1]IUST University of Iran, Tehran, Iran, [2]Maleke Ashtar University of Iran

P.S.A.41. **USE OF MICROBIOLOGICAL METHODS IN IMPROVEMENT OF PETROLEUM CHARACTERISTICS FOR REFINERY PROCESSING**
B. Jovančićević[1,2], M. Antić[1,3], M. Vrvić[1,]2, J. Schwrzbauer[4]
[1]Department of Chemistry, University of Belgrade, Belgrade, Serbia, [2]Center of Chemistry, IChTM, Belgrade, Belgrade, Serbia, [3]Department of Agriculture,

University of Belgrade, Belgrade, Serbia, [4] Institute of Geology and Geochemistry of Petroleum and Coal, Aachen University, Aachen, Germany

P.S.A.42. **MODELING OF ACID ACTIVATION ON LOCAL BENTONITE**

Lj.S. Rožić[1], T.B. Novaković[1], S.P. Petrović[1], S. Janković[2], D.M. Jovanović[1]
[1]IChTM-Department of Catalysis and Chemical Engineering, Belgrade, Serbia,
[2]Faculty of Technology and Metallurgy, Belgrade, Serbia

P.S.A.43. **COMPARATIVE VALUES OF LINEAR AND VOLUME SHRINKAGE OF PRODUCTS DURING DRYING AND FIRING ON THE BASIS OF ILLITE-KAOLINITE CLAYS DEPENDING ON THE MINERAL CONTENT**

M. Krgović
Faculty of Metallurgy and Technology, Podgorica, Montenegro

POSTER SESSION II

Wednesday, September 6, 2006, 20^{30}-22^{00}

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATIONS

P.S.B.1. **CURRENT STATES IN WIDE SUPERCONDUCTING FILMS**
V.M. Dmitriev[1,2], I.V. Zolochevskii[1]
[1]B.Verkin Institute for Low Temperature Physics and Engineering, National Academy of Sciences of Ukraine, Kharkiv, Ukraine, [2]International Laboratory of High Magnetic Fields and Low Temperatures, Wroclaw, Poland

P.S.B.2. **PLASMON-TWO PHONON INTERACTION IN PbMnTe AND PbTeS ALLOYS**
J. Trajić[1], N. Romčević[1], M. Romčević[1], V.N. Nikiforov[2]
[1]Institute of Physics, Belgrade, Serbia, [2]Department of Low-Temperature Physics, Moscow State University, Moscow, Russia

P.S.B.3. **BIPOLAR VIBRATIONAL MODES IN SPHERICAL CdS QUANUM DOTS**
R. Kostić, A. Milutinović
Institute of Physics, Belgrade, Serbia

P.S.B.4. **ELECTRON ATTACHMENT TO METALIC CLUSTERS**
A.R. Tančić, M. Davidović
VINCA Institute of Nuclear Sciences, Belgrade, Serbia

P.S.B.5. **3D-SIMULATION MODEL OF RADIATION AND COLOUR CENTERS IN SOLIDS**
A. Gavrilov, N. Kulagin
Kharkiv National University for Radioelectronics, Kharkiv, Ukraine

P.S.B.6. **SYNTHESIS OF MgO WHISKERS ON METAL-COATED SUBSTRATES BY THE EVAPORATION OF MgB_2 POWDERS**
H.W. Kim
School of Materials Science and Engineering, Inha University, Incheon, Korea

P.S.B.7. **EFFECT OF Eu DOPING ON MAGNETIC PROPERTIES OF $Ge_{1-x}Mn_x$ Te**
W. Dobrowolski[1], B. Brodowska[1], M. Arciszewska[1], I. Kuryliszyn-Kudelska[1], V. Domukhovski[1], M. Wójcik[1], V.E. Slynko[2], E.I. Slynko[2], V.K. Dugaev[2;3]
[1]Institute of Physics, Polish Academy of Sciences, Warsaw, Poland, [2]Chernivtsy Department of the Institute of Materials Science Problems, Ukrainian Academy of Sciences, [3]Department of Physics and CFIF, Instituto Superior Tecnico, Lisbon, Portugal

P.S.B.8. **SURFACE PROPERTIES OF BORON ION IMPLANTED GLASSY CARBON**
A. Udovičić[1], M. Šiljegović[1], M. Laušević[2], Z. Laušević[1]
[1]*The Institute of Nuclear Science Vinca, Laboratory of Physics, Belgrade, Serbia,* [2]*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia*

P.S.B.9. **MONTE CARLO CALCULATION OF X-RAY DEPOSITED ENERGY IN CdZnTe DETECTOR**
S.J. Stanković[1], M. Petrović[1], P. Osmokrović[2], B. Lončar[3], A. Vasić[4]
[1]*Vinča Institute of Nuclear Sciences, Belgrade, Serbia,* [2]*Faculty of Electrical Engineering, Belgrade, Serbia,* [3]*Faculty of Technology and Metallurgy, Belgrade, Serbia,* [4]*Faculty of Mechanical Engineering, Belgrade, Serbia*

P.S.B.10. **CHARACTERIZATION OF TARGET MATERIAL FOR X-RAY GENERATOR BY MONTE CARLO METHOD**
S.J. Stanković, R.D. Ilić, O. Ciraj-Bjelac, M. Kovačević, D. Davidović
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

P.S.B.11. **ION IMPLANTATION INDUCED MODIFICATIONS IN REACTIVELY SPUTTERED Cr-N LAYERS ON Si SUBSTRATES**
M. Novaković, M. Popović, D. Peruško, I. Radović, V. Milinović, M. Mitrić, N. Bibić, M. Milosavljević
VINČA Institute of Nuclear Sciences, Belgrade, Serbia

P.S.B.12. **MICROSTRUCTURAL CHANGES IN TiN THIN FILMS INDUCED BY ION IMPLANTATION**
M. Popović, M. Novaković, D. Peruško, I. Radović, V. Milinović, M. Mitrić, N. Bibić, M. Milosavljević
VINČA Institute of Nuclear Sciences, Belgrade, Serbia

P.S.B.13. **ANALYSIS AND MODELING OF ELECTRODE EFFECT ON THICK FILM NTC THERMISTOR VOLUME RESISTIVITY**
B. Radojčić[1], O. Aleksić[2], R. Ramović[3]
[1]*Institute of Security, Belgrade, Serbia,* [2]*Centre for Multidisciplinary Studies, Belgrade University, Serbia,* [3]*Faculty of Electrical Engineering, Belgrade, Serbia*

P.S.B.14. **THICK FILM ZnO MULTILAYER STRUCTURE APPLIED IN LCV CELL**
M.D. Luković [1], O.S. Aleksić[2], V.D. Marić[3]
[1]*Institute of Security, Belgrade, Srbia,* [2]*Center for Multidiciplinary Studies, Beograde, Serbia,* [3]*Technical Faculty, University of Novi Sad, Novi Sad, Serbia*

P.S.B.15. **SIMULATION STUDY OF GRANULAR COMPACTION DYNAMICS UNDER VERTICAL TAPPING**

D. Arsenović[1], S.B. Vrhovac[1], Z.M. Jakšić[1], Lj. Budinski-Petković[2], A. Belić[1]
[1]Institute of Physics, Zemun, Belgrade, Serbia, [2]Faculty of Engineering, Novi Sad, Serbia

P.S.B.16. **13X ZEOLITE WITH INCORPORATED NICKEL NANOCLUSTERS AS A THIN-LAYER ELECTRODE MATERIAL**
Z. Mojović[1], S. Mentus[2], I. Krstić[3], D. Jovanović[1]
[1]IChTM-Center of Catalysis and Chemical Engineering, Belgrade University, Belgrade, Serbia, [2]Faculty of Physical Chemistry, Belgrade University, Belgrade, Serbia, [3]Faculty of Chemistry,Belgrade University, Belgrade, Serbia

P.S.B.17. **BARE AND NAFION COVERED GOLD/AQUEOUS ELECTROLYTE SOLUTION BOUNDARY: ELECTROCHEMICAL OXIDATION OF OH^- IONS**
A. Abu Rabi[1], S. Mentus[2], D. Jovanović[1]
[1]IChTM-Center of Catalysis and Chemical Engineering, Belgrade University, Belgrade, Serbia, [2]Faculty of Physical Chemistry, Belgrade, Serbia

P.S.B.18. **SURFACE CHEMISTRY OF DIFFERENT CARBON MATERIALS**
M. Vukčević[1], A. Udovičić[2], Z. Laušević[2], M. Laušević[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Serbia, [2]Institute of Nuclear Science Vinca, Belgrade, Serbia

P.S.B.19. **STRUCTURAL REFINEMENT OF NANO SIALON POWDER USING X-RAY DIFFRACTION DATA**
A. Šaponjić, B. Matović, J. Dukić, A. Mihajlović, S. Bošković
Vinca Institute for Nuclear Sciences, Material Department, Belgrade, Serbia

P.S.B.20. **ELECTRICAL PROPERTIES OF SINTERED ZINC-TITANATE CERAMICS**
N. Obradović[1], A. Maričić[2], N. Labus[1], M-V. Nikolić[3], V. Pavlović[4], M.M. Ristić[5]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Cacak, Cacak, Serbia, [3]Center for Multidisciplinary Studies, Belgrade, Serbia, [4]Faculty of Agriculture, University of Belgrade, Belgrade, Serbia, [5]Serbian Academy of Sciences and Arts, Belgrade, Serbia

P.S.B.21. **CHARACTERIZATION OF INSOLUBLE MONOVALENT CATION SALTS OF 12-TUNGSTOPHOSPHORIC ACID**
M. Todorović[1], U. Mioč[2], I. Holclajtner-Antunović[2], T. Čajkovski[3], D. Bajuk-Bogdanović[2]
[1]Faculty of Chemistry, Belgrade, Serbia, [2]Faculty of Physical Chemistry, Belgrade, Serbia, [3] The Vinča Institute of Nuclear Science, Belgrade, Serbia

P.S.B.22. **DETERMINATION OF THE THERMOPHYSICAL PROPERTIES OF POLYOLEFINES USING PHOTOACOUSTIC SPECTROSCOPY**

M. Popović, Z. Stojanović, S. Galović
The "Vinča" Institute of Nuclear Sciences, Belgrade, Serbia

P.S.B.23. **CATALYTIC WET PEROXIDE OXIDATIVE DEGRADATION OF VOLATILE ORGANIC COMPOUNDS ON BENTONITE BASED CATALYSTS**
P. Banković[1], Z. Mojović[1], A. Milutinović-Nikolić[1], V. Drobnjak[1], Z. Čupić[1]
[1]IChTM-Center of Catalysis and Chemical Engineering, Belgrade University, Belgrade, Serbia

P.S.B.24. **SYNTHESIS AND CHARACTERIZATION OF THE POLYACRIFLAVINE**
B. Marjanović[1], G. Ćirić-Marjanović[2], I. Juranić[3], P. Holler[4]
[1]Centrohem, Stara Pazova, Serbia, [2]Faculty of Physical Chemistry, Belgrade, Serbia, [3]Faculty of Chemistry, Belgrade, Serbia, [4]Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic

P.S.B.25. **RUBBER ELASTICITY STUDY OF POLYURETHANE NETWORKS PREPARED BY ENDLINKING OF TELECHELIC DIISOCYANATES**
J. Budinski-Simendić[1], M. Ilavsky[2,5], J. Šomvarsky[2], M. Plavšić[3], Lj. Korugic-Karasz[4], T. Dikić[1], R. Radičević[1], K. Dušek[5]
[1]University of Novi Sad, Faculty of Technology, Serbia, [2]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic, [3]Belgrade University, Faculty of Technology and Metallurgy, Serbia, [4]Department of Polymer Science and Engineering, University of Massachusetts, USA, [5]Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic

P.S.B.26. **MICROSTRUCTURE AND MICROHARDNESS IN CURRENT ANNEALED $Fe_{65.5}Cr_4Mo_4Ga_4P_{12}C_5B_{5.5}$ BULK METALLIC GLASS**
N. Mitrović[1], B. Čukić[1], B. Jordović[1], S. Roth[2], M. Stoica[3]
[1]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia, [2]IFW Dresden, Institute for Metallic Materials, Dresden, Germany, [3]LTPCM, Institut National Polytechnique de Grenoble, St-Martin-d'Heres Campus, France

P.S.B.27. **MAGNETOIMPEDANCE EFFECT IN $Fe_{89.8}Ni_{1.5}Si_{5.2}B_3C_{0.5}$ METALLIC GLASS RIBBONS**
A. Kalezić-Glišović, N. Mitrović, A. Maričić, R. Simeunović
Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia

P.S.B.28. **CORELATION BETWEEN THE CRYSTALLISATION PROCESS AND CHANGE IN THERMOELECTROMOTIVE FORCE FOR THE AMORPHOUS ALLOY $Co_{84}Fe_{5,3}Si_{8,5}B_{2,2}$**

B. Jordović, S. Randjić, V. Maričić, S. Djukić
Joint Laboratory for Advanced Materials SASA, Tehnical Faculty Čačak, Serbia

P.S.B.29. **SOME PROPERTIES OF THE GLASS TRANSITION IN THE AMORPHOUS Sb-As-S-Se-I SYSTEM**
F. Skuban, S.R. Lukić, D.M. Petrović, M. Šiljegović
Department of Physics, Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia

P.S.B.30. **THE EFFECT OF TEMPERATURE ON THE MAGNETIC PROPERTIES OF THE ELECTROCHEMICALLY OBTAINED Ni_{95} Mo_5 POWDER PRESSED AT DIFFERENT PRESSURES**
R. Simeunović[1], L. Ribić-Zelenović[2], A. Maričić[1], M. Spasojević[2]
[1]*Technical Faculty Cacak, University of Kragujevac, Serbia,* [2]*Faculty of Agronomy Cacak, University of Kragujevac, Serbia*

P.S.B.31. **THE INFLUENCE OF CURRENT DENSITY ON NICKEL AND COBALT POWDER MICROSTRUCTURE**
L. Rafailović[1], M. Spasojević[1], L. Ribić - Zelenović[1], A. Maričić[2]
[1]*Faculty of Agronomy, Čačak, University of Kragujevac, Serbia,* [2]*Technical Faculty, Čačak, University of Kragujevac, Serbia*

P.S.B.32. **THE EFFECT OF HYDROGEN ABSORPTION ON ELECTRICAL RESISTANCE OF ELECTRODEPOSITED NICKEL AND COBALT ALLOY POWDER**
M. Spasojević[1], A. Maričić[2], L. Ribić - Zelenović[1], L. Rafailović[1], N.Krstajić[3]
[1]*Faculty of Agronomy, Čačak, University of Kragujevac, Serbia,* [2]*Technical Faculty, Čačak, University of Kragujevac, Serbia,* [3]*Faculty of Technology and Metallurgy, University of Belgrade, Serbia*

P.S.B.33. **NEW CATALYSTS FOR ELECTROCHEMICAL OXYGEN EVOLUTION**
L. Ribić-Zelenović, T. Trišović, M. Spasojević
Faculty of Agronomy Cacak, University of Kragujevac, Serbia

P.S.B.34. **THE INFLUENCE OF AMOUNT OF Nd-Fe-B POWDER ON THE MECHANICAL PROPERTIES OF COMPOSITE POLYMER – MAGNETIC MEDIUM**
D. Nedeljković[1], V. Ćosović[1], V. Radojević[2], N. Talijan[1], R. Aleksić[2]
[1]*Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia,* [2]*Faculty of Technology and Metallurgy, Belgrade, Serbia*

P.S.B.35. **HEAT TREATMENT EFFECTS IN A COPPER-BASED SHAPE MEMORY ALLOY**
V. Asanović, K. Delijić, N. Jauković
Faculty of Metallurgy and Technology, Podgorica, Montenegro

P.S.B.36. LASER BEAM INDUCED STRUCTURAL CHANGES IN MULTICOMPONENT NICKEL ALLOYS

A. Milosavljević[1], S. Petronić[1], M. Srećković[2], K. Kovačević[3], S. Ostojić[4], M. Kutin[5], S. Polić-Radovanović[6], D. Djordjević[1], V. Negovanović[1], N. Mirkov[1]
[1]Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia, [2]Faculty of Electrical Engineering, University of Belgrade, Belgrade, Serbia, [3]Institute for Steel and Iron Metallurgy, Nikšić, Montenegro, [4]Faculty of Metallurgical Engineering, Belgrade, Serbia, [5]GOŠA Institute, Smederevska Palanka, Serbia, [6]Bibliographic Institute, Belgrade, Serbia

P.S.B.37. FINE-STRUCTURAL INVESTIGATIONS OF NICKEL BASED SUPERALLOYS AFTER VARIOUS HEAT TREATMENTS

A. Milosavljević[1], S. Petronić[1], K. Kovačević[2], R. Prokić-Cvetković[1], I. Nešić[1], O. Popović[1], R. Pljakić[3], U. Miličević[4]
[1]Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia, [2]Institute for Steel and Iron Metallurgy, Nikšić, Montenegro, [3]"Prva Petoletka", Trstenik, Serbia, [4]Faculty of Electrical Engineering, University of Belgrade, Belgrade, Serbia

P.S.B.38. NUMERICAL AND ANALYTICAL MODELLING OF ELASTIC-PLASTIC FRACTURE MECHANICS PARAMETERS

Lj. Milović[1], A. Sedmak[2], S. Putić[1], M. Zrilić[1]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Serbia, [2]Faculty of Mechanical Engineering, University of Belgrade, Serbia

P.S.B.39. THE INFLUENCE OF AUSTEMPERING PARAMETERS ON THE MICROSTRUCTURAL AND MECHANICAL PROPERTIES OF LOW ALLOYED Ni-Mo DUCTILE IRON

B. Bošnjak, B. Radulović
University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montenegro

P.S.B.40. THERMODYNAMICS AND PHASE EQUILIBRIA INVESTIGATION OF THE AuIn-Sb SYSTEM

D. Živković[1], L. Gomidželović[2]
[1]University of Belgrade, Technical Faculty, Bor, Serbia, [2]Copper Institute, Bor, Serbia

P.S.B.41. PREDICTING APPROACH TO Ti-Al-Mn LIQUID ALLOYS THERMODYNAMICS

A. Kostov[1], D. Živković[2]
[1]Copper Institute, Bor, Serbia, [2]University of Belgrade, Technical Faculty, Bor, Serbia

P.S.B.42. **THE ROLE OF INTERMETALLIC PHASES IN FATIGUE CRACK PROPAGATION BEHAVIOR OF Al-Zn-Mg-Cu ALLOYS**

M. Vratnica[1, a], Z. Cvijović[2, b], K. Gerić[3, c], Z. Burzić[4,d]
[1]Faculty of Metallurgy and Technology, Podgorica, Serbia, [2]Faculty of Technology and Metallurgy, Belgrade, Serbia, [3]Faculty of Technical Sciences, Novi Sad, Serbia, [4]Military Technical Institute, Belgrade, Serbia

P.S.B.43. **THEORETICAL ASSESSEMENT OF CALCIUM ARSENATES STABILITY: APPLICATION IN TREATEMENT OF ARSENIC CONTAMINATED WASTE**

S. Raičević, V. Stanić
VINCA Institute of Nuclear Sciences, Radiation and Environmental Protection Laboratory, Belgrade, Serbia

P.S.B.44. **KINETIC- SPECTROPHOTOMETRIC DETERMINATION OF TRACES OF W(VI) IN SOLUTION**

E.T. Pecev[2], B.B. Petrović[1], R.M. Simonović[1], R.J. Micić[1]
[1]Faculty of Natural Sciences and Mathematics, University of Northen Kosovo, Kosovska Mitrovica, Serbia, [2]Faculty of Natural Sciences and Mathematics, University of Nis, Serbia

P.S.B.45. **KINETIC DETERMINATION OF TRACES OF V(V) IN SOLUTION**

R.M. Simonović[1], E.T. Pecev[2], R.J. Micić[1], B.B. Petrović[1]
[1]Faculty of Natural Sciences and Mathematics, University of Northen Kosovo, Kosovska Mitrovica, Serbia, [2]Faculty of Natural Sciences and Mathematics, University of Nis, Serbia

P.S.B.46. **A MODEL OF GAMMA-RAY IRRADIATION EFFECTS IN SILICON DIOXIDE FILMS AND ON SILICON DIOXIDE - SILICON INTERFACE**

M. Odalović, D. Petković
Faculty of Science and Mathematics, University of Pristina, Kosovska Mitrovica, Serbia

POSTER SESSION III

Thursday, September 7, 2006, 20^{30}-22^{00}

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

P.S.C.1. **USE OF PHONON CONFINEMENT MODEL IN THE SIMULATION OF RAMAN SPECTRA OF NANOSTRUCTURED MATERIALS**
M. Grujić-Brojčin, M. Šćepanović, Z. Dohčević-Mitrović, Z.V. Popović
Center for Solid State Physics and New Materials, Institute of Physics, Belgrade, Serbia

P.S.C.2. **MODELING AND INVESTIGATION OF SiGe BASED MOSFET STRUCTURE TRANSPORT CHARACTERISTICS**
P.M. Lukić[1], R.M. Ramović[2], R.M. Šašić[3]
[1]*Faculty of Mechanical Engineering, University of Belgrade, Serbia,* [2]*Faculty of Electrical Engineering, University of Belgrade, Serbia,* [3]*Faculty of Tecnology and Metallurgy, University of Belgrade, Serbia*

P.S.C.3. **CONDUCTION MECHANISM BASED MODEL OF ORGANIC FIELD EFFECT TRANSISTOR STRUCTURE**
R.M. Šašić[1], P.M. Lukić[2], R.M. Ramović[3]
[1]*Faculty of Tecnology and Metallurgy, University of Belgrade, Serbia,* [2]*Faculty of Mechanical Engineering, University of Belgrade, Serbia,* [3]*Faculty of Electrical Engineering, University of Belgrade, Serbia*

P.S.C.4. **PHONON THERMODYNAMICS IN CRYSTALLINE NANOFILMS**
J.P. Šetrajčić[1], V.M. Zorić[1], S.M. Vučenović[2], D.Lj. Mirjanić[2], V.D. Sajfert[3], S.K. Jaćimovski[4], D.I. Ilić[5]
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P.S.C.5. **INFRARED AND PHOTOLUMINESCENCE STUDY OF RAPID THERMALLY ANNEALED SiO_x THIN FILMS**
A. Milutinović[1], Z. Dohčević-Mitrović[1], M. Šćepanović[1], M. Grujić-Brojčin[1], D. Nesheva[2], Z.V. Popović[1]
[1]*Institute of Physics, Centre for Solid State Physics and New Materials, Belgrade, Serbia,* [2]*Institute of Solid State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria*

P.S.C.6. **POLYANILINE NANOTUBES**
J. Stejskal, E.N. Konyushenko, M. Trchová,
Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic

P.S.C.7. **A KINETIC STUDY OF A GUEST-HOST INTERACTION INSIDE A 3-D ZINCOPHOSPHATE**
N. Rajić, S. Šajić, Dj. Stojaković
Faculty of Technology and Metallurgy, Beograd, Serbia

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V. Djoković, D. Dudić, M. Marinović-Cincović, J. M. Nedeljković
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia

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E.S. Džunuzović[1], M. Marinović-Cincović[2], K. Jeremić[1], J. Nedeljković[2]
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Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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V.V. Vodnik, A. Krklješ, J. Kuljanin, J.M. Nedeljković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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A. Krklješ, Z. Kačarević-Popović, J.M. Nedeljković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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V. Spasojević, V. Kusigerski, M. Marinović-Cincović, J.M. Nedeljković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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M.I. Čomor, N.D. Abazović, S. Zec, I. Janković
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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D. Milivojević, J. Blanuša, B. Babić-Stojić
Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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D. Matveev[1], A. Aronin[1], G. Abrosimova[1], Yu. Kabanov[1], V. Molokanov[2], O. Rybchenko[1], I. Zverkova[1]
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Z.Ž. Lazarević[1], B.D. Stojanović[2], M.R. Vasić[2], N.Ž. Romčević[1], M. Mitrić[3], M.J. Romčević[1]
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T. Brdarić[1], J. Grbović-Novaković[1], Lj. Matović[1], N. Novaković[1], S. Mentus[2]
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M. Trchová, N.V. Blinova, J. Stejskal
Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic

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

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EMAT, University of Antwerp, Antwerp, Belgium

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I. Balać[1], M. Milovančević, C.Y. Tang[2], C.P. Tsui[2], P.S. Uskoković[3], N. Ignjatović[4], D.P. Uskoković[4]
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I.M. Djordjević[1], M.V. Gordić[2], D.R. Sekulić[1], Z. Petrović[3], M.M. Stevanović[1]
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N.L. Lazić[1], J. Budinski-Simendić[2], S. Ostojić[1], M. Kićanović[1], M.B. Plavšić[3]
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D. Dudić[1], S. Mojaki[2], A.S. Luyt[2], V. Djoković[1]
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G. Marković[1], B. Radovanović[2], M. Marinović-Cincović[3]
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P.S.D.8. **DISPERSION STRENGTHENED Cu-Ti_2 COMPOSITE FOR ELECTRICAL USE PROCESSED BY MECHANICAL ALLOYING**
V. Rajković, D. Božić, M.T. Jovanović
Institute of Nuclear Sciences "Vinča", Belgrade, Serbia

P.S.D.9. **ELECTROCHEMICAL STUDY OF AN AgO/TiO_2 COMPOSITE LAYER IN ALKALINE SOLUTIONS**
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P.S.D.10. **SIMPLE MODEL FOR COMPACTION OF VERTICALLY TAPPED GRANULAR MATERIALS**
Lj. Budinski-Petković[1], I. Lončarević[1], Z.M. Jakšić[2], S.B. Vrhovac[2]
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Lj.M. Gajić-Krstajić[1], T.Lj. Trišović[2], B.M. Babić[2], Lj.M. Vračar[3], N.V. Krstajić[3]
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M.B. Plavšić[1], I. Pajić-Lijaković[1], B. Bugarski[1], N.L. Lazić[2]
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M.B. Plavšić[1], M.M. Plavšić[1], P. Putanov[2]
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M.B. Plavšić[1], N.L. Lazić[2], I. Pajić-Lijaković[1]
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K.K Andjelković[1], D. Minić[2], T.R. Todorović[1], I.Z. Živanović[3]
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P.S.E.6. **THE EFFECT OF PROCESSING PARAMETARS ON CHARACTERISTICS OF PLLA MICROSPHERES**
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S. Siler Marinkovic, S. Dimitrijevic, M. Rakin, Lj. Mojović, K. Mihajlovska
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MARROW CELLS OF BALB/C MICE GROWN IN VITRO
P. Vasiljević[1], S. Najman[2], Lj. Djordjević[1], V. Savić[2]
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P.S.E.9. **EVALUATION OF COMPOSITE BIOMATERIALS APPLICATION IN JAW BONE RECOVERY**
Z. Ajduković[1], N. Ignjatović[2], D. Petrović[3], V. Savić[4], S. Najman[4], S. Petrović[5], R. Živković[6], D. Uskoković[2]
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P.S.E.10. **RADIOPROTECTIVE ACTIVITY OF FULLERENOL $C_{60}(OH)_{24}$ ON HUMAN MALIGNANT HAEMATOPOIETIC CELL LINES E**
V. Bogdanović[1], S. Šolajić[1], G. Bogdanović[1], A. Djordjević[2]
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P.S.E.11. **FULLERENOL-POLIDENTATE LIGAND**
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P.S.E.12. **USING AN ELECTOOPTICAL LIQUID CRYSTAL MESOPHASE TO ORIENTATE AND TEST OF HUMAN ERYTHROCYTES**
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P.S.E.13. **THE INFLUENCE OF THE NETWORK FORMERS FIELD STRENGTH ON THE CRYSTALLIZATION MECHANISM OF GLASS**
M.B. Tošić[1], V.D. Živanović[1], N.S. Blagojević[2], S.R. Grujić[2], J.D. Nikolić[1]
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P.S.E.14. **SYNTHESIS AND BIOCOMPABILITY OF HYDROTHERMALY OBTAINED NANOSTRUCTURED CALCIUMHYDROXYAPATITE**

V. Jokanović[1], M.D. Dramićanin[1], Ž. Andrić[1], V. Živojinović[2], D. Marković[2]
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P.S.E.15. **CHEMICAL STABILITY STUDY OF SOME DENTAL MATERIALS IN WEAKLY ACIDIC SOLUTIONS**

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Abstracts

Oral Presentation

PL.S.I.1

ECOMATERIALS IN THE GLOBAL ECO-SOCIETY: PRESENT SITUATION AND FUTURE PROSPECTS

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The concept of environmental conscious materials, *ecomaterials*, has been proposed in Japan since 1993. In 21st century, coexistence of economic health and reduced environmental burden is essential to sustainable development of our societies. Then the concept has been dispersed and recognized in the world as contributing to a sustainable society. In particular, the *ecomaterials* are associated with; minimal health hazards, minimal harmful emissions and wastes, minimal energy requirement, maximal recycleability and minimal material resource depletion, optimal physical properties and best technical performance. Every material has the possibility to become an *ecomaterial*, if properly selected and managed. In fact adoption of *ecomaterials* such as hazards-free and high resource productivity materials has remarkably increased in Japan.

Also the research theme of sustainable society is a comprehensive tackling of global environmental issues from both science and engineering and social science perspectives, moving beyond individual elemental technologies. The research includes (1) development of indicators for the assessment of sustainable development, (2) study of methods for developing new social systems and business models for design, production, dissemination, (3) circulation of technology, products, and services with high eco-efficiency, and (4) formation of an epistemic community concerned with environmental issues. The Ecomaterials Forum Japan has proposed new material recycling social system, an advanced model for secondary materials' utilization, guidelines and criteria for products and process designs for the environment, and so on.

For examples, a sound materials' circulation system named *material leasing system* has been developed. This material leasing system is the system in which the management of the responsibility to accept end-of-life material by the material's producer gives an economic motivation. Also advanced utilization of scrap to keep a green environment and local condition on materials flow through their life-cycles should be considered in the recycling system. To tackle with the key technologies of material manufacturing and recycling in vehicles, the subjects such as disposal process system for shredder residues, utilization of mixed waste plastics, recovery of functional metals used in the developing motor vehicle and advanced utilization of aluminum secondary alloys in products.

Not only developing *ecomaterials* and *eco-products*, but also promoting the international indices for disclosing environmental information of traded materials is important, since *ecomaterials* are internationally competitive and development of *ecomaterials* is advanced. Widespread of *ecomaterials* in a free trade will reduce the environmental burden of industrial products on a global mass scale.

PL.S.I.2

CASTING HIGH-TEMPERATURE SUPERCONDUCTORS ATOMIC LAYER-BY-LAYER

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Using the 'next-generation' molecular beam epitaxy system, we have reproducibly synthesized thin films of LaSrCuO, BiSrCaCuO and BaKBiO with rms surface roughness in the range 0.2-0.5 nm. This technology has enabled fabrication of precise and uniform multilayers and superlattices, some of which contain barriers or HTS layers that are just one-unit-cell thick and yet have no pinholes over macroscopic areas. In turn, such heterostructures enable novel experiments that probe into the basic physics of HTS.[1-4]

In this talk, we will report on our most recent results with such cuprate and bismuthate heterostructures, including XRD, AFM, RHEED, TOF-ISARS, LEEM, high-resolution TEM, transport, Hall effect, high magnetic fields (33 T), photo-induced absorption spectroscopy, photoconductivity, and resonant (synchrotron) X-ray scattering. We will also report on atomic-layer synthesis of "artificial" (i.e., metastable) superconductors with high-T_c (above liquid nitrogen temperature).

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This work has been done in collaboration with G. Logvenov, V. Butko, A. Gozar, A. Bollinger, Y. Zhu, J. He, P. Sutter (BNL); N. Bozovic(SJSU), P. Abbamonte (UIUC); G. Boebinger, S. Riggs (NHFML); F. Balakirev (LANL); S. Djordevic (Akron), and J. Clahyhold (Miami U.)

PL.S.I.3

NUMERICAL MODELING OF RF MAGNETRON SPUTTERING WITH METALLIC OR DIELECTRIC TARGET

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A comparative study of radio-frequency magnetron plasmas between metallic and dielectric target for film deposition has been performed by using an extended VicAddress consisting of PIC/MC model and the RCT model. We discuss the plasma structure and the transport of sputtered particles in Ar at 5 mTorr driven at 13.56 MHz with the amplitude of 200 V. The maintenance of the RF magnetron plasma in the dielectric target is quite different from that in the metallic due to a radial non-uniformity of the sheath structure caused by a local charging on the surface. The erosion profile estimated by the ion velocity distribution and the sputtering yield shows a marked difference between both of targets. Anomalous erosion with double peaks on the dielectric target is consistent with the experimental result.

PL.S.I.4

OPTICAL PROPERTIES OF InAs/AlAs SELF-ASSEMBLED QUANTUM DOTS

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General optical properties of self-assembled semiconductor quantum dots (QD) are reviewed, with special emphasis in the system formed by InAs QD with AlAs barriers. The dots are formed by self-organization of an InAs layer of thickness ranging from 1.4 to 1.9 monolayers grown by molecular-beam epitaxy between layers of AlAs. The average size and density of the dots varies across the sample, to allow a systematic study as a function of quantum confinement and coupling. Single dot photoluminescence (PL) emission is observed at high energies (1.6-1.8 eV) compared to InAs/GaAs QD. At even higher energies, a continuum emission is observed due to transitions involving electron extended states of the X conduction band of AlAs. Spectral broadening and excitation intensity dependence allow the assignment emission peaks to individual dots. The exciton and bi-exciton lines exhibit a fine-structure splitting due to the asymmetric exchange energy, resulting in the emission of linearly counter-polarized doublets. The study of these doublets as a function of the emission energy reveals a systematic dependence of electron interactions on dot size, in a similar way than in InAs/GaAs QD. However, both the biexciton binding energy and the fine structure splitting are essentially larger for AlAs barriers due to the increased confinement. Photoluminescence excitation (PLE) measurements reveal the spectrum of excited states of the QD. In some cases, clear PLE peaks evenly spaced at fixed energy intervals indicate a strong polaronic coupling inside the dots. From them, a characteristic phonon energy around 30 meV can be inferred for a single QD. Our results are discussed in the frame of the existing relevant knowledge of the optical properties and applications (present and future) of semiconductor self-assembled quantum dots.

PL.S.I.5

THE FORMATION OF CHRYSOTILE NANOTUBES UNDER HYDROTHERMAL CONDITIONS

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Recently the synthesis of one dimensional nanostructures such as nanotubes, nanobelts, nanowires and nanoneedles has received much attention within the materials science community. These structures are seen as potentially applicable in future attempts to construct various nanodevices. A significant amount of the literature on the subject deals with synthesizing new functional nanostructures but lacks the insight into the formation mechanisms of such structures. For this reason we decided to study the formation of chrysotile-$Mg_3[Si_2O_5](OH)_4$ nanotubes under hydrothermal conditions. Chrysotile is a serpentine-group mineral which forms curled single crystals in the natural hydrothermal environments due to the mismatch of the lateral dimensions between Mg and Si layers. We found that hydrothermal environment first leads to the formation of sheet-like nanoparticles based on bilayer chrysotile crystal structure, which subsequently grow and tend to curl upon exceeding a certain threshold size. Thus formed nanotubules grow only in the direction parallel to the tube axis. The influence of hydrothermal reaction parameters such as pH and temperature on the formation and morphology of chrysotile nanotubes will be discussed.

O.S.A.1

INTEGRATION OF TOP-DOWN AND BOTTOM-UP METHODS: GENERATING TEMPLATES FOR NANOWIRE DEVICES

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Self-assembly of block co-polymer systems can potentially realize spatially controlled nanostructure arrays with feature sizes rivaling state-of-the-art photolithography. However, the application of these self-assembled constructs to develop nano-circuitry with high level reproducibility on the macroscopic scale so as to provide device structures across a 300 mm wafer remains distant. However, the combination of photolithography and self-assembly might be used to generate such architectures with sub-20 nm (i.e. beyond the lithography limit) feature sizes. By constraining block co-polymers within narrow channels on a substrate extremely well-defined periodic patterns can be prepared. The feature sizes can be controlled accurately using block size. Selective removal of one of the component blocks can provide 'templates' to generate nanowire arrays. This work focuses on generating nm-size features across a real substrate. We use state of the art lithography to generate sub-μm features and within these generate nm sized co-polymer arrays. Spatial control is determined only by the block size of the co-polymers and not processing variables. Selective 'etching' and phase enhancement techniques were used to provide depth variations across the substrate and form the 'template' for nanowire development. The results of sputtering and electrochemical deposition used to fill the templates are outlined. The results demonstrate an exciting nanofabrication technique for creating high density nanowire arrays for the nanoelectronic industry.

O.S.A.2

PROCESSING OF NANOSTRUCTURED MATERIALS THROUGH METASTABLE TRANSFORMATION

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The European STREP project NAMAMET "Processing of NAnostructured MAterials through MEtastable Transformation", contract n. NMP3–CT–2004–001470, is under execution coordinated by Politecnico di Torino, Dip. Scienza dei Materiali e Ingegneria Chimica.

The basic idea proposed by the project is the use of metastable processing through plasma spray and combustion process for the synthesis of a broad class of nanostructured materials.

The synthesis is obtained by means of high temperature processes like Air Plasma Spray (APS) and Self-propagating High-temperature Synthesis (SHS), followed by rapid quenching in order to achieve metastability.

The systems under investigation have been selected for their strategic importance among the materials for advanced technological applications. In fact the Al_2O_3–TiO_2 and ZrO_2–Al_2O_3 systems are highly representative for the class of ceramic materials for *engineering applications*. The TiC–TiB_2 system is representative for the class of ceramics for *wear/abrasion resistant applications*. The Ti–Al_2O_3 system represents the most interesting class of *metal-ceramic composites* at industrial level. $NbAl_3$ is an intermetallic with potential engineering applications in *aircraft and land turbines* and was recently synthesised through processes investigated in the present project. Finally, Ni–Ti SMAs were produced too by means of techniques tested in the project and present very interesting potentiality in *advanced applications* as smart materials and medical devices.

The International Consortium in charge of the project is constituted by Universities, Research Centres and Small Medium Enterprises (SMEs). The Universities are from Italy Politecnico di Torino, Università di Cagliari, Dip. Ingegneria Chimica e Materiali, from Spain Universitat de Barcelona, from France Université de Technologie de Belfort Montbéliard, from Germany Technical University of Darmstadt and from United Kingdom University of Hertfordshire. The Research Centres are from Italy Istituto Superiore Mario Boella and Consiglio Nazionale delle Ricerche, Istituto per l'Energetica e le Interfasi, from Spain Consejo Superior de Investigaciones Cientificas, Instituto de Ceramica y Viario, from Portugal Instituto Nacional de Engenharia, Tecnologia e Innovaçao, from France Centre National de la Recherche Scientifique, Nanomaterials Research Group and from Poland Institute of Metal Cutting. The SMEs are from Spain Talleres Mecanicos Comas SA and from Portugal Tecnologia e Engenharia de Materiais SA.

The project started in August 2004.

The achieved results will be reported and discussed.

O.S.A.3

ELECTROCHEMISTRY AND DYNAMIC IONOGRAPHY OF SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS

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Self-propagating high temperature synthesis (SHS) is based on a heterogeneous combustion of condensed reagents that involves a chemical reaction with heat transfer from hot spots of the system to its cold spots. SHS is a complex phenomenon involving many different physical and chemical stages, whose role is still not clearly understood. A synthesis in the heterogeneous combustion regime passes through the chemical interaction of ions of origin reagents and can be characterized by the electromagnetic force (EMF) of combustion. The study of response of the process to external non-contact actions (including electrical and magnetic fields) is a powerful method into determining the reaction pathway and may lead to new ways of improving SHS products. External electrical fields modify combustion parameters of the SHS systems (inclusive of EMF). It may be via the transformation and displacement of the concentration cell relative to the zone of maximal heat evolution by virtue of changes in the concentration of active ions and the heat loss. Applied non-contact electric field influenced the phase composition and microstructure of SHS prepared materials. The magnetic characteristics of ferrite materials depend both on the intensity and polarity of the applied field. As a separate and very important part of experimental research the dynamic of solid oxidizers (such as peroxides, perchlorates etc.) decomposition under conditions of applied electric fields were also discussed. All the produced results have promoted the prerequisites of independent new directions in combustion and materials science – electrochemistry of combustion, ionic chemistry of combustion, and dynamic ionography of heterogeneous combustion processes. By using the dynamic iconography, sources of ionization of various reactionary mixes are identified. The maximal values of EMF, corresponding thermo diffused streams of cations and anions of different chemical elements in the reacting SHS systems was determined. The main stages of chemical interaction in SHS processes were analyzed. Reactions in the powdered mixtures containing solid oxidizers (such as alkaline or alkaline-earth metals) with Cr, B, Fe, Ti and its oxides were studied. A linear dependence of the EMF on the well-known ionic radius values of alkaline and alkaline-earth metals are established. For SHS with participation of chemical elements from the different groups of Periodic Table a linear dependence of EMF from its ionic potential takes place. The fundamental reasons of the observable phenomena and some aspects of its practical applications were also discussed. Authors thank the Russian Foundation of Basic Researches and Royal Society of Chemistry (RSC Journals Grant) for financial support.

O.S.A.4

BA-HEXAFERRITE NANOPARTICLES PREPARED BY HYDROTHERMAL SYNTHESIS

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Nanoparticles of barium hexaferrite of monodomain size with an average size of 50 nm were prepared by a hydrothermal route at temperature around 300 ^{o}C. The hydrothermal synthesis was optimized using a controlled hydrothermal process. During optimization of the hydrothermal synthesis the LaMer-Dinger principle was applied and the Ostwald Ripening process was considered. In order to mitigate the Ostwald ripening large organic molecules were used during the crystallization and growth of Ba-hexaferrite nanoparticles. The precursor compositions was varied by changing the $Ba(OH)_2$ / γ-Fe_2O_3 ratio.

O.S.A.5

PULSE PLASMA PROCESSING IN CARBON CONTAINING ATMOSPHERE FOR POSSIBLE SURFACE TREATMENT OF WIND TURBINE STEEL COMPONENTS

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The gears in wind turbine gearbox are exposed to severe working conditions including high mechanical stresses, alternative load, surface wear and corrosion and during the operation they can be source of high sound level witch influences the environment. We propose a new pulse plasma surface treatment consisting of plasma nitriding and subsequent plasma post nitrocarburizing or post oxidation process, which improves the fatigue resistance, wear resistance and corrosion resistance and contributes to the lowering of weighted acoustic level. The samples made of steel grades AISI C 1045, 4140 and H 11 were pulse plasma nitrided and plasma post-nitrocarburized or post oxidized. The Vickers's method was used for surface microhardness and depth profiling measurements, while the microstructure and surface zone morphology were examined by the optical microscopy and SEM. The surface zone phase analysis was performed by XRD method while the ball-grinding technique was used to measure the compound zone thickness. It was demonstrated that a low friction, chemically stable single-phase magnetite superficial layer can be formed by plasma post-oxidation of various steel grade substrates in the same batch. The post treatment in carbon containing atmosphere resulted in formation of a surface layer with gradually increased carbon content. Raman and IR spectra revealed the presence of an amorphous carbon based layer, while the formation of the cementite phase was found by XRD analyses. The surface layer composition was obtained by GDS analysis. The corrosion test revealed the enhanced corrosion resistance of postoxidized samples, while the running engine test with pulse plasma treated timing gears demonstrated the decrease of noise emission.

O.S.A.6

TRIBOLOGICAL BEHAVIOR OF CHROMIUM OXIDE PLASMA SPRAYED COATING ON MILD STEEL

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For some applications such as aircraft, automotive generating, pulp and paper, chemical and other industries, thermal-sprayed ceramic, metallic and cermet coatings are considered to be more suitable than conventional materials as they possesses favourable thermal and frictional properties. Among these thermal-sprayed coatings, chromium oxide based materials have been used to improve the scuff resistance and decrease the coefficient of sliding friction between various elements in contact. In the present paper we report on the surface microstructure and the tribological behavior of plasma-sprayed chromium oxide coating on steel substrate. Coatings were produced by using fully-automated atmospheric thermal spraying (APS) equipment. The morphology and the microstructure of the coating was studied using surface profilometry, X-ray phase analysis, microhardness testing as well as optical and scanning electron microscopy. The mechanical behavior of the composite coated-steel specimens was also examined. For the evaluation of friction and wear characteristics sliding friction tests were performed on a state-of-the-art pin-on-disc apparatus. Three different test loads were used in order to examine the influence of contact stress on tribological behavior. From the experimental data obtained plots of the variation of coefficient of friction and of the wear rate with time were constructed. The variation of mean coefficient of friction with applied load was also monitored. Tribological testing was also supported by metallography for the identification of wear mechanisms. It was verified that the dominant wear mechanism is abrasion; however, a superimposed mechanism based on microcracking is possible under certain conditions. Results obtained during present investigation were compared with results concerning chromium carbide plasma-sprayed coatings and similarities and differences in tribological behavior were identified.

O.S.A.7

COMPARISON BETWEEN DIFFERENT $LiFePO_4$ SYNTHESIS ROUTES

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Olivine-type lithium iron phosphate ($LiFePO_4$) powders were synthesized under three different methods: solid state reaction at high temperature, ultrasonic spray pyrolysis, and sonochemical activation. The samples were characterized by X-ray powder diffraction (XRPD). Particle morphologies of the obtained powders were determined by scanning electron microscopy (SEM). It was indicated that structural and microstructural parameters of this material were very dependably on synthesis condition. We present here the results obtained upon optimization of each procedure for designing this cathode material.

O.S.A.8

LOW-TEMPERATURE SYNTHETIC ROUTE FOR CARBIDE POWDER PREPARATION FROM BORIC ACID – CITRIC ACID GEL PRECURSOR

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Boron carbide powder was synthesized by sol-gel polycondensation of boric acid and citric acid. The starting materials were dissolved in water and mixed homogeneously until the formation of a precomposite gel, which was converted into cryogels after freeze-drying. Pyrolysing and subsequent heat treatment of these cryogel, that after decomposition results in boron carbide material. Characterization by nitrogen adsorption showed that precomposite cryogels and the composite powders were micro and mesoporous materials with high surface areas. The obtained materials have been analyzed by means of X-ray diffraction and electron microscopy. The results show that obtained boron carbide powder is composed of near equiaxed particles of narrow size distribution.

O.S.A.9

PRODUCTION OF TITANIUM ALUMINIDES VIA REACTION BETWEEN TiO_2-Al-Ca

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Titanium aluminide intermetallic compounds are a new class of aerospace materials with unique thermal properties. This paper describes the production of titanium aluminide intermetallic compounds via reaction in TiO_2-Al-Ca system. Based on results, the non-completed reaction in TiO_2, Al and Ca raw materials in a special reaction vessel results in the production of granulates of titanium aluminides, specially Ti_3Al as the metallic product and specially $Ca_{12}Al_{14}O_{33}$ as the non-metallic product. Microstructure of metallic product was porous and comprised of three different phases: matrix phase was Ti_3Al and precipitations were Ti and Al phase.

In this study, characterization of product was carried out by XRD and XRF and the microscopic study by the optical and scanning electron microscopy equipped with EDX.

O.S.A.10

MICROSTRUCTURAL PROPERTIES OF PZT THIN FILMS DEPOSITED ON $LaNiO_3$-COATED SUBSTRATES

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The modified polymeric precursor method (Pechini method) was successfully used for preparation of ferroelectric Pb $(Zr_{0.52}Ti_{0.48})O_3$ (PZT) thin films. Films were deposited on $LaNiO_3$ (LNO) – coated silicon (1 0 0) and platinum substrates (Pt (1 1 1)/Ti/SiO_2/Si) by spin coating technique. LNO electrodes were also prepared from citrate precursors and treated under different thermal treatment conditions to obtain films with different structural and microstructural properties. Investigation of PZT films microstructure was performed as a function of orientation and morphology of bottom LNO electrode. Grain size and morphology were analyzed by SEM and AFM, while the quality and orientation of PZT films were determined by XRD analysis. Conclusions about optimum properties of LNO electrodes were derived based on results of PZT characterization.

O.S.A.11

SYNTHESIS OF $LaMnO_3$ POWDERS FROM CITRATE PRECURSORS

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Pure and doped lanthanum manganites (LMO) are of technological importance mainly because of high electronic conductivity and colossal magnetoresistance. Among different methods for preparation of LMO, chemical solution-based methods showed numerous advantages, such as an easy control of stoichiometry and low cost. In this work LMO was prepared using a modified Pechini method from lanthanum and manganese citrates. Lanthanum citrate was prepared starting from La_2O_3, while manganese citrate was prepared from $Mn(NO_3)_2$. The valence state of manganese ions was controlled by adjusting pH value of the solution and confirmed by EPR and UV/VIS analysis. The thermal treatment conditions for preparation of LMO powders were determined from DT analysis of dried precursors. XRD results confirmed that pure LMO was successfully prepared. Particle size and morphology of LMO were investigated by SEM.

O.S.A.12

ENCAPSULATION OF THE ASCORBIC ACID IN DLPLG NANOSPHERES

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Poly (lactide-co-glycolide) (DLPLG) is very popular copolymer used for various medicinal, pharmaceutical, industrial and other purposes. The most attractive application of this copolymer is in medicine and pharmacy because it is very suitable for controlled delivery of medicaments. DLPLG nanospheres could be a viable vehicle for transdermal medicine delivery. In this paper we are describing new method of obtaining the system for targeted and controlled delivery of the ascorbic acid in the body. Ascorbic acid acts as a reductant for many free radicals, thereby minimising the damage caused by oxidative stress which is a root cause of, or at least associated with, many diseases. Copolymer DLPLG powder is produced using new chemical method with solvent/non-solvent systems where obtained solutions were centrifuged. The obtained DLPLG powder is non-agglomerated, spherical and with particles sizes in the submicron scale. The encapsulation of the ascorbic acid in the polymer matrix is performed in two ways in parallel; standard method of homogenisation of water and organic phases, and dry encapsulation by direct addition of powdered vitamin in the polymer solution. The samples were characterized by Infrared Spectroscopy (IR), Differential Scanning Calorimetry (DSC) and Scanning Electron Microscopy (SEM).

O.S.A.13

PREPARATION OF BASALT GLASS AND BASALT – BASE CASTINGS

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The possibilities of applying conventional raw materials, massive basalt from two localities, Vrelo and Donje Jarinje on Kopaonik Mountain for production of cast basalt, was investigated in this paper. From the geological point of view, locality Vrelo has very heterogeneous structure. Mainly, it consists of olivine basalts, which base mass is made of plagioclase, pyroxene and glassy phase. Locality Donje Jarinje contains andesite basalt which mineralogical composite is made of fenocristaline andesite and basic plagioclase in microcrystalline porphyry base. Solidification of basalt melt was tested in various conditions and we studied the dependence between glassy phase content in basalt castings and cooling speed or other parameters of technological process. Both, mechanical properties and structures of cast basalt was determined. Based on experimental results, technological treatment of industrial production of basalt castings was proposed.

PL.S.II.1

A NEW ASPECT IN THE COMPUTATIONAL NANOMATERIAL SCIENCE: ODD ELECTRONS IN MOLECULAR CHEMISTRY, SURFACE SCIENCE, AND SOLID STATE MAGNETISM

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A peculiar aspect of nanomaterial science concerns a common essence joining topics that seem absolutely different at first glance. This is resulted form a vital necessity to consider the main aspects of the problems at the atomic level. Thus, three topics mentioned above, namely, their historical evolution, the language, which implies sets of characteristic terms in use, original theoretical grounds, etc. are quite different. If radicals are well accepted characteristics of the molecular chemistry, dangling bonds and magnetic electrons are typical terms for the surface science and magnetism. However, actually, all the features are of the same origin and are connected with *odd electrons* of atoms which form either molecules or surfaces and magnetic solids. The term stands from the difference between the number of the atom valence electrons and that one of the neighboring atoms coupled to the considered one.

Historically, theoretical approaches to the phenomena have been developed in the different ways. Thus, the quantum theory of bonding forms the grounds for the molecular chemistry. At the same time, widely accepted a defect-state approach to surfaces on the basis of the bulk solid state physics is mainly used in the surface science. Particular theoretical approaches concentrated on the exchange and superexchange interaction of electrons are characteristic for the solid state magnetism consideration. However, if the same origin of the events is taken into account, one can suggest an unified theoretical and/or computational approach to all the phenomena making possible their consideration on the same conceptual basis as well as on the same computational footing. The current paper presents the spin-dependent Hartree-Fock SCF approach application to the chemistry of fullerenes, surface science of silicon crystal as well as to the molecular magnetism of both solid polymerized fullerenes and molecular crystals composed of transitional metal complexes.

PL.S.II.2

EXCHANGE BIAS IN MAGNETIC CORE/SHELL NANOPARTICLES

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In spite of its first report in the 50's by Meiklejohn and Bean, exchange bias (EB) effects in nanoparticle systems are still an active subject of research because of its technological application. Shifts of the hysteresis loops after field cooling, similar to what is observed in layered structures, have been experimentally observed in ferromagnetic particle systems having either oxide shells or coupled to antiferromagnetic (AF) environments but, in this case, interpretation of the results is usually hindered by collective and surface effects. In this talk, we will review the peculiar magnetic properties associated to the exchange coupling between the core and shell of the nanoparticles and to finite-size and surface effects [1]. After a presenting the main theoretical models proposed to explain the origin of EB, we will present the results of Monte Carlo simulations of the magnetic properties of a model for a single nanoparticle consisting in a ferromagnetic core and an oxidized surface layer [2] with the aim to clarify what is the microscopic origin responsible for the experimentally observed EB. The results of the simulations show how some of the phenomenology is related to the exchange coupling at the core/shell interface and prove that the existence of a net magnetization at the core/shell interface is responsible for the bias of the loops. The results are in agreement with recently reported experimental results on oxidized nanoparticle systems and ferromagnetic particles embedded in an oxide matrix.

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PL.S.II.3

HIGH EFFICIENCY OF LUTETIUM SILICATE SCINTILLATORS, Ce-DOPED LPS AND LYSO CRYSTALS FOR MEDICAL APPLICATIONS

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A number of cerium doped silicate based scintillators have been developed in the last ten years. These materials exhibit desirable qualities for high energy radiation detection: high density, scintillation decay times shorter than 100 ns and high light output, exceeding that of BGO ($Bi_4Ge_3O_{12}$), which is still commonly used for gamma-rays detection.

The interest in scintillators arises in various fields: (i) for medical applications, in the second generation of positron emission tomography (PET) to replace BGO, or for X-rays scanning. (ii) for security purpose (luggage control for instance) as well as for (iii) oil well logging. Of course the scintillators materials are also developed for high energy physics applications (in CERN-Geneva for the LHC experiment for instance).

In the present work we concentrate our interest on the investigation of new materials for medical imaging (in CT scan and PET devices).

We have introduced recently two new scintillators. The cerium doped lutetium pyrosilicate $Lu_2Si_2O_7$ (Ce: LPS) presents a high light output (average value: 26,300 ph/MeV), a relatively good energy resolution (10%) and a fast decay time (38 ns). We compare its properties to those of another recently developed cerium doped lutetium based silicate, Ce: $Lu_{2(1-x)}Y_{2x}SiO_5$ (LYSO).

At the conference we will review the state of the art in scintillation materials for medical applications. For the materials investigated in our research groups, both scintillators display quite comparable behaviours in terms of light output and energy resolution. LYSO: Ce keeps advantages thanks to a high crystalline quality. However, LPS has minimal afterglow and promising high-temperature luminescence efficiency, which can be used to develop new material for oil-well logging.

PL.S.II.4

PHOTOPHYSICS OF FULLERENE-DOPED NANOSTRUCTURES: OPTICAL LIMITING, HOLOGRAM RECORDING AND SWITCHING OF LASER BEAM

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The fullerene-doping effect on spectral, nonlinear optical properties, and dynamic parameters of conjugated organic systems based on pyridine, polyimide, polyaniline, liquid crystal, etc. has been studied. A fullerene introduction in these materials has been used due to high electron affinity of fullerenes that allows the intermolecular donor-acceptor interaction to be reinforced. The new charge transfer complex provokes new nanostructures potentials such as nonlinear transmission, laser-induced change in the refractive index, self-organization [1,2]. The application of the nanostructures studied in laser technique, display and medicine has been discussed.

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PL.S.II.5

NANOPARTICLES GENERATION IN CdSSe DOPED SILICA GLASS

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During the last decade, semiconductor nanoparticles in glass matrix have attracted much attention due to their potential application in optics. This work will focuses in the nanoparticles generation in CdSSe doped silica glass using an original technique based on a combined application of annealing and ultraviolet laser treatments. The heat treatments are conducted few tenths of degrees under the crystallization temperature and the additional energy is provided by a UV laser. This technique leads to well defined nanoparticles localization and controlling grown. Local and structural modifications are investigated using spectroscopic measurements techniques: absorption, luminescence and Raman scattering.

O.S.B.1

HIGH SURFACE AND HIGH NANOPOROSITY BORON NITRIDE ADAPTED TO HYDROGEN SEQUESTRATION.

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Many papers have been devoted to carbon nano structured compounds and a great interest had been focussed ten years ago the high possibility of storage of hydrogen in and out side carbon SWNT or MWNT (1). Unfortunately, the progresses in the researches relative to these compounds have not confirmed the promising results claimed (2). However a potential application remains for MWNT or high porosity carbon powders (3) in the field of cryotransportation of hydrogen. Boron nitride, BN, is an artificial ceramic whose structure is much closed to the graphite one. If the layer structure of the two phases is comparable, the symmetry of the electronic doublet existing in the graphite hexagons is more located on the nitrogen atom in BN opening vacant orbital on the boron atom. Another important difference is in the stacking of the BN layers. In graphite, the layers are shifted from half a hexagon motive while in BN the layers are just superposed with a BNB change. This structure induces narrow channels in the superposed hexagons. From these two different structures differences in the low temperature hydrogen absorption could be expected. If a large scale production of SWNT or MWNT of BN is difficult (4), high surface area powders have been described and prepared since a couple of year (5). The surface area has been found to be the annealing temperature dependant. The surface area of a low temperature prepared sample (1000 °C and 1000 $m^2.g^{-1}$) is drastically lowered, down to 300 $m^2.g^{-1}$, after annealing at 1800 °C. This lowering affects essentially the nanopores which could be the most interesting to trap hydrogen molecules (about 0.41 nm diameter). Several molecular precursors have been used. The best results in surface area term was obtained with polyborazylene prepared from borazine thermolysis. Currently surface area of more than 800 $m^2.g^{-1}$ could be obtained with an important nanoporosity. Several samples have been prepared in several gram amount. In order to facilitate the molecular hydrogen adsorption, noble metals have been deposited, on the more stable powders in about 1 to 5 wt.%. These high surface area BN powders are actually tested in order to make a comparison between the behaviour of the boron nitride powders and the nanocarbon structures.

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O.S.B.2

CHARACTERIZATION OF NEW COMPOUNDS FROM THE $RM_3(BO_3)_4$ FAMILY BY OPTICAL SPECTROSCOPY METHODS

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Borates with general formula $RM_3(BO_3)_4$, where R stands for a rare earth (RE) or yttrium and M = Al, Ga, Fe, or Sc, crystallize in the huntite type non centrosymmetric trigonal structure. Aluminates from this family combine good luminescent and nonlinear optical properties with excellent physical characteristics and chemical stability. Nd and, to a less degree, Yb containing alumoborates were widely investigated and used in self-frequency doubling and self-frequency summing lasers. Concentrated $NdAl_3(BO_3)_4$ crystals are efficient media for minilasers. Elaboration of growth technologies and study of new materials from the title family is currently in progress. Recently, single crystals of the whole series of RE iron borates have been grown. Borates with magnetic M ions have interesting new properties and promising new application potential. In this talk, I'll briefly review a spectroscopic research of RE iron borates carried out in my group in cooperation with the University of Groningen (the Netherlands), the Kazan' University (Russia), and the Laboratoire de Chimie Appliquée de l'Etat Solide, ENSCP (Paris, France). The crystals of good optical quality have been grown in the L.V. Kirensky Institute of Physics (Krasnoyarsk, Russia). The spectroscopic methods used were temperature-dependent high-resolution absorption Fourier spectroscopy, crystal-field calculations, and Raman scattering. Raman spectra evidence the weak first-order structural phase transition in $RFe_3(BO_3)_4$, R = Gd, Tb, Y, and Er, at T_s = 156 [1], 198, 345, and 340 K, respectively. $NdFe_3(BO_3)_4$ does not change its structure down to the lowest temperature used (3 K). We were able to identify the structure above (below) T_s as R32 ($P3_121$). Peculiarities of both structures are discussed. Positions of Stark levels in the energy interval between 2000 and 20000 cm^{-1} for R^{3+} ions, R = Nd, Tb, and Er, in the crystal field of $RFe_3(BO_3)_4$ have been determined from optical absorption spectra. Crystal-field calculations using the exchange-charge model revealed the crystal-field parameters for R^{3+} in both R32 and $P3_121$ phases. 3D magnetic ordering of Fe spins has been detected in all the above mentioned compounds (at T_N 36-40K) by the exchange splittings of R^{3+} (or Er^{3+} introduced as a probe) spectral lines [1-3]. The erbium spectroscopic probe method on single crystals of the Gd, Y, Er, and Tb iron borates enabled also to determine the magnetic structures of these compounds [3]. We show that the ground-state magnetic anisotropy of the R^{3+} ion plays a key role in establishing a particular magnetic structure. First results on several $RCr_3(BO_3)_4$ compounds are presented.

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O.S.B.3

NEGATIVE REFRACTION AND LEFT-HANDEDNESS IN 2D ARCHIMEDEAN LATTICE PHOTONIC CRYSTALS

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Study of the refraction and rightness effects in 2D Archemedean lattice photonic crystals is presented. A special emphasis is placed on possibilities of negative refraction and left-handedness in these structures. Beside the familiar Archimedean lattices like square, triangular, honeycomb and Kagome´ lattices, we consider also the less known 3^2,4,3,4 and 3,4,6,4 structures. This involves the calculations of band structures, band-gap maps, equifrequency contours, FDTD simulations of electromagnetic propagation through the structures as well as an experimental verification of negative refraction at microwaves.

O.S.B.4

DESIGN CONSIDERATIONS FOR NONMAGNETIC SEMICONDUCTOR- BASED SPIN FILTERS

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In this paper we have analyzed the possibility of enhancing spin-polarization performance of conventional nonmagnetic semiconductor heterostructures which rely on the resonant tunneling mechanism. Both, the bulk inversion asymmetry (BIA) and the structural inversion asymmetry (SIA) effects are taken into account in the presented model. The aim is to engineer nanostructures with maximal degree of spin separation in the tunneling electrons current, which might be useful in studying various spin-related phenomena in semiconductor materials. Spin-polarization status of the current, in the devices under consideration, should be controllable by moderate emitter-collector voltages. Additionally, the spin orbit-interactions (Rashba and Dresselhaus terms originating from SIA and BIA, respectively) are studied under the influence of an external perpendicular magnetic field, which leads to mixing of spin-up and spin-down states of neighbouring Landau levels. The prospects of efficient spin-filtering in these conditions are investigated as well.

O.S.B.5

THE ACTIVITY OF IRON-CONTAINING ZEOLITIC MATERIALS FOR THE CATALYTIC OXIDATION IN AQUEOUS SOLUTIONS

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The use of solid catalysts for selective oxidation of organic compounds, preferably at near ambient conditions and using clean oxidants like O_2 or H_2O_2, is a research area of great environmental and industrial importance. Due to their excellent characteristics zeolitic materials are recognized as the promising catalysts for the pollutants oxidation. They are also established as environmentally friendly materials. The incorporation of transition elements into framework positions of high silica zeolites and silicates has attracted much interest because it provides a novel ways for obtaining high dispersion of these elements within the zeolite structure. The iron ions are active in oxidation reactions in homogeneous as well as in heterogeneous catalysis. Their activity in solid phase depends on coordination of iron in the particular structure. In this work a series of iron-containing zeolitic materials, prepared by different procedures, have been tested as heterogeneous catalysts for the oxidation of the cationic dye methylene blue and phenolic solutions with H_2O_2 under mild conditions. For the purpose of comparison, Fe-AlPO, Fe-BEA and Fe-ZSM-5 zeolites, synthesized through hydrothermal crystallization of basic hydrogels and Fe/NaY and Fe/ZSM-5 materials prepared by an ion-exchange procedure, were tested. The catalytic performance of these materials has been evaluated on the basis of the leaching degree of iron species into the aqueous solutions as well as on the basis of their activity for phenol removal and total organic carbon (TOC) removal. Ion-exchanged zeolites, containing the iron ions with tetrahedral coordination, show higher activity for oxidation reactions. Zeolites where the iron ions are incorporated into the framework, with octahedral coordination, show lower leaching degree of iron species, i.e. show higher stability for leaching of iron species.

O.S.B.6

ADSORPTION POSSIBILITIES OF ZSM-5 ZEOLITES TOWARD ATMOSPHERIC AND WATER POLLUTANTS

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Zeolites are extensively used in chemical industry as catalysts and for gas separations [1-3]; these applications are related with their adsorption capabilities. Therefore, a widespread work has been done in studying the adsorption of many different adsorbates on molecular sieves. Special attention was paid to the adsorption on MFI type zeolites (ZSM-5 and silicalite) because of their shape selective properties. ZSM-5 is a medium-pore zeolite which contains straight parallel channels interconnected by zig-zag channels, each made of 10-membered oxygen rings, with a free aperture of both channels of about 0.6 nm [4]. In these systems, catalytic reactions involving NO_x have been investigated [2]. Besides, the adsorption of light alkanes on MFI structure has been studied with a particular intention to determine the amount of adsorbed gas and the locations of adsorbed molecules within the internal pore structure. For those purposes, different techniques such as: calorimetric and adsorption measurements, temperature programmed desorption, NMR, FT-Raman or neutron scattering spectroscopy, have been applied.

In this work we report the results concerning the adsorption of different molecules on ZSM-5 zeolites, containing different charge-balancing cations, at the near-room temperatures. ZSM-5 (Si/Al = 20) zeolite was home synthesized, ion-exchange method for metal incorporation into the structure has been applied. The samples are fully characterized using XRD, NMR and UV-VIS spectroscopies of solid state, and temperature programmed reduction (TPR) performed in 5%H_2/Ar stream. Specific areas were determined by N_2 adsorption and calculated using BET equation. The acidic character of the active sites was estimated by microcalorimetry of ammonia. The adsorption/desorption of N_2O, CO and n-hexane from the gas-phase was investigated at 303 K, using microcalorimetry, temperature-programmed desorption and FTIR spectroscopy. The heats of adsorption were measured in a heat-flow calorimeter of the Tian-Calvet type (C80 from Setaram), linked to a glass volumetric line. Both thermal effects and volumetric isotherms were detected. In addition, the adsorption of aqueous solutions of nicotine and phenol has been investigated at 308 K on the same samples; using calorimetry (Titrys from Setaram).

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O.S.B.7

STRUCTURAL INVESTIGATION OF Ba^{2+} AND Sr^{2+} DIPHYLLOSILICATE DOPED WITH Yb^{3+} IONS

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Glasses and crystal phases doped with rare earth ions are interesting materials for various applications, for example in telecommunication systems, optical amplifiers or for solid state lasers. Among other materials, $BaMgAl_{10}O_{17}$ doped with Eu^{2+} ions is used for plasma display panels. On the other hand, Sr^{2+} and Ba^{2+} aluminosilicates are phases which are widely used, because of their excellent electric, dielectric and thermal properties. These materials could be perspective candidates for other applications, if they are doped with transition metals or rare earth elements. There is a limited amount of information concerning this type of materials. It has been found that celsian doped with Eu^{2+} ions could be used in plasma display panels. In this work, Sr^{2+} and Ba^{2+} diphyllosilicates doped with Yb^{3+} ions have been prepared. The initial substance was LTA zeolite, which has been fully exchanged with Sr^{2+} and Ba^{2+} ions by aqueous ion–exchange procedure. Ion-exchange has been performed from very diluted solutions of Sr^{2+} and Ba^{2+} salts at room temperature. This procedure has been repeated several times. Ba-LTA and Sr-LTA samples have been doped with Yb^{3+} ions, also by ion – exchange. The initial Ba-LTA and Sr-LTA, as well as Ba-LTA and Sr-LTA doped with Yb^{3+}, have been thermally treated at 1000ºC. X-Ray Powder Diffraction (XRPD) patterns of these four materials have been collected. Crystal structures of these initial and doped diphyllosilicates have been refined by Rietveld method. By comparing the structures of doped and non-doped materials, it could be concluded that Yb^{3+} ions are incorporated into the zeolite structure. Also, thermal properties of the synthesized samples have been analyzed with Differential Scanning Calorimetry (DSC) and characterization of the surface has been done using Scanning Electron Microscope (SEM).

O.S.B.8

INVESTIGATION OF INTERACTION OF $(PO_4)/(WO_6)_3$ - LATTICE COMPONENTS OF KEGGIN`S ANION WITH CATIONS IN ALKALI-EARTH SALTS OF 12-TUNGSTOPHOSPHORIC ACID

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In this communication, the results of vibration spectroscopy studies of alkaline-earth 12-tungstophosphoric salts are presented. Different crystallohydrates of investigated salts, from mother solution and those kept under constant relative humidity (RH) of 35%, were studied. Mg-salt in deuterated form was also examined. On the basis of spectral data, an effort was made to determine the position of cations in the Keggin unit. Shifts or band splitting in vibration spectra of salts, as well as changes in band intensities are connected with the cation nature. The spectral data show a great influence of the cations on the secondary structure of Keggin anions which influence catalytic and conductive properties too.

O.S.B.9

PHOTOTHERMOELASTIC RESPONSE OF MULTILAYER SOLIDS

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Generalized model of both thermal and elastic variations of a layer exposed to periodically modulated laser beam is presented, including thermal memory effect. The transfer matrix based on this model that relates thermoelastic state vectors on the surfaces of the sample is derived. It is used for description of photothermoelastic response on the multilayer surfaces. Two cases are discussed, the case of perfect and case of imperfect contact between layers.

O.S.B.10

ELECTRON STRUCTURE, LUMINESCENCE PROPERTIES AND VALENCE STATE OF $Ca_3Ga_2Ge_4O_{14}$ AND $R.E._3Ga_5O_{12}$ GARNET CRYSTALS

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The single crystals with garnet structure are prospective materials for scintillation detectors and solid state lasers. Their resent development has aroused interest in the investigation of their physical properties.

This paper reports on results of investigation of electronic structure and luminescence properties of $Ca_3Ga_2Ge_4O_{14}$ and $R.E._3Ga_5O_{12}$ (R.E.=Gd, Sm, Nd) garnet crystals.

The $Ca_3Ga_2Ge_4O_{14}$ garnet crystals were grown by the Czochralski technique in a flow of dry oxygen using a platinum crucible. The UV band can be excited at band to band and exciton absorption region, is not elementary and presents a superposition of at least two bands. The origin of UV luminescence is discussed.

X-ray photoelectron, emission and absorption spectroscopes have been used to study the electron structure and valence state of $R.E._3Ga_5O_{12}$ (R.E.=Gd, Sm, Nd) and $Ca_3Ga_2Ge_4O_{14}$ garnet crystals. The experimental X -ray emissions spectra of components in garnet crystals were matched (used core level energy) in unified energetic scale. X-ray absorption spectra components (R.E., Ca, Ga, Ge) in garnet crystals were obtained at 80K and 300K using a tube spectrometer equipped with an RKD-01 co-ordinate detector.

The total and partial electron density of states $R.E._3Ga_5O_{12}$ (R.E.=Gd, Sm, Nd) have been calculated.

O.S.B.11

THE INFLUENCE OF RARE-EARTH ADDITIVES (La, Dy and Sm) ON THE MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF DOPED $BaTiO_3$ CERAMICS

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A series of La/Mn, Dy/Mn and Sm/Mn doped $BaTiO_3$ samples were investigated regarding their microstructural and dielectric characteristics. The samples were prepared by conventional solid state procedure with dopant concentrations ranged from 0.1 up to 5 at%. The Mn concentration of 0.01at% was the same in all sampes. The specimens were sintered in temperature interval from 1290^0C to 1350^0C in an air atmosphere for two hours.

The grain size and microstructure characteristics for various samples and their phase composition were carried out using a scanning electron microscope SEM equipped with energy dispersive spectrometer (EDS). With additive content higher than 1 wt%, the compositions exhibit a fairly uniform microstructure with normal grain growth and homogeneous additive distribution. The average grain sizes in these samples were about 1-2 μm and 2-3 μm being the smallest in Sm/$BaTiO_3$ ceramics of around 0.5 μm. The grain size decreases with an increase of additive content.

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 samples doped with 0.1wt% of additive, with small-grained microstructure and high sintering density, sintered at 1350°C, display the highest value of dielectric permittivity at room temperature, 6000 for Sm/Mn, 5000 for 0.1Dy/Mn and 6500 for 0.1La/Mn-BT. 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 (C) and the exponent of non-linearity of the permittivity (γ) in function of sintering temperature and concentration of additive were given.

O.S.B.12

CHANGES OF STRUCTURE AND PROPERTIES OF OLIGOPHENYLENES UNDER SELECTED EXTERNAL INFLUENCES

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Using molecular mechanics, semiempirical quantum mechanic and ab-initio, Linear Combination of Atomic Orbitals (LCAO) calculations, we investigated changes induced by pressure, external electric field and inter-molecular interaction in P2P to P6P oligophenylenes. The results are compared to existing experimental data and similar calculations, and some consequences for applications of oligophenylenes-based materials discussed.

O.S.B.13

MICROMECHANICAL ANALYSIS OF CONSTRAINT EFFECT ON FRACTURE INITIATION IN STRENGTH MIS-MATCHED WELDED JOINTS

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In the paper micromechanical approach to ductile fracture was applied in a study of constraint effect on crack growth initiation in mis-matched welded joints. Three-point bend (TPB) specimen with V-notch and fatigue pre-crack length of a/W=0.32 was numerically analysed by finite element method (FEM). Constraint effect was tested by various widths of the welded joint (6, 12 and 18mm). Filtub was used as base material, Niomol as weld metal in over-matched and VAC60 as weld metal in under-matched welded joint. Micromechanical parameters used in prediction of the crack growth initiation on TPB specimen were calibrated on round smooth specimen with radius of 5mm. Difference in fracture behaviour between over- and under-matched welded joints obtained in experimental results, was explained by numerical computations of void volume fraction in front of the crack tip.

O.S.B.14

INVESTIGATION OF POSIBILITIES OF SUPSTITUTION OF TUNGSTEN CARBIDE WITH BORON CARBIDE CERAMICS

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The aim of this paper is to investigate the possibilities of production and appliance of cutting tools and other boron carbide products. To that effect, products based on boron carbide advanced ceramics should replace tungsten carbide tools. Boron carbide is one of the hardest materials, ranked just after diamond and cubic boron nitride. Therefore, that is the hardest material that can be produced in large quantities. Essential properties of this material, in terms of possibilities of its application are: extreme hardness, good chemical resistance, exceptional nuclear properties, low specific mass of final products and the problems which occur in process of pressing and sintering on high density without additives. In this paper the problems of production and application of boron carbide tools are discussed.

O.S.C.1

RAMAN SCATTERING BY THE LONGITUDINAL OPTICAL PHONONS IN InN NANOCOLUMNS AND COMPACT LAYERS

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We have studied the vibrational and structural properties of hexagonal InN nanocolumns and compact layers grown by plasma-assisted molecular beam epitaxy on Si(111) substrates. Raman and X-ray diffraction results reveal high crystalline quality and full relaxation of both structures. According to the polarization selection rules for the wurtzite structure, the Raman spectra in backscattering configuration along the hexagonal axis show the E_2 and A_1(LO) modes in compact samples. However, Raman spectra of columnar samples reveal the E_2 and E_1(LO) modes, together with a broad and weak feature at 430 cm^{-1}. The observation of the E_1(LO) mode in a nominally forbidden scattering geometry is due to the light refraction on the lateral surfaces of the nanocolumns. The high refractive index of InN allows light propagation inside the nanocolumns nearly perpendicular to the hexagonal axis. The E_1(LO) assignment is confirmed by micro-Raman measurements performed in back-scattering geometry perpendicular to the hexagonal axis. The peak at 430 cm^{-1} is not detected in compact samples. It is attributed to the lower branch of the mixed E_1(LO) phonon-plasmon excitations originated by coupling of the optical phonon to intrinsic electrons that are accumulated in the lateral surface region of the nanocolumns. This is consistent with the existence of a surface electron accumulation layer, as reported in n-type InN [1].

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O.S.C.2

UPCONVERSION OF RARE EARTH DOPED Y_2O_3 NANOPARTICLES

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Rare-earth doped nanoparticles have drawn a lot of interest in the last few years for several potential applications: optoelectronics, transparent ceramics, nanosensors and medical diagnostics. In some cases, the material properties differ from those of conventional materials elaborated by solid state reaction and the particles size leads to specific applications (transparent ceramics or medical applications for instance).

In the present work, we compare the optical properties of YF_3 and Y_2O_3 doped with several RE^{3+} (RE= Eu, Er and Yb).

The nanoparticles were elaborated through mechano-chemical synthesis and combustion methods. Size dispersion is different for the two methods with size ranging between 15 and 50 nm. Materials homogeneity and optical properties were investigated in both systems.

Eu^{3+} ions are used as local probe. At first, the shape of the emission spectra is identical in bulk and nanostructured compounds. This reveals that no confinement effect occurs with RE^{3+} at such nanoparticles size, and that surface effects are not predominant. We have investigated the position of the $^5D_0 \rightarrow {}^7F_0$ emission at about 580 nm in the different systems as well as lifetimes and intensity parameters.

Yb^{3+}/Er^{3+} system could show upconversion emission. We have tried to quantify the efficiency of the upconversion process (absorption in the near infrared range and emission in the visible range) according to the host (oxide and fluoride matrix) as well as synthesis methods.

O.S.C.3

ORGANIC – INORGANIC NANOCOMPOSITES: PREPARATION AND CHARACTERIZATION

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The contribution deals with the preparation and multidisciplinary characterization of organic – inorganic (O-I) hybrid systems. Inorganic building blocks were formed using sol-gel process and organic polymeric matrix was created by polyaddition reactions. In same cases, nano additives differing in the shape and concentration (colloidal SiO2 particles, montmorillonite sheets) were also put into the reaction system. Reaction conditions for reproducible preparation were found and optimized. Solid-state NMR spectroscopy; dynamic mechanical thermal analysis; atomic force, optical, scanning and transmission electron microscopy, etc. were used for multidisciplinary characterization of final (bulk and surface) properties of the O-I nanocomposites.

O.S.C.4

STRUCTURAL CHARACTERIZATION AND LUMINESCENCE PROPERTIES OF NANOCRYSTALLINE SCANDIUM OXIDE PREPARED BY COMBUSTION SYNTHESIS

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In the field of luminescent materials there is a great interest in the synthesis and optical characterization of rare earth doped nanocrystalline phosphors. In order to improve the comprehension of the luminescent phenomena the studies related with the structure and chemistry of these materials are needed. We present here a study on nanocrystalline powders of scandium oxide, undoped and doped with europium and erbium, prepared by combustion synthesis. X-ray powder diffraction, electron microscopy, EDX spectroscopy and luminescence spectroscopy were used for their characterization. The objectives were to investigate the structure and morphology of the synthesized powders, in particular the aggregation and particle size distribution, as well the luminescence properties for the Eu-doped sample.

O.S.C.5

RADIATION STIMULATED PROPERTIES OF NON-STOICHIOMETRICAL OXIDE BULK AND NANO-CRYSTALS

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Experimental and theoretical data of study of properties non-stoichiometrical oxide materials as bulk and nano-sized samples with chemical formula AO, A_2O_3, ABO_3, $A_3B_2C_2O_{12}$ are presented this communication. Detail investigation of thermo-stimulated luminescence, conductivity and X-ray spectra on one hand and ab initio theoretical data were foundations for identification of radiation colour centers in oxides.

The following main tasks are focused:

- change of the electronic structure and optical properties of oxides after irradiation;
- properties and application of nano-sized samples of irradiated oxides.

O.S.C.6

SYNTHESIS AND LUMINESCENT PROPERTIES OF $CaSiO_3$:Eu^{3+} NANOPOWDER

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In the last years, a numerous investigations have been carried out on the optical spectroscopy of rare-earth doped nanocrystals. These materials properties differ from those of conventional materials influenced by the particle size. In view to improve the luminescent intensity in classical phosphors different new techniques of synthesis are developed. In this work we present convenient rout for synthesis of $CaSiO_3$:Eu^{3+} nanopowder. The applied synthesis procedure led to a very fine powder form samples with an average particle size of about 3 nm determined by transmission electron microscopy. In that case the emission intensities of $^5D_0 \rightarrow {}^7F_i$ (i = 0, 1, 2, 3 and 4) spin forbidden f-f transitions are enhanced compared to a bulk material. We can underline that these emission spectra are quite different in shape to those of bulk. At average size of 3 nm it is possible to observe size effect on the emission bands, for instance a broadening of the emission and a slight modification of the lifetime. In addition to a luminescent emission spectra and lifetime measurements, we present structural data obtained by means of XRD, IR and Raman spectroscopy, and relate them to observed luminescence behaviour.

O.S.C.7

N-TYPE SILICON ELECTRON MOBILITY AND ITS RELATIONSHIP TO THE KINK EFFECT FOR NANO-SCALED SOI NMOS DEVICES

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Electron mobility for the silicon-based devices is one of the most important parameters, which determine the behavior of the components. Mobility depends on the silicon purity, doping level, presence of the lattice defects and electric field in the particular device. These influences are particularly important for the nano-scaled devices since it is much more difficult to control the thickness of the active layer, uniformity of impurity doping and appearance of parasitic bipolar devices and capacitances. We have investigated a relationship between electron mobility for the silicon based PD (Partially Depleted) SOI (Silicon On Insulator) NMOS (n-type Metal Oxide Semiconductor) Devices, and related kink effect which appears as consequence of charge accumulation at the interface of the Buried Oxide. We relate PD SOI NMOS Device technology parameters to the kink effect and we propose a guiding line for alleviating the kink effect.

O.S.C.8

NANO-GRAPHITE BY LOW ENERGY PURE SHEAR MILLING

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Carbon nanostructures are currently studied for their exceptional electronic and mechanical properties. Carbon nanosheets, in particular, can have several interesting application. The usual preparation route is by chemical exfoliation even if mechanical methods appear suitable. In this work, the influence of low energy and pure shear mechanical deformation of graphite structure has been investigated with the purpose of preparing thin flakes preserving some crystalline order. Hexagonal graphite powder was milled up to 60 hours in device where pure shear is applied by a rotating tool at room temperature. The milled powders were characterized by XRD, HRSEM, TEM, and BET measurements. Experimental results show that structures similar to exfoliated graphite can be obtained by purely mechanical methods without the need of introducing any chemical modification of the base material.

O.S.C.9

CHARACTERIZATION OF SURFACE MODIFIED CARBON CRYOGEL

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A unique porous carbon, a carbon cryogel (CC), can be synthesized by the sol-gel polycondensation of resorcinol with formaldehyde in a slightly basic aqueous solution, followed by freeze-drying and pyrolysis in an inert atmosphere. Since the porous structure of a carbon cryogel can be changed by varying the synthetic conditions or surface modifications it is expected to be used as adsorbents, catalyst supports, electrode materials for electric double layer capacitors and so on. In this work carbon cryogel was modified by oxidation in nitric acid and properties of this sample were compared with properties of original sample. The BET experiments have shown that oxidation process decrease total surface area, S_{BET}, and increase the amount of microporous surface and volume. The cyclic voltammetry experiments have shown that, due to oxidation process, the basic voltammogram is different from what is observed on non-oxidized carbon cryogel. Voltammograms of oxidized samples show deviation from rectangular shape and reversible redox peaks connected with pseudo-faradic reactions. Total voltametric charge significantly increase on oxidized sample (from 124 to 386 F g^{-1}). Results obtained in this work show that carbon cryogel could be successfully used as a materials for supercapacitors.

O.S.C.10

INFLUENCE OF STRUCTURAL TRANSFORMATIONS ON ELECTRIC AND MAGNETIC PROPERTIES OF $Fe_{81}B_{13}Si_4C_2$ AMORPHOUS ALLOY

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The differential scanning calorimetry method was used for investigating the crystallization process of the $Fe_{81}B_{13}Si_4C_2$ amorphous alloy. It was shown that the examined alloy crystallizes in two stages in the temperature interval 750-840 K. Temperature dependence of the magnetic susceptibility relative 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 653 K for amorphous state. The magnetic susceptibility increases by 16 % after the first heating up to 680 K. During the second heating the Curie temperature was increased by 10 K. At 730 K the alloy has regained its ferromagnetic features. The crystallized alloy maintains ferromagnetic features in the whole temperature region during the heating up to 900 K.

Our results obtained on $Fe_{81}B_{13}Si_4C_2$ amorphous alloy by measuring the thermoelectromotive force and relative magnetic susceptibility were shown that each stage of crystallization has noticeable influence on investigated properties.

O.S.C.11

PHASE COMPOSITION AND MAGNETIC PROPERTIES OF MULTIPHASE MELT-SPUN $Nd_{4.3}Fe_{76.2}B_{19.5}$ ALLOY

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Nanocomposite Nd-Fe-B magnets are attracting considerable research interest due to their excellent magnetic properties and reduced content of rare earth element. Research activates in development of nanocomposite permanent magnetic materials based on multiphase melt-spun Nd-Fe-B alloys with reduced Nd content are directed towards two goals: optimization of process parameters when nanocomposite structure is achieved and defining of the interactive mechanisms between the grains of present phases in magnetic matrix which have influence on the magnetic properties. Key for optimization of the magnetic microstructure of this alloy is heat treatment. By appropriate heat treatment the grains sizes of present phases are reduced to nanoscale and formed nanocomposites $Fe_3B/Nd_2Fe_{14}B$ and/or α-$Fe/Nd_2Fe_{14}B$ are directly responsible for increase of remanence and therefore the increase of magnetic energy. The heat treatment regime which provided nanocomposite structure of the $Nd_{4.3}Fe_{76.2}B_{19.5}$ alloy that enhances the exchange interactions between the grains of soft and hard magnetic phases and consequently enhances remanence and magnetic energy was observed. Phase transformations and magnetic properties of multiphase $Nd_{4.3}Fe_{76.2}B_{19.5}$ alloy were investigated in the temperature interval of heat treatment 600-700°C. Experimental results of X-Ray diffractometric analysis (XRD) and ^{57}Fe Mössbauer spectroscopy (MS) were correlated with the results of magnetic measurements on vibrating sample magnetometer (VSM) and superconducting quantum interference device (SQUID). Based on high content of soft magnetic phase Fe_3B, presence of hard magnetic phase $Nd_2Fe_{14}B$ and analysis of measured magnetic properties it can be assumed that nanocompsite $Fe_3B/Nd_2Fe_{14}B$ was formed after the heat treatment of the $Nd_{4.3}Fe_{76.2}B_{19.5}$ alloy in the applied regime. This assumption is supported by the fact that remanence ratio calculated from SQUID hysteresis loop is higher than theoretical limit $Mr/Ms = 0.5$ which complies with theoretical assumptions for this type of melt-spun Nd-Fe-B alloys that predict possibility of enhancement of magnetic properties despite the reduced rare earth content. Part of the experimental results relevant for formation of nanocomposite structure and defining of the interactive intergranular mechanism which have dominant influence on the magnetic properties of investigated Nd-Fe-B alloy after the applied heat treatment regime are presented and discussed.

O.S.C.12

INFLUENCE OF INDIUM SUBSTITUTION ON THE STRUCTURAL AND MAGNETIC PROPERTIES OF Zn-FERRITES

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One of the most important prerequisite to use the unique properties of nanocrystalline ferrites in magnetic devices is that they have a narrow particle size distribution. This paper illustrates that it is possible to satisfy such a requirement by using the coprecipitation method for synthesis of $In_xZn_{1-x}Fe_2O_4$ with crystalline size about 5 nm. The effect of synthesis conditions on the phase composition and particle size of ferrite nanoparticles has been investigated by X-ray powder diffraction, scanning electrone microscopy and Mössbauer spectroscopy, while magnetic properties of nanocrystalline In-Zn-ferrites have been studied by SQUID magnetometer.

O.S.C.13

RIETVELD REFINEMENT OF $Ca_{0.7}La_{0.3}MnO_3$ AND $Ca_{0.7}La_{0.3}Mn_{0.8}Ce_{0.2}O_3$ PEROVSKITE STRUCTURES

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$CaMnO_3$ based ceramics are interasting for application in SOFC because of the high electronic conductivity. La and Ce doped $CaMnO_3$ nanopowders were synthesized using modified glycine/nitrate procedure. After prolonged exposure to air, starting powders composition changed. The powders XRD analysis revealed binary mixture in both samples. Sample doped with La in position A of perovskite structure consists of $Ca_{1-x}La_xMnO_3$ solid solution and $CaMnO_3$ as a second phase. Sample with La in position A and Ce in position B of perovskite structure consist of $Ca_{1-x}La_xMn_{1-y}Ce_yO_3$ and CeO_2. Structure refinement was carried out using the program FullProf and Rietveld refinement. Influence of La and Ce on unit cell parameters, atomic positions, occupation numbers and distances between atoms was analysed. According to these results conclusions were drawn about La and Ce content in solid solutions. Quantitative phase analysis was performed as well, in order to obtain the amounts of each phase. Microstructure size-strain analysis was performed and these results are in nanometric range.

O.S.C.14

CHARACTERIZATION OF SYNTHESIZED PEROVSKITE La(Ti-Mg-Fe)O_3 OBTAINED IN PLANETARY BALL MILL

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Using mechanochemical procedure, two series of perovskite-type oxide catalysts are synthesized: $LaTi_{0.4}Mg_{0.6-x}Fe_xO_3$ ($0.13 \le x \le 0.53$) and $LaMg_{0.5}Ti_{0.5-y}Fe_yO_3$ ($0.2 \le y \le 0.4$). The influence of substitution of Mg and Ti with Fe cation on structural and catalytic properties was examined. For structural characterization XRDP and Mössbauer spectroscopy was used.

XRDP show that all synthesized samples are monophase after mechanochemical treatment. Mössbauer spectroscopy show that all iron ions are octahedrally coordinated Fe^{3+} ions with a high spin configuration.

Comparison of catalytic activity in reaction of total combustion of methane show cvalitative difference in this two series of catalyst.

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PL.S.III.1

NANODIAMOND: ULTIMATE CARBON MATERIAL

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Let us first summarize recent trends in the developments of carbon material science:

1. Major R&D efforts are being directed to new nano-carbon materials with strong supports from official sources all over the world.
2. In the five years, much emphasis has been focused on C_{60} and SWCNTs, but these *aces* turned out to have their own problems (productivity, cost, purification) that have so far been difficult to overcome. Investors began retreating.
3. The other long-time champion among materials scientists has been the CVD diamonds, thick films consisting of small diamond crystalline grains held together by weak forces. The size of grains used to be micrometers, but now the interests are focused on those having nano grains, dubbed ultrananocrystalline diamond (UNCD). Nevertheless, cost remains high, applications limited, and the final goal of diamond semiconductor far away.

It seems that we are heading towards a deadlock, if it were not for nanodiamond particles. Although there is no doubt about the eventual developments in C_{60} and carbon nanotubes, nanodiamond is, as I believe, a more realistic and highly capable candidate as the *first major and versatile nanoparticle* for emerging nanotechnology.

Perspectives on Manufacture of Nanodiamond. At the moment three promising methods are known or under investigation.

(1) Separation from detonation soot of explosion of Composition B, one of the most popular wartime explosives.
(2) Irradiation of superdense electron beam onto carbon nano-onions.
(3) Disintegration of CVD/NCD or UNCD films.

Among these, method 1 has been in operation for years now, but is now undergoing substantial transition into the second-generation process, which will be discussed in some detail in this lecture. Developments of industrial processes in Japan will be mentioned. Methods 2 and 3 are also being investigated by us.

Unique Properties and Behaviors of Nanodiamond. According to TEM observations, particles are polyhedral in shape, although highly irregular and defective. Specific surface area is very high, 700 cm^2/g. Surface is highly polar, as indicated by the presence of OH and COOH groups in IR, high affinity to polar media like water and polar aprotic solvents, and high stability of colloid in these media. Color is black when dried to loosely aggregated powder, and brown to black when in colloidal solution depending on concentration. Health hazard is unknown.

Perspectives on Industrial Application of Nanodiamond. New insights are being gained in the course of developments in nanodiamond particles having single-digit nano-size of 2-5 nm. We will not positively attempt to replace the current uses of microdiamonds and CVD diamonds but aim at exploiting new applications advantageous due to the above-mentioned unique properties. Reinforcement components for composites of synthetic resins, plastics, metals, ceramics and glasses are the obvious first choices for testing. No less interesting are the applications to ultra polycrystalline moulds by shock compression or low-temperature extrusion. Taking advantage of its polar nature we will explore the possibility to use as coatings that can be applied directly from its colloid. Sol-gel method can be used to make fibers and films out of colloidal solution. Finally they can be used as ultra fine 'dots' as the nuclei for the growth process of larger diamond particles. Also promising is the application to cell biology as the single-digit nanodiamond can be inserted into a living cell, which is of the order of a few microns in size. Imaging by using fluorescent nanodiamond as well as cell therapy or drug delivery by using nanodiamond attached with biologically active molecules.

PL.S.III.2

HYDROGEN IN NANOSTRUCTURES

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Methods of hydrogen nanostructure preparation in the forms of particles, films and tubes are described as applied to metals (Mg and Pd), intermetallics (Mg_2Ni and $LaNi_5$), semiconductors (Si and Ge) and dielectrics (C and BN). Attention takes to the mechanical alloying and film technology as very universal methods for the hydrogen nanostructure preparation. Structural features, solubility and diffusion mobility, sorption and desorption, physical and mechanical properties are discussed in detail. The necessity of different independent characterization methods such as XRD, TEM, SEM, AFM, AES, XPS, and Raman spectroscopy is pointed for representative conclusions on the structure and content change. Examples of real and potential application of hydrogen nanostructures are presented and considered as applied to hydrogen storage, sensors, and solar cells.

PL.S.III.3

PREPARATION AND CHARACTERIZATION OF BINARY OXIDE CATALYSTS CONTAINING CERIA COUPLED WITH GROUP III (B, Al, Ga, In) OXIDES

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Ceria-containing materials have a wide range of applications in catalytic processes such as the treatment of exhaust gases, combustion, and deNO$_x$ reactions. However, the major drawbacks of an oxygen storage system based on pure CeO_2 are its thermal resistance, low-temperature activity, and textural stability, which are insufficient to meet the requirements of high-temperature applications. The present work focuses specifically on the combination of ceria with another oxide from group III in order to improve the catalytic properties. In this work CeO_2 – (B_2O_3, Al_2O_3, Ga_2O_3, In_2O_3) mixed oxides catalysts were prepared by two methods including a sol-gel method and a more classical coprecipitation route. The amount of M_2O_3 guest oxide was varied from 6 to 36 wt%, depending on the preparation method. The surface structures were characterized by BET, XRD, Raman spectroscopy and thermogravimetry. Temperature Programmed Reduction/Oxidation (TPR/TPO) was employed to test the red-ox properties of the investigated samples. The surface acidity and basicity were measured by using microcalorimetry and XPS for the adsorption of probe molecules, such as NH_3 and SO_2. Variations of preparation method and loading of M_2O_3 brought about changes in the surface structures of dispersed guest oxide species. Only boria created significant acidity, and the samples prepared by the sol-gel method exhibited less surface acidity than their coprecipitated analogues. The basicity compared to pure ceria was sharply decreased for boria-ceria, slightly decreased for alumina-ceria, and slightly increased for gallia-ceria and india-ceria. The TPR profiles were examined in relation with the nature of the phases and the extent of reduction. The temperature of the maximum of the reduction peak for CeO_2-In_2O_3 samples prepared by coprecipitation decreased with increasing In_2O_3 loading, while the samples prepared by sol-gel gave a very different TPR profile. The properties were shown to strongly depend on the preparation procedure, chemical stability and structural features including the phase composition and the kinetics of the oxygen uptake/release.

PL.S.III.4

REACTION WITH HYDROGEN OF MICRO AND NANO COMPOSITES BASED ON Mg HYDRIDES

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Magnesium and its compounds are promising materials for solid state hydrogen storage. The practical exploitation of the intrinsic potentialities is presently limited by several kinetic barriers in the reaction of H with Mg, so that the decomposition of MgH2 occurs at temperature too high for most technological applications. A few categories of composite materials have been observed to release hydrogen at temperatures lower than that of pure Mg without a heavy degradation of the storage capacity. The cooperative effect, which appears to be at the basis of this phenomenon, seems to be a proper way to affect the decomposition temperature in the Mg-H system even if a full physical understanding of such behaviour is still lacking.

In order to contribute to clarify this point, we have investigated the desorption behaviour of several Mg-Ni and Mg-$LaNi_5$ composite hydrides, synthesized by BM. The hydrogen desorption data obtained by differential scanning calorimetry and thermo-gravimetry/differential thermal analysis have been correlated with the microstructure of the samples as derived from X-Ray diffraction, Scanning Electron Microscopy, X-Ray photoelectron spectroscopy.

The release of the whole hydrogen content occurs by a limited number of desorption channels. The observed behaviour can be explained on the basis of BM induced modification of the surface structure and by a fast redistribution of hydrogen among the two phases of the composite material.

PL.S.III.5

NANOTECHNOLOGY BEYOND MINIATURIZATION: INSPIRATION FROM BIOLOGY

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The astonishing advances made in the computer technology during the second half of the 20th century was fueled mainly by miniaturization of microelectronic components. Moore's law predicts that the continuing trend will eventually reach the nanometer scale, where cross-talks between discrete components become inevitable. Yet the nanometer scale is precisely where biology thrives; the cross-talks are nothing but the ubiquitous biochemical reactions. A quick glimpse into biology gave us the impression of a large variety of biomaterials. The sheer variety and spatial proximity would promote the complexity of interactions. Complexity may be the prerequisite for biology-like intelligence to emerge. But complexity in terms of variety and the large repertoire of interactions may not be sufficient. Probably there is more to biology than meet the eyes. We turn to biology for inspiration in the spirit of reverse engineering. In this paper we focus at intelligence exhibited at the systems level, and ask the blunt question of what makes a genius' brain tick [1]. A literature search of mainstream psychology reveals a plethora of experimental observations but few coherent theories. In addition to paying attention to psychology and cognitive science, we also explored areas neglected by mainstream psychologists, namely, computer science, artificial intelligence and introspective reports by creative individuals of the past, such as W. A. Mozart, H. Poincaré, N. Tesla, and A. Einstein. First, we found that creativity and the lack of it are not a black-and-white dichotomy but rather a distribution on a continuous spectrum. By contrasting individuals on the two extremes of this spectrum, we found that the answer had been known at an anecdotal level but was prematurely dismissed by mainstream psychologists. In brief, geniuses had a penchant for thinking in pictures (visual thinking) when they explored for potential answers to a problem, while they thought in words or rules (verbal thinking) when they verified a potential answer. Individuals severely handicapped in creativity tended to use verbal thinking exclusively. Visual thinking, which is essentially a parallel and analog process, tends to include false positive solutions, which can be subsequently scrutinized and eliminated by strict verbal thinking. Exclusive verbal thinking has a tendency to eliminate false negative answers prematurely. Further analysis allows difficult concepts such as intuition and the "aha" phenomenon to be understood and explained in explicit terms. Implications to designs of smart biosensors will also be discussed [2].

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PL.S.III.6

A UNIFIED DECOHERENCE-BASED MODEL OF MICROPARTICLES IN A SOLUTION

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The complex behavior of microparticles in a solution calls for the different theoretical backgrounds. Here, we keep the line of the two, recently developed theories on the individuality, on the one, and on the conformational transitions of macromolecules in a solution, on the other side. Given as the separate theories, the two models may raise certain controversy in respect to their mutual consistency. Needless to say, their mutual consistency is necessary for both validity of the theories in a general context as well as in search for a unified physico/chemical picture concerning the microparticles in a solution dynamics. We point out consistency of these theories based on the definition of a molecule through their constituent subsystems (e.g., the center-of-mass and the "conformation" subsystems).

PL.S.III.7

EFFECT OF HYPERBRANCHED VEGETABLE OIL POLYOLS ON PROPERTIES OF FLEXIBLE POLYURETHANE FOAMS

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Standard formulation of car seat molded foams is based on petrochemical polyols of molecular weight 3000-6000 and copolymer polyols containing micron size polymeric particles. Copolymer polyols typically constitute 30% of the mixture with the base polyol. They help cell opening, increase load bearing and tear strength of the foams, but they are relatively expensive. Hyperbranched polyols of petrochemical origin were used in molded foams. They were solid in the pure form and due to high crosslinking density could be incorporated at low concentration in conjunction with copolymer polyols. Three hyperbranched polyols with primary and secondary hydroxyl groups and different hydroxyl numbers were prepared from soybean oil and tested in flexible foams. Novel polyols were liquid even at very high molecular weights and could completely replace copolymer polyols. Functionality of these polyols increased linearly with molecular weight to very high values, resulting eventually in their high crosslinking power. The effect of the type of hydroxyl groups (primary vs. secondary), hydroxyl number (from 60- 150 mg KOH/g), and concentration (2-15%) in the mixture with the base polyol on foam properties were tested. It was found that hyperbranched polyols could replace copolymer polyols completely but their effect on cell morphology and mechanical properties varied with the type of polyol and concentration.

O.S.D.1

HIGH PRESSURE SINTERING OF SILICON NITRIDE BASED COMPOSITES

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Silicon nitride has high level of hardness, high temperature strength, heat resistance and oxidation resistance. High pressure sintering allows the densification process of silicon nitride ceramics to accelerate, receive fine structure and increase its mechanical and physical properties.

The evolution of structure, phase composition, density, hardness and fracture toughness of Si_3N_4-TiN composites with Y_2O_3 and Al_2O_3 additions depending on sintering temperature (up to 1900 ^oC) and pressure (up to 4 GPa) are studied. Phase composition of composites changes with temperature increasing because polymorphous transformation in silicon nitride and its interaction with Y_2O_3-Al_2O_3 melt. Material based on α-Si_3N_4 with high hardness and fracture toughness is obtained.

O.S.D.2

ANALYSIS OF MICROMECHANICAL PROPERTIES OF PARTICULATE COMPOSITE MATERIAL SiO_2-HDPE

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In this study, the influence of particle/matrix interface on the mechanical properties of particulate composites was investigated. Composites with SiO_2 particles with 3 μm in diameter and high density polyethylene (HDPE) matrix (PETROHEMIJA, Serbia) were produced by hot pressing with various particle contents and particle surface treatment with commercially available silane coupling agents (Hüls, Germany): 3-aminopropyl-triethoxysilane (AMEO), 3-methacryloxypropyl-trimethoxy silane (MEMO) and 3-glycidyloxypropyl-trimethoxysilane (GLYMO).

Mechanical properties of composites were determined by tensile, compression and three-point bending testing. Additionally, numerical analysis was performed in order to calculate Young's modulus, Poisson's ratio and coefficient of thermal expansion for various particle content. The correlation between measured composite micromechanical properties with various interface structures is presented. Exponential parameter of Young's modulus was determined using Brick-wall method for various applied silane treatments.

O.S.D.3

MULTILAYERS COMPOSITE MATERIALS WITH NON-USUAL POISSON'S RATIOS

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Most of usual materials exhibit Poisson's ratio comprised between 0 and 0.5. But, for some kind of cellular materials, or for some stacking sequences of unidirectional plies, a composite material can exhibit negative or greater than 0.5 Poisson's ratios. In this paper, a study of different stacking sequences such as $[\pm\beta/\pm\theta]_s$ plies made from highly anisotropic fibre pre-preg is presented. A special computer programme has been developed for this purpose.

Eighteen stacking sequences, including $[\pm\theta]$ ones, have been computed. The results show that at least one of the Poisson's ratio varies between -0.8 to +0.4.

Such kind of materials may find applications for particular cases, as their strength is significantly increased by this phenomenon.

O.S.D.4

THERMOFORMING PROCESS ANALYSIS OF WOVEN FABRIC REINFORCED THERMOPLASTIC COMPOSITES

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Thermoforming is an effective fabrication method of the woven fabric reinforced thermoplastic laminates into final shape. To successfully investigate the formability of composite parts and optimize the processing parameters in thermoforming process, an accurate and effective model and computational method is essential.

In the present research work, a finite element method is presented to analyze the thermoforming process of woven fabric reinforced thermoplastic laminates. Since the deformation process is done at melting temperature of thermoplastic resin, the reinforced laminate is considered as a viscose material reinforced with the woven continuous fibers, while elastic behavior was consider for melted resin in the recent research works to simplify the deformation analysis. Due to high axial stiffness of continuous fibers compared to melted resin and high material bulk viscosity at forming temperature, the kinematical constrains of fiber inextensibility and material incompressibility are considered in the presented formulations. To eliminate the accumulation of computational errors in each time increment, the kinematical constrains are defined according to reference configuration. Unlike quasi-static assumption used in some previous investigations to model thermoforming process, the deformed geometry is calculated according to current fiber direction and material properties at the end of each increment. Using an appropriate solution method, the computed deformations satisfy the kinematical constrains and tool contact conditions in an exact manner. The comparison with the analytical solutions and previous numerical results shows that the presented method provides an accurate and efficient procedure in the thermoforming analysis of woven fabric reinforced composites. The numerical results of forming process can be used to compute the mechanical properties of finished parts. The method used to derive the governing equations is a general procedure and can be applied to finite element analysis of any rate dependent materials.

O.S.D.5

THEORETICAL-EXPERIMENTAL INVESTIGATION AND COMPARATIVE MODELLING OF CUTTING FORCE IN CUTTING OF FIBRE REINFORCED PLASTIC

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Polyetheretherketones (PEEK) and especially when reinforced by fibres, are high performance thermoplastic polymers in engineering. In many applications there is need of machining for precise control of size and shape, and improved surface quality. These composites being inhomogeneous in structure show complicated machining behaviour. The knowledge of cutting forces developing in the various cutting processes under given cutting factors is of great importance, being a dominating criterion of material machinability. In the present contribution a theoretical and experimental investigation is carried out in turning glass fibre reinforced polymer (PEEK GF 30) with cutting force considered as the main machinability factor. Theoretical and experimental cutting force models were considered for deeper understanding of cutting mechanics in this case. The theoretical analysis was based on Merchant and Armarego models. The experimental model was formulated in terms of the cutting conditions, namely feed (f), cutting speed (v) and depth of cut (a). A data mining (Taguchi) method was used for the plan of experiments. Next, a related comparison is attempted to results obtained using the semi-empiric specific cutting pressure (Kienzle-Victor) and the Kronenberg cutting force models. This extended analysis can be of direct practical significance due to the wide use of PEEK GF 30 in aerospace applications and biomechanics.

O.S.D.6

SINTERING CHARACTERISTICS OF TUNGSTEN COPPER COMPOSITE MATERIALS

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W-Cu composites can be fabricated via tow convectional processes; liquid phase sintering and infiltration. Tungsten and copper exhibit negligible solubility for each other in liquid and solid state, so densification can be attributed to either rearrangement or solid state sintering. Factors affecting sintering and densification of W-Cu composites are temperature, time and sintering aides. Effect of such parameters on sintering and densification behavior of W-Cu composites investigated. Density was measured by arithmetic method. Microstructure studied by SEM and optical microscope. Co and Ni were used as activator in solid state and liquid phase sintering. Finally best activator content and optimum time-temperature for solid state, liquid phase and infiltration process were determined.

O.S.D.7

Al-PILLARED MONTMORILLONITE WITH INCORPORATED TRANSITION METALS OXIDE (Co, Ni); PHYSICOCHEMICAL AND MAGNETIC PROPERTIES

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Pillared clays (PILCs) are a class of new nanoporous materials which receive increasing attention because of their potential use as catalysts and catalysts support. In our previous works we have studied physicochemical properties of Al-pillared montmorillonite based on natural bentonite »Sipovo« (BiH) doped with two different polyoxometalates (12-tungstophosphoric acid and ammonium-decavanadate). In this work, results of the incorporation of the transition metals Co and Ni in Al-pillared montmorillonite will be reported. These metals or their oxide forms are well known catalysts for different hydrotreating reactions. The supports with Co and Ni oxide on Al-pillared montmorillonite were prepared by impregnation/sol-gel process of PILC with different amount (10 and 20 mas.%) of cobalt and nikel salts solutions. Obtained impregnated substrate was calcinated at about 280°C. Obtained samples were characterised by X-ray diffraction, infrared spectroscopy, BET isothers and low temperature magnetic characterization by SQUID magnetometer.

O.S.D.8

INTERPRETING XPS C1S BINDING ENERGIES IN FLUORINE CONTAINING NANOPARTICLES

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A method for predicting XPS C1s binding energies in polymers [1] and silicon containing nanoparticles [2] has been developed previously, based on the the semi-empirical AM1 method. A linear correlation has been provided between the binding energies - corrected by the so-called Madelung intramolecular potential - and the partial atomic charges determined quantum chemically. We successfully resolved a recent controversy with regards to use of this method for interpreting XPS spectra of fluoropolymers. In the current contribution we also investigate the possibility of using the equation to describe fluorine-containing nanoparticles, which have increasing technological importance.

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O.S.D.9

THE INFLUENCE OF GAMMA RADIATION ON THE GLASS TRANSITION OF HYDROXYAPATITE/POLY L-LACTIDE COMPOSITE

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Hydroxyapatite/poly L-lactide (HAp/PLLA) is a composite biomaterial which has been widely utilised for substitution and reparation of the hard bone tissue. On the other hand, it is well known that gamma irradiation has been successfully employed in the modification/sterilization of such porous composites and has advantages over other procedures. In this paper, differential scanning calorimetry (DSC) measurements were used to investigate the influence of radiation on glass transition behavior and structural relaxation in this region, as well for the estimation of activation energy for this process. The activation energy ΔH^* for structural relaxation in the glass transition region has been determined on the basis of the heating rate dependence of glass transition temperature T_g. Furthermore, the results have been correlated with those obtained by gel permeation chromatography (GPC). Our findings support the fact that radiation-induced chain scission in the PLLA phase is the main reason for decaying apparent activation energy with the absorbed dose.

O.S.D.10

FATIGUE CHARACTERIZATION OF HONEYCOMB SANDWICH PANELS

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The honeycomb sandwich panels are mostly used for their high stiffness, their good fatigue resistance and their low weight ratios. This material is used in different applications and especially in the aeronautic industry. In this case the simple knowledge of its static properties is not sufficient and additional information about fatigue properties is needed.

To establish the remaining fatigue life model, a better understanding of the various failure mechanisms during cyclic loading is necessary. Fatigue tests (four points bending) have been achieved on sandwich panels to support the model.

The static results show that:

- The behaviour of the sandwich materials with low weight ratio looks like a ductile material in contrary to those with a high weight ratio.
- The stiffness and the ultimate load increase with the weight ratio.
- The fracture load is proportional to the weight ratio.

The fatigue results show that:

- The damages are located between the fixed supports and the loading point,
- The cracks grow diagonally from the core to the interfaces,
- The catastrophic failure is due to the buckling of the core.

All previous tests were made on sandwich panel without defect. The focus is now to work on the same material but with some defects. In fact, in actual conditions these panels can be affected by some dust or stone impacts and it is important to know their behaviour with this kind of damages. It also allows choosing where the failure will begin.

These defects will be simulated by a hole not emerging in the centre of the upper face sheet.

To study the growth of the failure near the hole, acoustic emission will be used. It will allow knowing the different stages of failure mode.

The expected result is a diminution of the remaining fatigue life time, proportionally to the size of the hole.

O.S.D.11

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

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In this paper, we report the results of preparation and properties of $BaTi_{1-x}Sn_xO_3$ (BTS; x=0-0.15) multilayered ceramics. The BTS powders were prepared using solid state reaction of the commercial powders $BaCO_3$, TiO_2 and SnO_2, at 1100 ^oC in 2 hours. After calcination starting BTS powders were sonochemically treated and powders with average particle size < 100 nm were obtained. Starting BTS powders were characterized by XRD. The BTS powders were pressed (P~300 MPa) into 2 to 5 layers pellets of 8 mm in diameter and 1.2 mm in thickness. Combinations of layers were: 0-15, 7-15, 7-10-12-15, 8-9-10-11-12, 9-10-11-12-13 i 10-11-12-13-14 (numbers designate mol% of Sn in BTS). The pellets were sintered at different temperatures between 1350 and 1450 ^oC for 5 hour in air. The microstructure of these multilayered materials was investigated by SEM and EDX methods. The BTS multilayered ceramics were electroded with Ag and dielectric and ferroelectric properties were measured.

O.S.E.1

FROM MICRO TO NANO COMPOSITE BIOMATERIALS CALCIUM PHOSPHATE/ BIORESORBABLE POLYMERS

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Composite biomaterials have essential potential for natural bone tissue reparation. Ceramics/polymer composites play a significantly role in these reparations, as their properties are very close to the natural bone tissue. Calcium phosphate/bioresorbable polymer biomaterials belong to this group of composites and due to their osteoconductive and biocompatible properties they can be successfully implemented in bone tissue reparation. Bioresorbable polymers like as poly-l-lactide (LPLA) and poly-dl-lactide-co-glycolide (DLPLG) are suitable candidates for these aims. This paper shows possibilities of synthesizing composite biomaterials calciumphosphate (CP)/bioresorbable polymers (LPLA or DLPLG) formed as bloks, and powders. CP/DLPLG composite biomaterial was produced in form of spherical micro and nanogranules. Each CP micro granule or nanoparticle was coated with amorphous DLPLG polymer. The influence of the processing technique on the structure and characteristics of the composite biomaterial was studied by X-ray diffraction analysis (XRD), differential scanning calorimetry (DSC), scanning electronic microscopy (SEM), atomic force microscopy (AFM) and Fourier transform infra red (FTIR). *In vitro* and *in vivo* research used as the bases for the clinical application of the composite.

By two-step procedure we synthesized the blocks of high density CP/LPLA composite biomaterial. In the first step, highly porous composite with desired ratio of components, CP particles' size and LPLA moll mass is obtained by the optimal processing. Second step comprehends the designing of the composite blocks' properties by compacting through cold and hot pressing. By hot pressing it is possible to influence the changes in porosity, PLLA moll mass and crystalline/ amorphousness ratio. Obtained composite biomaterial blocks have the compressive strength of up to 140 MPa and elasticity module of up to 10 GPa. A calcium phosphate/poly-dl-lactide-co-glycolide (CP/DLPLG) composite biomaterial was synthesized in the shape of spherical micro granules (150-200 μm) and nanosize particles (30-40 nm) by an emulsification/ evaporation procedure. By hot pressing of micro granules CP/DLPLG were obtained blocks of 97% theoretical density and compressive strengths of 82 MPa. From nano particles was obtained injektable pastes suitable for small damage reconstruction of bone. *In vitro* research on cellular cultures showed good adherence of fibroblast cells to the composite biomaterial surface. Application of CP/LPLA or (DLPLG) facilitated overgrowth of new-formed vascular tissue, fibroblasts and intensified the activity and adherence of osteoblasts. The obtained results from patientes also indicate a more intensive osteoregenerative process and high level of ostaoblast activity on the side where the composite was implanted.

O.S.E.2

RELEVANCE OF POLARON/SOLITON-LIKE TRANSPORT MECHANISMS IN CASCADE RESONANT ISOMERIC TRANSITIONS OF Q1D-MOLECULAR CHAINS

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Our recently proposed quantum approach to biomolecular isomeric-conformational changes and recognition processes, additionally supported by biomolecular resonant recognition model and by quantum-chemical theory of biomolecular non-radiative resonant transitions, is hereby extended to cascade resonant transitions via close intermediate participating isomeric states - which might be related to polaron/soliton-like energy and charge transport mechanisms in Q1D-molecular chains, whose relevance is explored in this paper.

O.S.E.3

THE MONOCRYSTALLINE PHOTORECEPTOR OF *EUGLENA GRACILIS* FROM A PHYSICISTS POINT OF VIEW

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The photoreceptive crystal in the green algae *E. gracilis* has directional sensitivity to incident light. Incident photons induce conformational changes in the algal rhodopsin single molecule, resulting in highly efficient energy conversion exceptionally little disturbed by thermal noise. The photocycle of this single photon detector is a simple two step process. This biomaterial with molecular precision is a promising candidate for biomimetic applications, e.g. in information technology. Emerging nanoelectromechanical systems (NEMS) might even use such a crystal as energy converter, simply by making use of ambient light. We characterize this biomaterial with confocal laser microscopy, scanning probe microscopy on the single molecule level and nanoscale force spectroscopy, thereby contributing to a sound basis for the correlation between structure and function of this amazing material.

O.S.E.4

CENTRIOLE – CYTOSKELETON MIMICRY FOR NANO MATERIAL SELFCONTROL

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Microtubules alone are capable of organizing themselves in time and space. Centriole is biological organela which is composed of 27 microtubules. Also, microtubules participate in cytoskeleton which is responsible for many functions of cell, including signal transduction from cell membrane to nucleus. Consideration of functions of centriole-cytoskeleton interaction as self-mapping process, based on fractal and chaos, open new possibilities for nanomaterial control mimicry.

O.S.E.5

OSTEOGENIC EFFECTS OF ADDED FLAVONOID EXTRACT IN IMPLANTS COMBINED OF HAp/PLLA AND BONE FRAGMENTS

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Some of flavonoid supstances have been reported to be effective in tretment of osteoporosis. There are data on osteogenic flavonoid effects by dietary supplementation or *in vitro*. However, no information is available regarding the relationship between locally aplicated flavonoid and osteogenesis in situation where the contact of bone with implant exists. In this purpose we analized implants prepared of combination of vital or nonvital bone fragments with biocomposite HAp/PLLA in which added flavonoid preparation BP1 extracted from grape. There were 8 types of implants. A half of them was composite with low molecular PLLA (50 000), and the rest was with high molecular PLLA (430 000). Each of them mixed with vital or nonvital bone fragments. Each combination of HAp/PLLA and bone fragments was prepared with BP1 supplement and without BP1. Intraperitoneal implantation to Balb/c mice was performed and implants were extracted after 4 months. The implant resorption and osteogenesis were analized by light microscopy. The ratio between new formed bone area and implanted bone area was parameter of osteogenesis. It was found that in implants with low molecular PLLA and nonvital bone fragments the most of composite was resorbed and mature fibrous tissue was formed. With added BP1 enhondral bone forming and high cell density around new formed bone was seen. In combination the same composite and vital bone, implant had preserved hematopoeisis, and with added BP1 hematopoiesis was more marked with emphatic presence of megakariocytes. In implants with high molecular PLLA osteogenesis was found without presence of BP1, and regardless whether biocomposite mixed with vital or nonvital bone fragments. However, increase of new formed bone was more than doube larger in implants with vital bone fragments than in nonvital. These results show that designed composite materials posses good biocompatibility, that their combination with bone fragmets enables ostegenesis and hematopoiesis, and that added flavonoid BP1 influences stimulatory to these processes.

O.S.E.6

ALGINATE MICROBEADS AS CELL SUPPORT FOR CARTILAGE TISSUE ENGINEERING: BIOREACTOR STUDIES

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Alginate was shown to be a suitable support for entrapment and cultivation of chondrocytes and bone marrow stromal cells, which under appropriate in vitro conditions synthesized cartilaginous components. The main limitation in these cultures may be low rates of mass transport through the alginate matrix governed by diffusion. In this study, we have designed and utilized a bioreactor system based on a packed bed of alginate microbeads with immobilized chondrogenic cells. Continuous medium perfusion at physiological rates (~ 100 μm/s) provided convective mass transport through the packed bed, while small diameters (~ 500 μm) of microbeads produced by electrostatic droplet generation ensured short diffusion distances to the immobilized cells. Over 5 weeks of cultivation, the cells synthesized extracellular matrix components indicating potentials of this system for precise regulation of the cellular microenvironment in cartilage tissue engineering.

O.S.E.7

NON-MAGNETIC MATERIALS BEHAVIOUR ON NANOTESLA SCALE

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As non-magnetic materials; plastic, aluminum and bronze have been investigated in room conditions in four different situations: (1) under normal conditions, (2) under influence of magnets (magnetization), (3) during demagnetization, and (4) after demagnetization. All three types of materials shown similar behavior on nano Tesla (nT) scale. Measurements are done in range from from 27pT to 320μT with precision ±3pT. Magnetic behavior of these materials could be explained as quantum mechanics behavior of conformation change of structure under surface.

O.S.E.8

A Cu^{2+} PROBE OVER RANITIDINE AND NIZATIDINE OR *In Silico vs.* EXPERIMENTALLY OBTAINED COMPLEXATION OF DRUGS

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To validate and compare experimentally obtained results, *in silico* model of title drugs mode of interaction with Cu^{2+} ion were proposed. Furthermore, proposed procedure can be used for fast examination of flexible bioactive molecules interaction with metal ions. The two drug molecules in complexes are coordinated to Cu^{2+} forming two six-member rings, as experimental data show. Both molecules have a nine rotatable bonds allowing conformational flexibility. Conformations, obtained using Accelrys Catalyst program, are taken from Super Drug Database (SDD). Examination of drugs interactions with Cu^{2+} ion with the 100 conformers in a set were done using GRID program. Obtained molecular interaction fields (MIF) show that favorable interaction of Cu^{2+} probe with the molecule is in good agreement with experimental ones only for "U shaped" conformers. The steric proximity of $-N(Me)_2$ group from the other termini of the molecules are important in those cases. For the "linear" and "intermediate" conformers the probe exerts favorable interactions exclusively on the region of heteroaryl rings of drugs (furane or tiazoline) and the sulphur in β position from it.

O.S.E.9

TRANSPORT OF DRUGS IN POLY(2-HYDROXYETHYL METHACRYLATE) AND POLY(2-HYDROXYETHYL METHACRYLATE-CO-ITACONIC ACID) HYDROGELS. DIFFUSION AND RELEASE STUDIES

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Investigation of drug (therapeutic active substances) transport through crosslinked hydrogels requires quantitative analysis of solute diffusion through the macromolecular mesh of the polymer. The study of solute transport in hydrogels necessitates a thorough characterization of the polymer diffusional space available for transport. Solute transport in microporous hydrogels can be analyzed using hydrodynamic theories that consider the frictional characteristics of the spherical solutes as they diffuse through cylindrical pores. Derivation of solute transport through pores is based on the equation of solute flux with additional hindrance terms for convection and restrictions due to the tortuosity of the transport path. The apparent diffusivity, D, relative to the diffusivity in the bulk solution, D_∞, is related to the restriction coefficient, λ, that is defined as the ratio of solute to 'pore' radius, r_s / r_p.

The aim of this research was to define the controlling parameters affecting transport of drugs through poly(2-hydroxyethyl methacrylate), PHEMA, and poly(2-hydroxyethyl methacrylate-co-itaconic acid), P(HEMA/IA). The hydrogel formulation investigated the amount of ionizable comonomer (IA), which defined the mesh size available for solute diffusion. The solutes selected for this study represent varied molecular size and included theophylline, fenethylline hydrochloride and gentamicin sulphate. These hydrogels are microporous based on the characteristic mesh sizes of 0.01-0.1 μm. Accordingly, solute diffusion and release studies were performed and analyzed using the commonly applied (free volume and hydrodynamic) theories. The observed deviations from theory were attributed to hindered diffusion of drugs caused by solute/polymer interactions. The results demonstrated that the transport of drugs through the hydrogels was influenced by the type of solute and hydrogel porosity. The solute diffusion coefficients were correlated with the mesh size of the PHEMA and P(HEMA/IA) hydrogels.

O.S.E.10

HETEROPOLY COMPOUNDS AS BIOACTIVE AGENTS

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In our previous work we proved significant antiviral activity of Keggin type of heteropoly compounds (HPC), such as 12-tungstophosphoric acid (WPA) and its salts against the plant viruses *Tobacco mosaic tobamovirus* (TMV) and *Cucumber mosaic cucumovirus* (CMV) in curative as well as in preventive purposes. We have found that WPA and its compounds is transported through the plant in vertical and horizontal directions after their foliar application on *Nicotine tobacco, var. Samsun,* as host plant. It is important to estimate the distribution profile of selected WPA compounds through the host plant and thus to contribute to the explanation of their antiviral activity mechanism. Stability of Keggin anion depends on medium pH. Keggin anion, $PW_{12}O_{40}^{3-}$, may be easily hydrolyzed and decomposed to WO_4^{2-} and PO_4^{3-} through different polyanions, so the next aim is to define which form of Keggin anion is bioactive. According to that goal the influence of pH of fresh plant juice on Keggin anion structure is followed.

Poster Presentation

P.S.A.1

SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS OF $Cr_{2-x}Ti_xO_3$

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Titanium substituted chromium oxides $Cr_{2-x}Ti_xO_3$ have been successfully developed as gas sensing materials at elevated temperatures for the detection of combustible and toxic gases. In the present work a new method of synthesis of such materials with the use of reactions of self-propagating high-temperature synthesis (SHS) has been offered. The series of experiments on synthesis of compounds of the composition $Cr_{2-x}Ti_xO_3$ by SHS method (x varied from 0, 0.01, 0.02 … up to 2) has been carried out. Synthesis was carried out in air with the subsequent annealing at 900 °C within 4 hours. The synthesized samples were investigated by the methods of X-Ray analysis, SEM, TG-DTA. The magnetic characteristics (coercive force, magnetization of saturation), values of a specific surface, pycnometer density and gas sensor properties have been also determined.

P.S.A.2

THE EFFECT OF AN APPLIED ELECTRIC FIELD ON SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS IN Ba-Fe-O-SYSTEM

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Barium hexaferrite is widely used for making permanent magnets since it has rather high value of coercive force. In this work the influence of a constant contactless electric field on phase formation during self-propagating high-temperature synthesis (SHS) and properties of SHS-product is investigated. It was found that electric field influenced the parameters of a process. Microstructure, phase composition and magnetic characteristics of combustion products were obtained by scanning electronic microscopy, X-ray and vibrating sample magnetometry. A correlation was found between the observed physical properties and the magnitude of the applied electric field. A role of the field activated oxygen exchange during the combustion synthesis is discussed. It is an actual problem in the practice of creating materials with the given set of properties.

P.S.A.3

THE INFLUENCE OF CHARGING EFFECTS ON THE SiO_2 ETCHING PROFILE EVOLUTION IN FLUOROCARBON PLASMAS

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A comprehensive simulation of etching profile evolution requires knowledge of the etching rates at all the points of the profile surface during the etching process. Electrons do not contribute directly to the material removal, but they are the source, together with positive ions, of the profile charging that has many negative consequences on the final outcome of the process especially in the case of insulating material etching. The ability to simulate feature charging was added to the 3D level set profile evolution simulator described earlier. The ion and electron fluxes were computed along the feature using Monte Carlo method. The surface potential profiles for the entire feature were generated by solving Laplace equation. Calculations were performed in the case of simplified Ar^+/CF4 nonequilibrium plasma etching of $SiO_{2.}$

P.S.A.4

PARTICLE-IN-CELL MODELLING OF A NEUTRAL BEAM SOURCE FOR MATERIAL PROCESSING IN NANOSCALE STRUCTURES FABRICATION

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Neutral beam processing is being considered as one of the most promising methods to overcome plasma process induced damage in material processing. Surface treatment by neutrals avoids problems with surface charging effects, frequently encountered when using common ion treatment, especially for low k-materials. In this paper the influence of various parameters on the neutralization of ion beams due to both gas phase collisions and ion surface interactions based on a Particle in Cell with Monte Carlo collisions (PIC/MCC) simulation is studied.

P.S.A.5

GXRD ANALYSIS OF TiN COATINGS DEPOSITED ON ION IMPLANTED STAINLESS STEEL

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Nitrogen ion implantations were performed on AISI 1045 steel substrates. The ion energy was 40 keV and the ion doses were from $5x10^{16} – 5x10^{17}$ ions cm^{-2}. On such substrates we have deposited 1.3 μm thick TiN coatings. Structural characterizations were performed by grazing incidence X-ray diffraction analysis (GXRD), normal X-ray diffraction analysis (XRD), and scanning electron microscopy (SEM). Microhardness was measured by Vicker`s method. The obtained results indicate that the formation of iron nitrides occurred in the near surface region of the substrates. This effect is more pronounced for higher implantation doses. Structure of the deposited TiN coatings shows a dependence on the implanted doses. Ion implantation and deposition of hard TiN coatings induce an increase of microhardness of this low performance steel for more than eight times.

P.S.A.6

ION BEAM SPUTTER DEPOSITION OF Ni THIN FILMS: INFLUENCE OF ENERGETIC PARTICLES ON STRUCTURAL EVOLUTION

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Advantages of film deposition by ion beam sputtering include low temperature processing, improved adhesion and control of crystallographic orientation. In this paper, the nickel thin films were deposited on glass substrates by argon ion beam sputtering using a broad beam ion source. The sputtering voltage was varied in the range of 1kV-1.7 kV and the incident angle of the sputtering ion beam to target plane was 50^0. The chamber base pressure was $4x10^{-6}$ mbar, while a process pressure of $1x10^{-4}$ mbar was required for Ar ion source operation. At the ambient substrate temperature the deposition rate was about 0.1 nm/s. The Ni film electrical resistivity by fore-point probe technique, thickness with profilometer and preferred orientation with XRD were measured. The influence of process parameters, such as Ar ion beam energy, N_2 partial pressure and angle of incidence of condensing species on the structural changes from (111) orientation to (200) orientation will be presented. The experimental conditions enable the lattice parameters and the resistivity increase and the grain size decreases with increasing energy delivered to the growing film. The energy and the particles flux distribution, for different angles of incidence, generated during Ar ion beam sputtering of Ni target were calculated by Monte Carlo simulations (SRIM). Structural variation and resistivity changes will be discussed on the basis of total energy per deposited atom contribution to the film growth.

P.S.A.7

NANO-STRUCTURED TiN THIN FILMS DEPOSITED BY SINGLE ION BEAM REACTIVE SPUTTERING

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A broad beam ion source based on modified magnetron ion source was home made and designed for thin film processing. At low working gas pressure of $1x10^{-4}$ mbar, the TiN films (δ-TiN phase) with a (220) preferred orientation were grown by ion beam reactive sputtering. The deposition rate was in the range 0.1nm/s to 0.2 nm/s and the substrate temperature was ambient. The influence of the deposition process parameters on the TiN film structure were analyzed in the two ways: first, the vertical dimension of grains was calculated from XRD results and second, the film roughness, surface morphology, lateral dimension of grains were revealed by STM. The growing film was under oblique-angle argon ion bombardment by the beam periphery. The energy input leads to the films structural disordering with the vanishing of (220) preferred orientation and considerable reduction in lateral grain diameter, while the vertical grain dimension was nearly constant. The single ion beam reactive sputtering was found to be a powerful method for the deposition of nano-structured TiN thin films with controlled reduction of grain size to the about 10 nm.

P.S.A.8

EQUIVALENT CIRCUITS OF UNIPOLAR PULSED PLASMA SYSTEM FOR ELECTRICAL AND OPTICAL SIGNAL ANALYSIS

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Matching of pulse plasma generators to various gas discharges for surface treatment of materials depends on plasma processing equipment. In order to investigate influence of pulse plasma generator and gas discharge parameters on electrical signal waveforms during the process of unipolar pulse plasma nitriding, equivalent electrical circuit was introduced. The influence of parasitic inductance of interconnection lines and vacuum chamber physical properties was also included in given equivalent circuit. Gas discharge characteristics at different process parameters were investigated. It was found that the gas discharge and pulse plasma generator configurations, as well as the electrical properties of interconnecting lines determine the system electrical signal response. From the analysis of optical signals emitted by the gas discharge it was found that the optical signal response may be represented by a typical RC integrator circuit response with the time constant higher than that of the equivalent electrical circuit of generator load. The conclusion was drown that the process of charge particles generation is followed by the process of active species generation responsible for thermo-chemical processes on the cathode surface. Thus, the increase of the pulse plasma frequency is limited by the thermo-chemical process efficiency, and not only by generator switching characteristics or by gas discharge electrical properties.

P.S.A.9

PLASMA ASHING 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 unprecedented 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.A.10

CATALYST-FREE GROWTH OF TIN OXIDE ONE-DIMENSIONAL NANOSTRUCTURES ON SILICON SUBSTRATES

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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. 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 without using any metal-related catalysts. 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.A.11

FORMATION OF GAS PHASE BORON AND CARBON CONTAINING MOLECULAR SPECIES AT HIGH TEMPERATURES

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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. Among of them, they are used as protective thin film coating. One important technique to produce these substances and such protective coating is chemical vapour deposition (CVD) in particular thermal plasma CVD. Thermal plasma, as high temperature mixture of atoms, molecules, ions and electrons is also widely used for the synthesis of high purity ultra fine powders of silicon, boron, titanium etc. oxides, nitrides and carbides [1]. Reactants, introduced into thermal plasma, evaporate and, depending on the temperature, partially dissociate into atoms and ionizes, 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, the formation of ultra fine (solid) particles can be achieved. In the optimization of this synthesis process, the first and very useful step is undoubtedly thermodynamic analysis

In this paper we consider the formation of boron carbide at high temperatures in thermal plasma. This process is investigated theoretically by computing the equilibrium composition of the gas mixture containing boron (taken in the form of diborane – B_2H_6) with argon and the mixture of hydrogen with some hydrocarbon as a source of carbon atoms. The calculation is performed for temperature range between 500 and 6000 K, for different B/C 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. Gibbs energies of B_2C, BC_2 and BC molecules are calculated in the framework of the present study, by using the results of theoretical *ab initio* studies carried out by Martin *et.* al. [2,3]. From the calculated compositions of the investigated gas systems, the conclusions are made concerning the importance of the specific boron and carbon containing molecular species in the formation of solid boron carbide.

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P.S.A.12

PREPARATION OF ZrO_2 AND Al_2O_3 THIN-FILMS ON STAINLESS STEEL BY SPRAY PYROLYSIS

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The catalysts for VOCs deep oxidation, based on well dispersed active noble metals within a thin film on a stainless steel (SS) substrate obtained by spray pyrolysis, offer a significant advantage with regard to the ceramic monolith because of its better thermal conductivity and resistance to thermal shock, shorter light off time and higher mechanical strength. Within this work we have synthesized thin-film ZrO_2/SS and Al_2O_3/SS by spray pyrolysis method. The specific surface areas of samples were determined by the BET-method and samples surface were characterized by scanning electron microscopy and X-ray photoelectron spectroscopy. Comparison between different thin films Al_2O_3 and ZrO_2 as catalysts supports have been discussed.

P.S.A.13

NANOSIZE POWDERS OF REFRACTORY COMPOUNDS FOR OBTAINING OF FINE-GRAINED CERAMIC MATERIALS

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Most of ceramic materials are made from powders and therefore their properties depend to a large extent on the quality of the starting powders. The powder determines processing, sintering behavior and the subsequent formation of the microstructure, which strongly influences many properties of the dense materials. One of the ways for production of ceramic materials with a fine-grained structure is the application of nanopowders. Different methods are used for production of nanopowders. One of them is the method of plasmachemical synthesis. Different nanopowders of refractory materials can be obtained by this method. Preparation of nanosized powders of nitrides and oxides and their composites by the method of plasmachemical synthesis, their characteristics and the possible advantages of nanopowders were investigated.

P.S.A.14

SOL-GEL ELABORATION AND OPTICAL FEATURES OF Eu^{3+}-DOPED CdS NANOCRYSTALS IN SiO_2

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In the last decade, encapsulation of nanocrystalline semiconductors doped with rare earth ions into transparent matrices has received attention due to their applications in the field of non-linear optics and optical switching.

One main interest of these materials, besides the narrow emission lines of the luminescent species, lies in the modulation of the optical response as a consequence of the quantum size effect.

Eu^{3+}-doped CdS nanocrystals embedded in a SiO_2 matrix is presented in the literature as a promising material for these applications. In this work, the samples were synthesised through s*ol-gel* method since this method confers a great chemical homogeneity, and allows the *in-situ* generation and controlled growth of the CdS nanocrystals within the silica glass. The influence of the sol-gel conditions on the Eu^{3+} optical response has been investigated and will be presented at the conference.

Among the results one can emphasized:

(i) The synthesis conditions can be varied to modify the structure of the material, i.e., the dispersion of the rare earth ion, the size of the CdS nanocrystals within the silica matrix.

(ii) There is some relationships between the synthesis conditions, the structure and the optical properties of the material.

(iii) From the optical analysis: there is an energy transfer from CdS nanoparticles to Eu^{3+} ions but also a back transfer. This has been confirmed from the accurate analysis of the decay curves and the absorption and excitation features.

P.S.A.15

REDUCTION OF NANOMETRIC MAGNETITE POWDER

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The iron oxide powders can be reduced up to pure Fe. In the second step, reaction of Fe powder with water leads to the hydrogen releasing. The process could be of great interest for the new concept of hydrogen production and storage. Nanometric magnetite powder was obtained via electrochemical process at room temperature, by using low-carbon steel plates as electrodes immersed in NaCl solution. High-temperature reduction through isothermal heating of the starting nanometric magnetite powder was conducted in the temperature range from 600 K to 690 K. XRD phase identification and SEM particle size and shape examination of both starting powders and those obtained after their thermal treatment were performed. Magnetic and electric properties of the synthesized powders and their changes during heating were established. Mentioned changes were correlated with the reduction level of the magnetite phase.

P.S.A.16

STRUCTURAL CHARACTERIZATION OF Nb AND La DOPED NANOSTRUCTURED TITANIA POWDERS AND COATINGS

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Nanostructured titania is very atractive semiconducting materials because its excellent properties and have widely possibilities of applications in optical and electronic devices, solar cells, gas sensors, photocatalysis etc. Rutile is the most stable and the most studied phase of titania, but for many applications anatase displays more interesting properties, quite different from rutile. Since anatase is more suitable than rutile for monitoring some gases, and photodegradation pollutants, it is necessary to stabilize anatase phase at higher temperatures and hinders its transformation to rutile. The aim of this study was the investigation of effects of type and concentration of a dopant and the heat treatment conditions on anatase stabilization, as well as on its average grain size, surface area, pore morphologies, as predominant factors for its performances. Nanocrystalline titania powders and coatings undoped and doped with different at% of Nb and La, have been obtained by sol-gel method. Powders were subjected to different temperature treatments from 450°C to 660°C. Coatings were deposited on alumina substrates by dip technique and undergone to several heat treatments, between 500°C and 800°C. All powders and coatings are nanocrystalline with average grain size less than 50 nm. The thickness of all coatings is less than 1 μm. In La-doped coatings, anatase is remarkably stabilized at 800°C, while in Nb-doped coatings anatase is stable at 710°C. Compared to coatings, powders are much more sensitive to the temperature, so rutile is present in all samples already at 450°C.

P.S.A.17

SYNTHESIS OF $MgFe_2O_4$ NANOPARTICLES BY MECHANOCHEMICAL PROCEDURE

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Magnesium ferrites are ones of the most abundant members of the soft magnetic materials. In the last few years, the interest for new methods of their preparation increases, because it is well known that the physical and chemical properties of these materials strongly depend on the preparing conditions. Powder samples of soft ferrites of $MgFe_2O_4$ were synthesized by planetary ball mill synthesis. The influence of long-term milling of a mixture of MgO-α-Fe_2O_3, $MgCO_3$-α-Fe_2O_3, $Mg(OH)_2$ - $Fe(OH)_3$ and $Mg(OH)_2$-α-Fe_2O_3 powders in a planetary ball mill on the reaction synthesis of nanosized $MgFe_2O_4$ ferrites was studied. Mechanochemical reaction leading to formation of the $MgFe_2O_4$ 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 all samples. The synthesized $MgFe_2O_4$ ferrite has a nanocrystalline structure with a crystallite size less then 100 nm. Results were compared with the $MgFe_2O_4$ sample, made by chemical method, from complex compounds with acetylacetonato-ligands.

P.S.A.18

MECHANOCHEMICAL SYNTHESIS OF ZnO AND ZrO_2 NANOPARTICLES AND INHIBITING EFFECT OF $CaCl_2$ AND NaCl ON PARTICLE AGGLOMERATION

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Zinc oxide has a wide range of applications including functional devices, catalysts, pigments, optical materials, cosmetics, UV-absorbers and additives in many industrials products. Zirconia based ceramics are widely used both as structural and functional materials in technical applications.

Mechanochemical processsing involves the mechanical activation of solid-state displacement reactions at low temperatures in a ball mill. In the case of ZnO the starting materials were $ZnCl_2$ and $Ca(OH)_2$. Milling of precursors leads to formation of $Zn(OH)_2$ within a solid, inert matrix $CaCl_2$. After milling, the powder was calcinated in air at 400°C for 8h to decompose $Zn(OH)_2$ into ZnO. Removal of $CaCl_2$ was carried out by washing the powder with etanol using a centrifuge.

Mechanochemical reaction of $ZrOCl_2{\cdot}8H_2O$ and NaCl has been used to sinthesize nanocrystalline powder of ZrO_2. Starting powders were mixed in the stoichiometric ratio. Reactant mixture was milled using a panetary ball mill. Milling times ranged from 15min to 4h. The milled powder was annealed at 400°C for 1h. Removal of NaCl was carried out by washing the powder with deionised water using a centrifuge.

Powders caracterization was preformed using X-ray diffraction method (XRD) and scanning electron microscopy (SEM).

P.S.A.19

ADSORPTION OF SOME WEAK ORGANIC ELECTROLYTES FROM AN AQUEOUS SOLUTION ON SILICA

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The adsorption of organic electrolytes from aqueous solutions on various adsorbents has been frequently investigated because of its importance for water purification. Phenol and substituted phenols are very common contaminants of water. In this paper, the results of the adsorption of some weak organic electrolytes (Hydrochinon, Phloroglucin and Acidum Gallicum) from an aqueous solution on silica are presented. The adsorption of the organics was investigated by the batch method. Effects of the solution pH (in the range 2-10) and concentrations of these compounds on the adsorption were investigated. In the case of acidum gallicum, adsorption isotherms (in the pH range 2- 6) were determined. The obtained results indicate that the amount of adsorbed acidum gallicum increases with its increasing concentration. The maximum adsorption was recorded at pH = 2-3 (pH value equal to the pH_{pzc} of SiO2) with acidum gallicum molecule being undissociated (pKa = 4.41). The experimental data were fitted with different models of adsorption isotherms. The maximum amount of acidum gallicum adsorbed, as well as the constants of adsorption process were calculated.

P.S.A.20

COLLOIDAL PROCESSING OF TIRON STABILIZED ALUMINA SUSPENSIONS

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It has been well recognized that colloidal ceramic processing, which is composed of the dispersion of the starting powder in a liquid media to make a suspension and its subsequent consolidation, is superior to conventional dry pressing in the control of density and microstructure of the sintered compacts. Efficient deaglomeration and dispersion of the ceramic powder is crucial for minimizing defects. To obtain a ceramic suspension with high solid content that can be successfully processed, low viscosity must be achieved and stability must be maintained. This requires efficient dispersants; therefore, a good knowledge of the stabilizing mechanisms in ceramic suspensions is of critical importance.

In this research, Tiron was used as dispersant for the preparation of stable alumina aqueous suspensions. The effect of dispersant concentration and pH on the rheological behavior of the suspensions and properties of slips, obtained by pressure filtration, was studied. Alumina suspensions were prepared in acidic and basic pH region. Alumina content varried from 60-80 mass %, whereas, the amount of Tiron added ranged from 0 to 1.5 dmb % (dry mass basis of the powder). Homogenization of the suspension was done by ball milling. Rheological behavior of the colloidal suspensions was studied using controlled shear rate viscosimetry. Consolidation of the suspensions was performed via pressure filtration at 5 MPa in an experimental set-up. Microstructure of the green cast bodies was studied by scanning electron microscopy and mercury porosimetry. Rheological study has shown that stabilizing mechanism in the Tiron-alumina suspensions, although all of them exhibit shear thinning behavior, differs remarkably in respect to the suspension pH. The optimum powder dispersion to achieve the greatest suspension stability, occurs in the basic region, at pH 9. Therefore, it is possible to prepare basic alumina suspensions with 80 mass% and viscosity less 5 Pas at $1s^{-1}$. The recommended amount of Tiron in order to obtain minimum viscosity is 0.5 dmb %. On the other hand, stable acidic suspension allow up to 60 mass % solid loading at higher Tiron amount, 1.5 dwb %. Structural analysis of green cast bodies has proved the advantages of wet consolidation route. Uniform microstructure without significant deffects, as well as narrow pore size distribution was found in all samples. However, the highest solid content provided for the best particle packing with the smallest pore radius in the range from 0.032 to 0.064 μm.

P.S.A.21

EXPERIMENTAL AND THEORETICAL CHARACTERIZATION OF THE 3D-DOPANTS BIAS ON THE H DESORPTION OF Mg HYDRIDES

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Magnesium-based materials are promising systems for hydrogen storage applications and a number of studies have been carried out to improve their performances. A crucial point is their absorption/desorption kinetics. As it was already reported, milling and mechanical alloying are common methods to achieve nanostructures. In order to enhance the H kinetics, a variety of additives have been suggested, such as 3d metals, 3d-metal oxides and intermetallics.

In the present work both experimental and theoretical approaches are used to characterize the H absorption/desorption features of Mg composites in presence of transition metals Ti, Ni, Fe and Co. The experimental samples are obtained by ball milling, performed under Ar, using stainless steel vial and balls. X–ray diffraction spectra is obtained with Cu-Kα radiation and graphite monochromator. Morphological characterization is carried out by a scanning electron microscope equipped with energy-dispersive spectrometry and H-desorption measurements are performed by a differential scanning calorimeter.

Extensive electronic structure calculations, based on the density-functional theory, are used to characterize the equilibrium properties and the behavior under pressure of MgH_2. Subsequently, we compute both relaxed structures and solution energies of substitutional solid solutions for several 3d metals (Fe, Ni, Ti, Al, Pd, Co, etc.) in MgH_2. The good correlation between theoretical solution energies and experimental desorption temperatures reveals a general trend in these systems. Few notable exceptions can be detected. These latter can be explained in terms of peculiarities in the experimental composite microstructure.

P.S.A.22

INFLUENCE OF TRIBOPHYSICALLY ACTIVATION ON MASS CHANGES OF CORDIERITE DURING SINTERING PROCESS

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Cordierite, $2MgO\cdot 2Al_2O_3\cdot 5SiO_2$ is very attractive ceramic material due to its properties. In the aim of researching the possibilities of sintering temperature decreasing, the starting components have been tribophysically activated. Mass changes of the examined cordierite mixture samples were followed by TG-analysis as a function of activation time, during the process of sintering. The research showed that mass-loss of the samples increases with tribophysical activation time increasing. The approximate model was used to analyze the stability level of investigated system.

P.S.A.23

EXPERIMENTAL SPRAY POWDERS PRODUCED FROM USED HARDMETAL BY VARIOUS MECHANICAL METHODS

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The goal of this work was to produce spray powders by using used hardmetal (WC-Co) as a raw material. Used WC-Co powder was obtained mechanically by a disintegrator process from tungsten carbide throw-away inserts. Main efforts were made to achieve spray powders which properties are comparable with commercial ones. The main advantage is the usage of used hardmetal; firstly, it contains W which is expensive with growing demand material and secondly, it is a method for recycling it. Powders there produced by the mechanical methods involving mixing, sintering, crushing, plating/agglomerating in a ball mill, attrition mill and disintegrator. Chemical composition and morphology of powder particles was studied by energy-dispersive X-ray mapping technology, SEM and Omnimet Enterprise Image Analysis System. The granularity of produced powders was analysed by a laser diffraction analyser Analysette-22 compact, also sieve analysis were used. Produced powders were sprayed by TAFA HVOF system JP-5000.

P.S.A.24

THE LOW TEMPERATURE AEROSOL SYNTHESIS OF YAG:Ce $^{3+}$ NANOSTRUCTURES: COMPARATIVE STUDY OF THE XRPD MICROSTRUCTURAL PARAMETERS

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The objective of this work is to present the results of the comparative analysis for the YAG:Ce^{3+} microstructural parameters obtained from x-ray powder diffraction (XRPD) data using Fullprof and Koalariet-XFit programs. Both programs are based on Rietveld method of structural refinement where fitting is done by convolution and corrections of peak width for instrument broadening through either using the reference specimen (Fullprof) or the fundamental parameters approach (Koalariet-Xfit). YAG:Ce^{3+} powder is obtained *via* low temperature aerosol route at 320^{0}C followed with post annealing treatment at 900 and 1000^{0}C. Chosen technique of synthesis, i.e. ultrasonic spray pyrolysis, provides the generation of spherically shaped and submicronically sized particles having composite nanostructure. Besides targeting cubic garnet structure $Y_3Al_5O_{12}$ (YAG), the presence of either perovskite $YAlO_3$ (YAP) or monoclinic $Y_4Al_2O_9$ (YAM) phase is detected, as well. Since garnet phase represents a very promising host phosphor material being doped with rare-earth ions, the most important criteria determining its applicability in various optical devices is the uniform distribution of the luminescent center in the host lattice as well as the cubic YAG phase crystallinity. Comparison of data obtained for the same samples through usages of the above mentioned XRPD analyses give us insight of the validity of the refined parameters. It was shown that determined differences in microstrain and crystallite size are related to the anisotropy feature of analysed microstructural data.

P.S.A.25

RAPID SYNTHESIS AND CHARACTERIZATION OF $Li_{1+x}Cr_yMn_{2-x-y}O_4$

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$LiMn_2O_4$ spinel is very promising cathodic material for ion-lithium batteries because it delivers voltage of 4V, good initial capacity, low cost and it is non toxic material. Synthesis of spinel $LiM_xMn_{2-x}O_4$ in which some Mn ions are substituted by other metal cations enable lower decrease capacity. In this work powder materials $LiCr_{0.15}Mn_{1.85}O_4$ and $Li_{1.05}Cr_{0.10}Mn_{1.85}O_4$ are prepared by rapid glycine-nitrate method. The results of the final Rietveld refinement is lattice parameter a = 8.2338 Å for $LiCr_{0.15}Mn_{1.85}O_4$ and a = 8.2095 Å for $Li_{1.05}Cr_{0.10}Mn_{1.85}O_4$. SEM micrographs of obtained powders show that average particle size of prepared powder materials is below 500nm. $LiCr_{0.15}Mn_{1.85}O_4$ shows initial discharge capacity of 110 mAh/g and after 50 cycles discharge capacity decreases to 91 mAh g^{-1}. $Li_{1.05}Cr_{0.10}Mn_{1.85}O_4$ shows initial discharge capacity of 85 mAh/g and after 50 cycles discharge capacity decreases to 84.7 mAh/g.

P.S.A.26

EFFECT OF HEAT TREATMENT ON THE FORMATION OF ε-Fe_2O_3 PHASE FROM HEMATITE NANOPARTICLES IN SILICA MATRIX

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Hematite nanoparticles in silica matrix with Fe/Si molar ratio of 0.6 was prepared by the sol-gel method. Final heat treatment of the samples was carried out at different temperatures in the 200-1000 ˚C range. The so-obtained samples were characterized by x-ray powder diffraction, transmission electron microscopy and magnetic measurements. Transmission electron microscopy revealed broad size distribution of nanoparticles ranging 5-20 nm. X-ray diffraction confirmed the presence of the hematite phase for the samples that were heat treated at temperatures up to 700 ˚C. Their zero field magnetization curves exhibit a broad maximum at around 60 K while the zero field and field curves remain separated until temperatures up to 350 K, indicating broad size distribution. For high temperature heat treated samples above 700 ˚C, the analysis of the magnetic properties indicate the formation of ε-Fe_2O_3 phase which exhibits a large coercive field at room temperature.

P.S.A.27

DENSIFICATION BEHAVIOUR OF NANO-SIZE CEO$_2$

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A nano-size CeO_2 powder has been synthesized by modified glycine nitrate process (MGNP). The synthesized powder has been characterized with X-ray diffraction (XRD), the Brunauer Emmett Teller (BET) method and transmission electron microscopy (TEM). The lattice parameter and crystallite size have been obtained by Rietveld refinement of X-ray diffraction patterns. The shrinkage kinetics of the green body has been continues monitored in air and oxygen atmosphere using a high temperature dilatometer up to 1500°C. During the high temperature sintering in air process a redox reaction occurred (Ce^{4+} was partially reduced to Ce^{3+}, and oxygen gas was released). The redox reaction influenced the sintering behaviour of CeO_2, resulting in a decrease in density. On the basis of shrinkage kinetics data in oxygen atmosphere a master sintering curve for CeO_2 has been constructed. Using the concept of the master sintering curve the densification behaviour in oxygen atmosphere has been successfully predicted from early to final stages of sintering.

P.S.A.28

FURTHER DEVELOPMENT IN KINETICS MODEL OF SiO$_2$ DISSOLUTION IN NaOH AQUEOUS SOLUTION - I

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Silica dissolution in aqueous NaOH, according to the ratio $SiO_2/Na_2O=2$, is a complex process at elevated temperatures and high pressure. It is of very important to develop adequate mathematical model, using which it is possible to predict the dynamical response of process parameters. In this work several kinetics models were developed, and afterwards compared with experimental results. Silica was assumed to be smooth spheres, which decreased in size, as dissolution proceeds. The influence of the particle size, the operating temperature and the hydroxide ion molality on the kinetic rate were studied. It is concluded that developed models are sufficiently corect, in engineering sense, and can be used for dynamical prediction of process parameters. It is certain that these models can be used to correlate the experimental data on dissolution.

P.S.A.29

FURTHER DEVELOPMENT IN KINETICS MODEL OF SiO_2 DISSOLUTION IN NaOH AQUEOUS SOLUTION - II

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The batch dissolution kinetics of SiO_2 particles in aqueous NaOH, according to the ratio $SiO_2/Na_2O=2$, was investigated at elevated temperatures and high pressure. It is concluded that development of adequate mathematical model is of mayor importance for prediction of dynamical response of process parameters. Several kinetics models were developed, within this work, followed by previous work, and afterwards compared with experimental results. The influences of SiO_2 particle diameter, working temperature and hydroxide ion molality on dissolving kinetics were investigated. It is concluded that developed models are sufficiently correct, in engineering sense, and can be used for dynamical prediction of process parameters. It is certain that these models can be used to correlate the experimental data on dissolution and for prediction of process parameters.

P.S.A.30

INTERACTION BETWEEN HYDROGEN MOLECULE AND THE WALL OF A CARBON NANOTUBE

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When hydrogen molecule comes to the nanotube wall, one of the following three events will happen: (1) reflection of molecule from the wall, (2) passing through and (3) moving nearby the wall. In series of numerical experiments, for different temperatures and different initial velocities of molecule, we have determined the probabilities of these events. In the prepared programme for numerical solving of the classical equations of motion, interaction between hydrogen molecule and C atoms is described by the Lennard-Jones potential. At the initial moment, the molecule placed far from the nanotube wall has velocity oriented to the wall. At this moment, C atoms are placed randomly around its equilibrium positions, with the amplitude corresponding to the assumed temperature. Thermal motion of C atoms yields different effects on the hydrogen molecule motion in repetitive numerical experiments for the same temperature. The complex motion of hydrogen molecule nearby the wall and reflection of molecule are possible for low initial velocity of molecule. If the initial velocity is large enough, passing through the wall and reflection are possible. For the same initial velocity of molecule, when temperature increases then probability of reflection increases too. For intermediate initial velocities, we get the reflection only. If hydrogen is inside of the carbon nanotube, results of our computation agree with the real experiment. At room temperature or lower one, hydrogen does not flow out of the nanotube. Such investigations may be of interest for storage of fuel in the carbon nanotubes.

P.S.A.31

KINETIC STUDY OF THE SYNTHESIS OF POLY(CARBOSILOXANE) AND ALKYL SIDE-CHAINS CONTAINING POLY(SILOXANE) BY HYDROSILYLATION

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Hydrosilylation, an addition reaction of ≡Si-H bonds to unsaturated, vinyl or allyl groups, has attracted considerable attention in silicon polymer chemistry. One of the preferred hydrosilylation catalysts is Pt-divinyltetramethyldisiloxane complex, Pt-DVTMDS, known as Karstedt′s catalyst. In this work Pt-DVTMDS catalyzed hydrosilylation reaction was successfully applied for the preparation of: 1) linear poly(carbosiloxane) from 1,3-divinyltetramethyldisiloxane and 1,1,3,3-tetramethyldisiloxane and 2) poly(siloxane) with alkyl side-chains, from poly(methylhydrosiloxane) and 1-decene. In order to investigate kinetics of both reactions, few series of experiments were performed at different reaction temperatures (from 25 to 64 °C) and with different catalyst concentrations (from $7.0 \cdot 10^{-7}$ to $3.1 \cdot 10^{-5}$ mol of Pt / mol of $-CH=CH_2$). Experiments were carried out in bulk, by reacting equimolar amounts of ≡Si-H and $-CH=CH_2$ groups. The course of each reaction was monitored by quantitative infrared spectroscopy, following the disappearance of the ≡Si-H band. Kinetic investigations showed behavior typical for the first order reactions.

P.S.A.32

TESTING OF CATALYTIC ACTIVITY OF POLYURETHANE SYSTEMS

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Polyurethane (PUR) systems were prepared from poly(butadiene)- and polyether-based polyols and from aliphatic and aromatic diisocyanates (isophorone diisocyanate, diphenymethane diisocyanate, etc). Aliphatic extenders or cross-linkers were also used in some cases. Commercially available amines (mainly tertiary amines, e.g. diethylenetriamine) and organometallic systems (e.g. dibutytin dilaurate) were tested as PUR catalysts. Dynamic mechanical thermal analysis (DMTA) was used as a powerful tool for comparing the materials prepared. Rheologic investigations make it possible to follow the network formation and to compare the effect of different catalysts used. The shear moduli in the rubber plateau give information about the crosslink density. Tensile and swelling properties of selected samples were also determined.

P.S.A.33

A TEMPLATING ROLE OF 3-METHYLAMINOPROPYLAMINE IN THE SYNTHESIS OF OPEN-FRAMEWORK PHOSPHATE-BASED MATERIALS

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Open-framework metallophosphates are of great interest due to the structural diversity but also due to their potential application in the sorption, separation and catalytic areas. Generally, these solids are formed under hydrothermal conditions. The hydrothermal crystallisation seems to be a promising route for producing inorganic solids with extended architectures since the composition and temperature of the reaction mixture can be varied over a wide range. Also, the presence of an organic amine in the reaction mixture has a crucial structure-directing role. Usually, these species exert structural specificity enabling inorganic moieties to connect themselves in a specific manner.

In this work we have investigated hydrothermal crystallization of several metallophosphates - zincophosphates, chromium phosphates, aluminophosphates and transition metal-substituted aluminophosphates, in the presence of 3-methylaminopropylamine (MPA). Until now this organic species has not been employed as a structure directing agent in the synthesis of open-framework phosphates.

The synthesis was carried out hydrothermally in poly(tetrafluoroethylene)-lined stainless-steel containers at 130-190 °C for 1-10 days. The products were filtered and washed with distilled water, then ultrasonically treated in order to remove amorphous impurities, and air-dried. The crystal morphology was examined by using JEOL 5800 SEM. Elemental analysis of the products was conducted by the inductive plazma emission spectroscopy (ICP). Carbon, hydrogen and nitrogen were determined by a standard C-H-N analyzer. Fourier transformed infrared (FTIR) spectra were recorded in the 4000 to 400 cm^{-1} range on a Digilab-FTS-80 spectrophotometer, using the KBr wafer technique. Thermogravimetrical analyses and differential scanning calorimetry (TGA and DSC) were performed using a Q-600 Simultaneous DSC-TGA instrument (TA Instruments) at a heating rate of 10 $^{o}C/min$ under a nitrogen flow. Crystallinity of the solids was examined by X-ray powder diffraction patterns using a Philips diffractometer PW 1710. Crystallization of zincophosphate and aluminophosphate solids yielded crystals suitable for single-crystal analysis. These data were collected on a Nonius Kappa CCD diffractometer using MoKα radiation.

Investigation showed that MPA exerts a different structure-directing role depanding mainly on the composition of reaction mixtures. A layered (2-D) zincophosphate and a 3-D aluminophosphate were obtained. In both cases, however, MPA strongly interacts with the phosphate-based frameworks.

P.S.A.34

FORMATION OF COPPER ELECTRODES WITH A VERY DEVELOPED SURFACE AREA BY ELECTRODEPOSITION

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The electrodeposition represents an excellent tool for the formation of metal deposits with a very developed surface area which can be successfully used as electrodes in electrochemical devices such as fuel cells, batteries and sensors. The basic characteristics which these electrodes should satisfy to be used for these purposes are: the open porous structure which enable rapid transport of gas and liquid, and the extremly high surface area which is desirable for electrochemical reactions. Formation of copper electrodes with the stated characteristics is the topic of this investigation. It will be shown that copper deposits with the extremely high surface area are obtained at high overpotentials at which copper electrodeposition process was competitive with the process of hydrogen evolution. The obtained copper deposits were denoted as honeycomb like structures.

P.S.A.35

THE FORMATION OF NANOCRYSTALLINE STRUCTURE IN AMORPHOUS $Fe_{80}B_{20}$ ALLOY BY SEVERE PLASTIC DEFORMATION.

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The structure evolution of melt-spun amorphous alloy $Fe_{80}B_{20}$ under high pressure torsion at room temperature and 200^0C has been studied. The formation of nanocrystalline structure in this alloy by usual annealing is unknown. The structure, morphology and size of nanocrystals were studied by transmission electron microscopy and X-ray diffraction. The nanocrystalline structure was found to form mainly inside the shear bands at room temperature. The distribution of nanocrystals formed at 200^0 C is more uniform. The size of obtained crystals is 5-10 nm. Specific features of the structure are discussed. The financial support of the Russian Science Support Foundation and RFBR (project 06-02-16677) is gratefully acknowledged.

P.S.A.36

FABRICATION OF SIC BY CARBOTHERMAL-REDUCTION REACTIONS OF SEPIOLITE

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In this paper the possibility of using sepiolite as Si precursor for low temperature synthesis of silicon carbide (SiC) by carbothermal-reduction reactions was studied. A sepiolite of Serbian origin and carbon (from various precursors) as reducing agent were used. The green bodies with various C/SiO_2 ratios were carbonised at 1073K and heat-treated at 1673K in controlled Ar flow atmosphere. Phase evolution, phase content and weight loss were followed as a function of C/SiO_2 ratio and carbon origin. Starting materials and products have been characterized by means of XRD and SEM investigations. The results show that sepiolite can be very effective source for obtaining of silicon carbide powders.

P.S.A.37

THE EFFECT OF THERMO-MECHANICAL PROCESSING ON THE PROPERTIES OF SOME Al-Fe-Si ALLOYS WITH HIGH Fe/Si RATIO

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The paper deals with the effects of the thermo-mechanical processing parameters on the properties of two Al-Fe-Si foil's alloys. Two twin roll cast alloys with high Fe/Si ratios (≈6) were processed under different combinations of homogenization, deformation and annealing treatments. The influence of the small additions of manganese on the mechanical behaviour, plastic anisotropy and formability of sheets in hardened and annealed tempers is described. Corrosion resistance of tested sheets in chloride ambience is also presented, because this type of Al foils is dominantly used in packaging (food) industry and heat exchangers.

P.S.A.38

MATHEMATICAL MODEL FOR MICROSEGREGATION OF Al-Cu5wt.%-Mg ALLOYS

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In this paper, model for microsegregation of ternary Al-Cu5wt.%-Mg alloys with considering of diffusion in primary phase is presented. Results of numerical analysis are compared with appropriate experiments. The model calculates composition profiles of Cu and Mg in primary phase and takes into account diffusion in solid phase due to the compositional gradients. Microsegregation is well known phenomenon and occurs on micro scale (scale of dendrites) during the solidification. It usually cause non – uniformity in composition of alloying elements in solid phase. In the following, this conditions cause non-uniform physical and mechanical properties of final alloy. Understanding of microsegregation is essential for controlling solidification process in order to achieve better control of heat treatments and optimum material properties[1,2].

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P.S.A.39

DISTRIBUTION Zn DURING THE CRYSTALLIZATION $Al(OH)_3$ FROM CAUSTIC SODA SOLUTION

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During the crystallization $Al(OH)_3$ from caustic soda solutions several phenomena occurs simultaneously: agglomeration, nucleation and growth of $Al(OH)_3$ crystals. These processes determine the physical-chemical characteristic of precipitated $Al(OH)_3$. Presence of impurities (organic and inorganic) in the caustic soda solution has the great influence on the mentioned phenomena, and so on the characteristics of precipitated $Al(OH)_3$.

In this paper we have investigated distribution of Zn during the crystallization $Al(OH)_3$ from synthetic caustic soda solution. Experiments have carried out at the different conditions and seed grain size. Synthetic solutions concentration of 155 g/l $Na_2O_{(c)}$, (prepared from pure Al (99.999%) and NaOH) are used for investigation of crystallization process. Experiments were performed at the temperature of 60^0, 65^o and 70^o C, mass ratio 1.05 and seed ratio 0.5.

Distribution of Zn in the crystallization of $Al(OH)_3$ as well as in the precipitated $Al(OH)_3$ is obtained on the basis chemical, microstructure and grain size analysis.

Influence of Zn on the phenomena of crystallization process, exactly on the agglomeration and $Al(OH)_3$ growth processes, is investigated as well.

P.S.A.40

THE THERMAL PROPERTIES OF NANO-SIZED $KClO_4$

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This paper describes the effect of heating rate and particle size on the critical temperatures of potassium perchlorate($KClO_4$). On the basis of results, these critical temperatures comprise of melting point, transformation and decomposition temperatures shift to higher values, while the heating rate is increased. Results show that the particle size has an important role in critical temperature of $KClO_4$. With decrease of particle size, the effect of heating rate on the critical temperature is decreased. The effect of heating rate was negligible, when the average of particle size reached to 100nm. In this investigation the differential thermal analysis (DTA) was used to determine the critical temperatures. The ball milling was used to decrease of $KClO_4$ particle size.

P.S.A.41

USE OF MICROBIOLOGICAL METHODS IN IMPROVEMENT OF PETROLEUM CHARACTERISTICS FOR REFINERY PROCESSING

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In purpose to make improvement of petroleum characteristics for refinery processing (removing paraffins), the simulation experiments of biodegradation were conducted with the biomass suspension and crude oils. Two types of crude oils have been treated with bacterial cultures. Sirakovo oil (Sir), as a sample of paraffinic type, and Velebit oil (Ve), oil as a sample of naphthenic type, were investigated. Degradation process was performed with two kinds of substratum (inorganic "KNOP", and organic "BUJON") and on light and in darkness. After a three months period organic substance was extracted by means of chloroform. In the extracts the group composition was determined. *n*-Alkanes and isoprenoid aliphatic alkanes in the aliphatic fractions, were analyzed using gas chromatography (GC). Total isoprenoid aliphatic alkanes and polycyclic alkanes were analyzed by GC-MS. Obtained results have shown that experiments performed on daylight and with inorganic "KNOP" gave the best degradation results for *n*-alkanes (unwelcome for refinery processing) and isoprenoids (desirable compounds). Organic "BUJON" substratum on light gave very good results only for unwelcome *n*-alkanes.

P.S.A.42

MODELING OF ACID ACTIVATION ON LOCAL BENTONITE

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The content of Fe_2O_3 obtained after leaching of bentonite clay from the location of Bogovina, with HCl acid has been studied by statistically designed experiments. The effects of relevant factor, such as temperature, leaching time, acid normality, solid – to – liquid ratio, stirring rate, on leaching yield of Fe_2O_3 have been investigated. Experiments have been planned by factorial design and orthogonal central composite design methods.

Conventional and classical methods of studying a process by maintaining other factors involved at an unspecified constant level does not depict the combined effect of all the factors involved. This method is also time consuming and requires a number of experiments to determine optimum levels, which are unreliable. These limitations of classical method can be eliminated by optimizing all the affecting parameters collectively by statistical experimental design.

P.S.A.43

COMPARATIVE VALUES OF LINEAR AND VOLUME SHRINKAGE OF PRODUCTS DURING DRYING AND FIRING ON THE BASIS OF ILLITE-KAOLINITE CLAYS DEPENDING ON THE MINERAL CONTENT

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Illite-kaolinite clays, besides illite and kaolinite minerals, usually contain also α-quartz, Fe_2O_3, $CaCO_3$. This content of raw material has also influence on different values of linear and volume shrinkage during drying to the constant mass in air and in dryer, at the same conditions of raw materials preparation, as well as on different values of product shrinkage during sintering process. Depending on the sintering temperature, mineral content of illite-kaolinite clays causes solid state reactions, polymorphic transformations, formation of liquid phase. New crystal phases, i.e. compounds formed in solid state reactions during sintering process, are determined by firing regime as well as by mineral content of illite-kaolinite clays.

In this paper two types of illlite-kaolinite clays (marked as "PV" and "BP") were used for the formation of specimens. The samples were formed by plastic shaping in a mould corresponding to a parallelepiped with the following dimensions 7.7cm x 3.9cm x 1.6cm. The clay characterisation was performed by mineral content determination using x-ray analysis, chemical content determination and granulometric analysis for determination of granulometric content. The samples were fired at the temperatures of 800ºC, 900 ºC, 1000 ºC, 1100 ºC and 1200 ºC.

The investigation results demonstrate that the values of linear and volume shrinkage during drying to the constant mass in air and in dryer and during sintering process are determined by firing regime as well as by mineral and chemical content of illite-kaolinite clays.

P.S.B.1

CURRENT STATES IN WIDE SUPERCONDUCTING FILMS

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The temperature dependences of the current-voltage characteristics of high-quality thin films of tin from 7 to 50 micron thick are investigated in the absence of external magnetic field. For the first time we have experimentally observed phase slip centers (PSCs) and phase slip lines (PSLs) on the same superconducting tin film with known parameters in the temperature intervals corresponding to the mechanisms of their formation and existence. We have shown that the states of a wide film with increasing transport current appear in the following order: the superconducting state for current less then critical; the resistive vortex state for current more then critical, but less then maximum current for the uniform flux flow (instability current); the critical state due to the onset of instability of the steady pattern of viscous motion of the vortices; a vortex-free resistive state with PSLs for current more than instability current, but less then the upper critical current; the normal state at a current higher than the upper critical current.

P.S.B.2

PLASMON-TWO PHONON INTERACTION IN PbMnTe AND PbTeS ALLOYS

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In this work far-infrared spectroscopy in a wide temperature range were used to investigate the vibration properties of $Pb_{1-x}Mn_xTe$ ($x \leq 0.12$) and $PbTe_{1-x}S_x$ ($x \leq 0.05$) single crystals. In analysis of experimental results we are going to use dielectric function that in advance takes into account the existence of plasmon-two phonon interaction. As a result of the best fit we obtain the three frequencies of coupled modes, and than calculated the values for two LO modes and ω_P. We found that the phonons in $PbTe_{1-x}S_x$ show the two-mode behavior (each TO-LO mode pair for the end members degenerates to an impurity mode). In the case of $Pb_{1-x}Mn_xTe$ we registered very interesting situation: if the Mn made impurity mode above the top of the optical band of PbTe (ω_I=190cm^{-1}), we registered two-mode behavior; if Mn give us so call "in band" mode (ω_I=53cm^{-1}) we have intermediate one-two-mode behavior (LO-mode frequency shift continuously from PbTe to MnTe, while the other modes resemble two-mode case).

P.S.B.3

BIPOLAR VIBRATIONAL MODES IN SPHERICAL CdS QUANUM DOTS

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Quantized dipolar modes in a spherical CdS quantum dot (QD), which make a polar isotropic material, are considered in the framework of continuum model. As to the mechanical boundary conditions rigid sphere is concerned (u=0 at the surface). The phonon related polarizability of single CdS QD and average dielectric function of composite containing QDs of one dimension are calculated. The effect of QD dimension and concentration to effective dielectric function are analyzed. Experimental far-infrared reflection and absorption spectra are discussed in the frame of results of this calculation

P.S.B.4

ELECTRON ATTACHMENT TO METALIC CLUSTERS

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The calculations of the low-energy attachment cross section to metallic clusters are investigated. Low energy electrons are taking as slow enough to excite a giant dipole collective resonance within the cluster. The calculations are more refined than earlier calculations – they don't depend on the experimental date and we improved RPAE calculation of the collective resonance in the cluster. The results are interested in the nano region and for designed new materials.

P.S.B.5

3D-SIMULATION MODEL OF RADIATION AND COLOUR CENTERS IN SOLIDS

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Mathematical and simulation approach for study of dynamic properties of unit colour and radiation defects or clusters in solids were proposed this communication. Change of electronic structure on distance of defect – environment and defect - defect interaction were studied in detail. Results of simulation of the electronic structure of unit centers and clusters were compared to experimental and theoretical data of study of properties micro- and nano-sized samples of oxides.

Separate data were discovered for 3D-simulatiion of luminescence properties of novel anti-Stoks materials.

P.S.B.6

SYNTHESIS OF MgO WHISKERS ON METAL-COATED SUBSTRATES BY THE EVAPORATION OF MgB_2 POWDERS

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Magnesium oxide (MgO) has been an exceptionally important material for use in catalysis, toxic waste remediation, as additives in refractory, paint and superconductor products. Furthermore, MgO is a typical wide bandgap insulator, and thus its electronic and optical properties of bulk MgO have been investigated. One-dimensional (1D) nanostructures have enhanced physical properties due to their decreased size, increased surface-to-volume ratio, and the novel morphologies, making them attractive materials with many possible applications. Accordingly, several researchers have paid attention to the 1D MgO nanostructures.

In the present work, we demonstrated the production of MgO rods or whiskers on metal-coated substrates by thermal evaporation of MgB_2 powders. X-ray diffraction and high resolution electron microscopy coincidentally indicated that whiskers were single-crystalline cubic structure of MgO. The photoluminescence spectrum under excitation at 325 nm showed a broad band with a prominent emission peak around 435 nm.

P.S.B.7

EFFECT OF Eu DOPING ON MAGNETIC PROPERTIES OF $Ge_{1-x}Mn_x$ Te

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Interesting possibilities of application gives co-occurrence of ferro-electric and ferromagnetic properties. Material which possesses such unique properties is GeMnTe. It is well known, from early 70's, that even a small admixture of MnTe in GeTe leads to a ferromagnetic behavior [1]. GeMnTe crystallizes in the NaCl structure. The rhombohedral distortion is observed for $x = 0{:}00$ to $x = 0{:}18$. Ge1MnTe is a strongly degenerate semiconductor with 10^{20}-10^{21} cm^{-3} holes. The source of ferromagnetism is the RKKY interaction. The Curie temperature depends on both the Mn content and the carrier concentration and its highest reported value (for $x = 0{:}6$) does not exceed 160 K. In the present paper, the preliminary results of studies of quaternary GeMnEuTe system will be presented. We investigated Bridgman method grown crystals with Mn content about 0.07 and Eu content equal 0.04. X-ray investigation revealed that the samples are single-phase and showed that the crystal is rhombohedrally distorted with a lattice constant $a_o = 5{:}9754$ Å and rhombohedral distortion angle = $88{:}37^o$. The Curie temperature obtained for GeMnEuTe system substantially exceeds the values of TC reported in GeMnTe crystals and layers with similar composition, i.e. approximately 40 K. The origin of this substantial Curie temperature enlargement is not fully explained yet. One of the hypotheses assumes that the addition of Eu ions into GeMnTe can block a creation of antiferromagnetic Mn–Mn pairs, which presence decreases the Curie temperature. Anyway, the increase of TC seems to be too large to be explained by the above hypothesis. The result of nuclear magnetic resonance studies may shed some light on the observed anomaly. The spin-echo resonance does not correspond to the anticipated position of Mn^{2+} ion, but occurs at lower frequencies. This may suggest that the system is in a mixed valence state and that an additional channel of interaction between magnetic ions is open.

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P.S.B.8

SURFACE PROPERTIES OF BORON ION IMPLANTED GLASSY CARBON

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A study has been made in the attempt to modify glassy carbon (GC) by boron (B^{3+}) ion implantation. B^{3+} ion implantation into GC was performed at energy of 50 keV at the dose of 5×10^{16} ion/cm^2 at room temperature. TRIM-98 Calculation Code showed that maximal penetration depth of B^{3+} was 0.3 μm from the surface of implanted glassy carbon (GCB-i). The amount and the stability of surface oxygen groups of GCB-i were examined using temperature programmed desorption (TPD), by monitoring desorption of CO and CO_2. Results showed that implanted boron affects the desorption peaks. Peaks are shifted towards higher temperature and the total area under each curve is enlarged, suggesting the increased thermal stability as well as the enlarged amount of the oxygen groups on the GC surface after ion implantation.

P.S.B.9

MONTE CARLO CALCULATION OF X-RAY DEPOSITED ENERGY IN CdZnTe DETECTOR

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CdZnTe detectors have been employed in diagnostic x-ray spectroscopy. This paper presents Monte Carlo calculation of x-ray deposited energy in CdZnTe detector for different energy of photon beam. In incident photon direction, the distribution of absorbed dose in detector is determined. On base the detector response in dependence of thickness changing, about deviation of material characteristics is concluded. Results of numerical simulation suggest that CdZnTe detector could be suitable for X-ray low energy.

P.S.B.10

CHARACTERIZATION OF TARGET MATERIAL FOR X-RAY GENERATOR BY MONTE CARLO METHOD

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The use of different target materials for X-ray generator is subject of engineer's practice and investigation. This paper presents the application of Monte Carlo method for simulation of electrons transport through material of the anode, where they are slowed down resulting in the production of bremsstrahlung radiation. The aim is restitution and demonstrating of numerical technique for characterisation of target material by means of the X-ray spectrum. A knowledge of the X-ray spectrum is required in order to understand the various stages in the production of diagnostic image, with the aim of reducing patient dose and optimising image quality. Upgrading of calculation methods originates the improving of design of X-ray tube components.

P.S.B.11

ION IMPLANTATION INDUCED MODIFICATIONS IN REACTIVELY SPUTTERED Cr-N LAYERS ON Si SUBSTRATES

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Chromium-nitride layers are interesting as hard coatings, wear and corrosion protection materials. Various methods were investigated for their deposition, synthesis and modification. Here we present the possibilities to modify the structure of these layers by ion implantation. Cr-N layers were deposited on (100) Si wafers by reactive ion sputtering, to a thickness of 200 nm. In order to study the influence of ion implantation we have used ions of different mass and energy, nitrogen and argon, and different ion fluences. Nitrogen ions were implanted at 80 keV, and argon ions at 120 keV, to 1-15x10^{15} ions/cm^2. The ion energy was selected to keep the projected range of the ions within the deposited layers, to avoid interface mixing of the layers with the Si substrates. The beam was scanned homogenously on an area of 2x2 cm^2, and the current was maintained at ~ 1 A/cm^2, in order to prevent beam-heating of the targets. Structural characterization of the samples was performed by cross-sectional transmission electron microscopy, x-ray diffraction, and Rutherford backscattering spectrometry. Ion implantation induces deposition of energy and numerous atomic collision cascades in a target material, which can significantly influence the resulting layer structure. In this study we will present the results of microstructural changes in the layers as a function of irradiation parameters.

P.S.B.12

MICROSTRUCTURAL CHANGES IN TiN THIN FILMS INDUCED BY ION IMPLANTATION

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A study of the microstructural changes in TiN films induced by implantation of nitrogen or argon ions is presented. Titanium nitride thin films were deposited by reactive ion sputtering from a 99.9% Ti target, with an argon ion beam in a nitrogen ambient. The base pressure in the chamber was ~ $2x10^{-6}$ mbar, N_2 partial pressure $3x10^{-4}$ mbar, and Ar partial pressure $1x10^{-3}$ mbar. The films were deposited on (100) Si substrates, to a thickness of 200 nm, at a rate of ~ 7 nm/min, at ambient temperature. After deposition the films were implanted with 80 keV nitrogen ions or 120 keV argon ions, to the fluences from $1\text{-}15x10^{15}$ ions/cm^2. The ion beam was uniformly scanned over an area of 2x2 cm^2 on the target, and the beam current was held at ~ 1 A/cm^2 in order to avoid heating of the samples during ion irradiation. The implantation energy was chosen to give the projected ion range within the deposited layers, in order to minimize the influence of the substrate on the induced structural changes. Structural analysis of the samples was performed by cross-sectional transmission electron microscopy, x-ray diffraction, and Rutherford backscattering spectrometry. While ion implantation is mainly used to improve adhesion of these layers to the substrate, our primary interest was to study microstructural changes induced within the layers. We have correlated these changes with the ion implantation parameters, i.e. the ion mass, energy and fluence.

P.S.B.13

ANALYSIS AND MODELING OF ELECTRODE EFFECT ON THICK FILM NTC THERMISTOR VOLUME RESISTIVITY

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Thermistor sheet resistivity depends on NTC layer thickness, surface electrode value, electrode shape and bulk resistivity. In this paper thick film thermistor geometries and diffusion effects of metal electrodes were tested, analysed and simulated. Thick film planar thermistors, such as rectangular, sandwich, multilayer, segmented and interdigitated, were printed with law temperature NTC paste NTC 3K3 95/2 (EI IRITEL). Their resistivity was analyzed as a function of volume resistivity variations due to electrode effect (diffusion of PdAg into NTC layer) and variation of geometrical parameters, such as length l, with w, thickness d, number of segments n. Using experimental data a model for counting the diffusion effect on volume resistivity was formed by simple fitting procedure. The agreement of calculated data enables including that formula to total physical/mathematical model of thermistor resistivity. This tool was used for simulation of other NTC thermistor geometries interpolated between tested ones or used for extrapolated geometries to mesured test samples. Thus, theoretical experiment eg simulation predicts and determines the behavior of new thermistors before printing, firing and measuring.

P.S.B.14

THICK FILM ZNO MULTILAYER STRUCTURE APPLIED IN LCV CELL

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At first thick film ZnO was applied in simple varistor structures such as sandwich, multilayer, segmented and interdigitated. Based on those initial applications multifunctional and multilayer constructions such as LCV cells were realized and characterized. ZnO varistor paste with nanometric particle size was used in LCV cell (L-inductive, C- capacitive, V- varistor) as a multifunctional material. Meander (L) was printed by PdAg paste as the top electrode of the sandwich capacitor (C) comprising a varistor layer (V) in the middle as an overvoltage protector and high dielectric constant material (under the varistor threshold). This elementary LCV cell with distributed parameters L/C/V was tripled by multilayer screen printing to form three parallel inductors/capacitors connected by terminals in one 3D LCV cell. PdAg and ZnO layers were printed on alumina and fired sequentionaly at 850 ^{0}C/10 min in the hybrid conveyor furnace. The main parameters such as Z (ω) and S21 (ω) were measured in the range of 1MHz to 3 GHz by network analyzer and compared with 3D small ceramic EMI chip filters.

P.S.B.15

SIMULATION STUDY OF GRANULAR COMPACTION DYNAMICS UNDER VERTICAL TAPPING

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Granular materials can compact under the influence of sufficiently strong, successive tapping. Recent experimental investigations show that the packing fraction obeys a very slow relaxation to a final, dense packing fraction. We study by numerical simulation the compaction dynamics of frictional hard disks in two dimensions under the action of gravity, subjected to vertical shaking. The model proposed here is based on the ideas of Barker and Mehta [Phys. Rev. A **45**, 3435 (1992)] and Bideau and coworkers [Phys. Rev. E **63**, 051304 (2001)], but with some differences, especially concerning the way of gravitational redeposition of the granular particles. The compaction dynamics exhibits an interesting Mittag-Leffler law that is one of the most frequently used phenomenological fitting function for relaxation processes in many complex disordered systems such as glasses, ferroelectric crystals, and the dielectrics. We are able to describe the structure and distribution of arches formed by hard particles during non-sequential deposition of the grains after each shaking cycle. Our results are in good agreement with experimental results and with other models, especially concerning the dynamics of compaction, the influence of the extitation strength on the compaction efficiency, and some memory effects.

P.S.B.16

13X ZEOLITE WITH INCORPORATED NICKEL NANOCLUSTERS AS A THIN-LAYER ELECTRODE MATERIAL

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Ni nanoclusters were incorporated in 13 X zeolite cavities up to weight percent 40 % Ni. For this purpose, nickel acetylacetonate / acetone solution was used for zeolite impregnation. After solvent evaporation, and thermal degradation of nickel acetylacetonate unger hydrogen flow, nickel modified zeolite was obtained. Its X-ray diffractogram evidences the presence of finely dispersed nickel. A thin layer of this material was bonded on glassy carbon surface by means of nafion. The electrochemical behaviour of this electrode was tested in both acidic and alkaline solution of sodium sulphate. The electrolysis of water is feasible with this electrode, and basic electrochemical reactions within the water decomposition voltage limit are $Ni(OH)_3/Ni(OH)_2$ redox reactions, and oxygen reduction reaction, involving gaseous oxygen accumulated within zeolite cavities.

P.S.B.17

BARE AND NAFION COVERED GOLD/AQUEOUS ELECTROLYTE SOLUTION BOUNDARY: ELECTROCHEMICAL OXIDATION OF OH^- IONS

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Electrochemical oxidation of hydroxide ions on gold rotating disc electrode, bare and covered with Nafion membrane, in sodium sulphate solution made basic with sodium hydroxide was investigated. The properties of the OH^- ion oxidation wave were tested by varying the electrode rotation speed and concentration of OH^- ion in the solution. The plot of the limiting current corresponding to OH^- ions oxidation wave against the square root of the rotation speed gave a straight line indicating that the limiting current is controlled by the diffusion of hydroxide ions towards the electrode. Similarly, at given rotation rate, the limiting current was found to be proportional to the concentration of hydroxide ions. Nafion influence on limiting current was also discussed. These results suggested the possibility of using the oxidation wave for analytical purposes.

P.S.B.18

SURFACE CHEMISTRY OF DIFFERENT CARBON MATERIALS

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The amount and type of oxygen functional groups on carbon samples (activated carbon, carbon monolith, felth and glassy carbon) were examined by Boehm titration and temperature-programmed desorption (TPD), by monitoring desorption of CO and CO_2. During the TPD examination there is the possibility that desorbed CO_2 could be reduced on carbon material, therefore that phenomena was studied. Obtained results showed that the overall number of groups determined by TPD is considerably higher than those obtained by Boehm titration. TPD provides quantitative information on the total number of surface groups but does not lead to detailed qualitative information on the carbon surface, while Boehm titration gives quality and quantity information only about acidic groups. The nature of surface chemistry depends of the type of precursors used for producing examined carbon materials.

P.S.B.19

STRUCTURAL REFINEMENT OF NANO SIALON POWDER USING X-RAY DIFFRACTION DATA

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The nanosize β-Sialon ($Si_{6-x}Al_xO_xN_{8-x}$) powders were synthesized by carbothermal reduction-nitridation (CRN) processing using natural alumosilicates as precursor. The evolution of the crystalline phases was followed as a function of annealing time and sintering temperature. The Rietweld refinement was employed to get the structural information of the powders obtained. The final weighted R-factor, R_{wp}, was 7.6% and the goodness-of-fit indicator was 1.7. The mass fraction of all phases based on the refined scale factors was determined. Results also show that linear increase of lattice parameters occurs with increasing Al concentration.

P.S.B.20

ELECTRICAL PROPERTIES OF SINTERED ZINC-TITANATE CERAMICS

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The aim of the research in this paper was an investigation of electrical properties of sintered zinc titanate (Zn_2TiO_4) ceramics obtained by mechanical activation. Stoichiometric mixture of zinc oxide and titan dioxide, was mechanically activated in a planetary ball mill up to 300 minutes. Phase compositions of mechanically activated specimens were detected using X-ray powder diffraction method. Activated samples were sintered isothermally in air for 60 minutes at 1000°C.

The impedance, capacitance, resistance and the quality factor were measured at different frequencies (5 kHz - 5 MHz). The sample activated 30 minutes exhibited the best Q-factor. Analysis of the results obtained established fundamental laws of the influence of tribophysical activation on sintering and properties of the investigated system.

P.S.B.21

CHARACTERIZATION OF INSOLUBLE MONOVALENT CATION SALTS OF 12-TUNGSTOPHOSPHORIC ACID

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Heteropoly acids (HPA) and their salts are widely studied in relation to their catalytic properties for acid type or mild oxidation reactions as well as to their application as electrolytes in fuel cells. In spite of high acid strength of heteropolyacids (HPAs) their catalytic applications for heterogeneous reactions are limited by their low surface areas. Cs, Rb and K as well as Ag and Tl salts of 12-tungstophosphoric acids (WPA) are characterized by relatively high surface areas and microporous structures. It can be expected that these salts can be even more efficient as catalysts for some acidic reactions than their parent acid due to their higher superficial proton content. The mentioned salts are insoluble in polar solvents and have relatively high proton conductivity. Therefore they can be applied as electrolytes in fuel cells. The aim of this paper is to investigate conditions of synthesis of neutral and acid K, Ag and Tl salts of WPA. These salts will be characterized by application of elemental, thermal and microscopic analysis and IR spectrometry. Their proton conductivity should be measured and compared with that of parent acid.

P.S.B.22

DETERMINATION OF THE THERMOPHYSICAL PROPERTIES OF POLYOLEFINES USING PHOTOACOUSTIC SPECTROSCOPY

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Thermophysical properties of a few polyolefine foils of different molecular weights have been measured by photoacoustic technique. Thermal parameters of foils are correlated with some physical properties of the sample. It is shown that the physical properties influence the thermal ones.

P.S.B.23

CATALYTIC WET PEROXIDE OXIDATIVE DEGRADATION OF VOLATILE ORGANIC COMPOUNDS ON BENTONITE BASED CATALYSTS

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Water pollution is increasingly abundant problem. Therefore, methods for water pollution prevention and water purification have been of great interest as a subject of recently conducted research projects. The techniques usually adopted to achieve water purification are largely based on the use of phase separation methods and/or adsorption on active suspended materials as well as biodegradation. There are several drawbacks of these methods, including the inability of quantitative removal of pollutants or the fact that they are time consuming and effective only at low concentration levels. The alternative water purification method could be catalytic oxidative degradation in the presence of hydrogen peroxide as a generator of $HO^{\bullet}$ radicals. Among extremely vicious pollutants are some volatile organic compounds due to their high toxicity. In recent works, major attention has been dedicated to phenols and their catalytic oxidative removal neglecting the removal of some other organic pollutants. This work is dealing with the results of oxidative catalytic degradation of several other aromatic pollutants on a series of bentonite based catalysts in the presence of hydrogen peroxide. Catalytic activity of the obtained catalysts was examined using UV/VIS spectrometry and TOC analysis, on previously characterized catalyst samples.

P.S.B.24

SYNTHESIS AND CHARACTERIZATION OF THE POLYACRIFLAVINE

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Novel polymeric materials were synthesized by chemical oxidative polymerization of the acriflavine hydrochloride using potassium dichromate, ammonium peroxydisulfate, and ferric ammonium sulfate as oxidants, in acidic aqueous solution at room temperature. Polyacriflavines were characterized by elemental analysis, gel-permeation chromatography, conductivity measurements, FTIR spectroscopy, and scanning electron microscopy. Theoretical study of the acriflavine polymerization mechanism has been based on the MNDO-PM3 and AM1 semi-empirical quantum chemical computations of the heat of formation and ionization energy of the acriflavine, generated reactive species and reaction intermediates, taking in account influence of pH and solvation effects. Redox activity of the polyacriflavines was studied by the cyclic voltammetry.

P.S.B.25

RUBBER ELASTICITY STUDY OF POLYURETHANE NETWORKS PREPARED BY ENDLINKING OF TELECHELIC DIISOCYANATES

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Modelling of elastomers that are used in advanced technologies is mostly based on the adition of certain contributions to the mechanical properties of the material (such as influence of ions, magnetic or nano particless). Since swollen networks are often used in these technologies, it is desirable to study rubber elasticity and swelling behavior using the theory whose basic assumptions can be apllied on elastomeric matrix. The competing theories of equilibrium swelling and of rubber elasticity accounting for the behaviour of polymer networks both require the concept of "ideality". An "ideal" network can be defined as a collection of individual Gaussian elastic chains connecting f-functional crosslinks. In the James-Guth theory ("phantom' model"), the elastically effective chains are considered as 'immaterial' and can cross each other freely without destroying the network topology. They merely transmit the forces exerted on the crosslinks to which they are linked. Flory-Erman theory unifies the "phantom' model" and Flory-Wall approach ("affine" model) by the introduction of a second parameter that should account for possible inhomogeneities in the network topology, perturbing the affine transformation of the constraints with respect to macroscopic deformation. The networks prepared by endlinking processes are of great interest, as they allow one to test the validity of the existing thermodynamic and dynamic theories by establishing relationships between the network structure and its properties. The aim of this work was to study uniaxially deformation of dry and swollen networks obtained by the catalytic cyclotrimerization of telechelic diisocyanates based on 2.4-TDI and poly(oxypropylene) diols of different size. When the conditions for synthesis have been chosen adequately, the precursor chains usually exhibit average molar masses that are close to the narrow distributions (predominantly due to the negative first shell substitution effect on 2.4-TDI). The precursor chains were characterized by size exclusion chromatography (SEC). The reaction of network formation proceeded in the undiluted state. The equilibrium swelling degree was related to the parameters, which are experimentally accessible for a network arising from an end-linking process (the functionality of the crosslinks and the average molar mass of the elastic chains) using Flory-Rehner theory. The experimental data for network elasticity modulus were compared with those arising from the "affine" model and the "phantom' model". A comparison led to the conclusion that the difference between moduli for front factor A=l/3 (for the trifunctional networks) may be adequately described using Langley-Graessley concept of trapped entanglement contribution.

P.S.B.26

MICROSTRUCTURE AND MICROHARDNESS IN CURRENT ANNEALED $Fe_{65.5}Cr_4Mo_4Ga_4P_{12}C_5B_{5.5}$ BULK METALLIC GLASS

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Iron based bulk metallic glasses (BMG) developed during the last decade exhibit excellent soft-magnetic properties making them attractive as a core material for magnetic devices. However, in order to make BMG attractive for wide industrial application, alloys with enhanced glass forming ability as well as high mechanical strength and corrosion resistance should be developed. Replacement of Fe by Cr and Mo seems to be quite effective for this purpose.

A master alloy ingot with the nominal composition $Fe_{65.5}Cr_4Mo_4Ga_4P_{12}C_5B_{5.5}$ was prepared by induction melting a mixture of the Fe-B, Fe-C, Fe-Ga, Fe-P prealloys and Mo, Cr, Fe, B pure elements under argon atmosphere. From the master ingot, cylinders (i.e. rods) were cast by melt injection into a 1.5 and 1.8 mm diameter copper molds. The wide supercooled liquid region between crystallization temperature (T_X) and glass transition temperature (T_g) in the as-cast state $T=T_X-T_g=60$ K as well as high value of reduced glass transition temperature $T_{rg}=T_g/T_m=0.6$ (T_m is melting temperature) approves enhanced thermal stability of the alloy against crystallization.

The microstructure of the different samples was characterized by optical microscopy (OM) and X-ray diffraction (XRD). The microhardness HV1 values were determined using a Vickers indenter. In the as-cast "XRD-amorphous" state was observed microhardness HV1=742. Multistep current annealing (CA) thermal treatments were performed for structural relaxation. After applying enough high heating power per square area ($P_S \geq 7$ W/cm^2) intensive crystallization of the samples were observed. These microstructure changes after crystallization that is characterized by appearance of several iron-metalloid compounds (Fe_5C_2, Fe_3Ga_4, $Fe_{63}Mo_{37}$ and $Mo_{12}Fe_{22}C_{10}$) bring about differences in the microhardness values. The areas of still present amorphous matrix are with increased value HV1=876, but remarkable decrease to HV1=323 was observed in precipitated crystallized zone that propagate along inner part of cylinders.

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P.S.B.27

MAGNETOIMPEDANCE EFFECT IN $Fe_{89.8}Ni_{1.5}Si_{5.2}B_3C_{0.5}$ METALLIC GLASS RIBBONS

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In this paper we studied magnetoimpedance (MI) effect in $Fe_{89.8}Ni_{1.5}Si_{5.2}B_3C_{0.5}$ amorphous alloy prepared by single-roller melt-spinning technique. As soft magnetic properties were determined by field induced anisotropy (and therefore the magnetic domain structure), ribbon samples were annealed under tensile stress in order to enhance induction of transverse anisotropy and therefore to improve magnetoimpedance effect. Stress-annealing (SA) technique up to 420 ^{O}C/475 MPa/30 min. was used for tailoring electrical resistivity (ρ) and magnetic permeability (μ), i.e. two material properties that in classical skin effect determine the penetration depth $\delta_m = (\rho/\pi\cdot\mu\cdot f)^{1/2}$, and therefore on MI-effect.

The MI measurements were performed by four-point method in the longitudinal direction of a ribbon (thickness $d\approx30$ μm and length l=65 mm). The MI-ratio defined as $\Delta Z(H)/Z=[Z(H)-Z(H_{max})]/Z(H_{max})$ were explored in a dc axial magnetic field produced by Helmholtz coils generating a maximum field $H_{max}\approx5$ kA/m. The frequency of MI measurements ranged from 100 kHz to 10 MHz and sinusoidal current amplitude was fixed at 8 mA, i.e. sufficiently small that the influence of self-heating can be neglected. The critical frequency of about 600 kHz (when $\delta_m \approx d/2$) was observed as the point with the initial increase of the MI. Significant improvement of MI-response after annealing at 420 ^{O}C up to value $\Delta Z/Z \approx 25$ % was recorded at frequency 4 MHz.

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P.S.B.28

CORRELATION BETWEEN THE CRYSTALLIZATION PROCESS AND CHANGE IN THERMOELECTROMOTIVE FORCE FOR THE AMORPHOUS ALLOY $Co_{84}Fe_{5,3}Si_{8,5}B_{2,2}$

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Thermal and kinetic anayises of the structural changes for the amorphous alloy $Co_{84}Fe_{5,3}Si_{8,5}B_{2,2}$, during the processes of non – isothermal heating and isothermal annealing, have been performed. The crystallization process has been investigated using the method of differential scanning (DSC). It is determined that this alloy crystallizes through three different stages. Changes in the electronic structure of the amorphous tape, for the temperature range 20 to 600^0C have been studied. This was achieved by measuring the thermoelectromotive force (TEMS), of the thermo pair made of two tapes with same chemical structure of the alloy $Co_{84}Fe_{5,3}Si_{8,5}B_{2,2}$ but different atomic structure: one is the crystal state (CL) and the other is in the amorphous state (AM). Analysis of the temperature dependence of the electromotive force has shown the following: the investigate alloy is thermically stable up to 400^0C and changes in the atomic structure as well as equalizing of the free electron density in booth parts of the thermo pair AM – CL, take place in the temperature range from 400^0C to 600^0C. Kinetic parameters of the process were determined by measuring time dependence of the TEMS in isothermic conditions at the temperatures 500, 520 and 540^0C.

P.S.B.29

SOME PROPERTIES OF THE GLASS TRANSITION IN THE AMORPHOUS Sb-As-S-Se-I SYSTEM

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Transformations of the glasses from the multicomponent pseudobinary system $(As_2Se_3)_{100-x}(SbSI)_x$ were analyzed from the aspect of determining the glass transition temperature T_g,, activation energy of the process E_t,, and characteristic changes of the specific heat. The established dependence of T_g on glass composition and heating rate served as the basis for determining the activation energy of the structural relaxation process E_t. The abrupt increase in the specific heat c_p at the glass transition temperature was analyzed with the aim of material classification according to the criterion of the so-called 'fragility'. It was found that the investigated glasses, i.e. their melts, belong to the group of thermodynamically 'strong' melts.

P.S.B.30

THE EFFECT OF TEMPERATURE ON THE MAGNETIC PROPERTIES OF THE ELECTROCHEMICALLY OBTAINED Ni_{95} Mo_5 POWDER PRESSED AT DIFFERENT PRESSURES

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By the electrochemical codeposition from ammonium solution of $NiSO_4$ and $(NH_4)_6 Mo_7O_{24}$ at j = 100 mA m^{-2}, on a titanium cathode, $Ni_{95,5}$ $Mo_{5,5}$ alloy powder is obtained. The DSC measurements show that the structure of the powder does not change in the temperature range from 293 K to 460 K. Therefore, in this range, there is not any considerable change in magnetic permeability either. Structural changes in the powder take place at 460 K to 580 K temperature interval and cause an increase in magnetic permeability and the occurrence of endopeak on the thermogram. At temperatures higher than 620 K, with the temperature increase, magnetic permeability rapidly decreases. The Curie temperature of the powder is 640 K. With the increase of the powder pressing pressure magnetic permeability increases and electric resistivity decreases. By the pressing the distance between atoms of adjacent species is reduced, causing higher overlapping of their 3d and 4s orbitals. This results in an increase in the electron number in the conductivity zone and causes electrical resistivity decrease and magnetic permeability increase.

P.S.B.31

THE INFLUENCE OF CURRENT DENSITY ON NICKEL AND COBALT POWDER MICROSTRUCTURE

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Co and Ni alloy powder were obtained by electrochemical deposition from ammonium solution of cobalt and nickel sulfate. The structure of the obtained powder depends on current density and solution composition. The Ni and Co content in the obtained powders is approximately equal to the concentrations of Ni^{2+} and Co^{2+} ions in the solution. Powder with more than 60mol.% Ni obtained on current density j<200mAcm^{-2} consists only of the fcc phase. The powders with content of Ni<60 mol.% electrodeposited on current density j <300mAcm^{-2} consists of two phase regions fcc and hcp. By increasing Co contents in alloy and deposition current density, percentage of hcp phase increases.

At higher current densities amorphous powder is obtained. Minimum of current density for deposition of amorphous powder increases by increasing Co content in alloy.

P.S.B.32

THE EFFECT OF HYDROGEN ABSORPTION ON ELECTRICAL RESISTANCE OF ELECTRODEPOSITED NICKEL AND COBALT ALLOY POWDER

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Nickel and cobalt alloy powder were electrodeposited from ammonium sulfate solutions. Microstructure of the powder depends on deposition current density and content of nickel and cobalt in alloys. By annealing powders at temperatures higher than 720 K the structure of powder is changed. Kinetics and mechanism of hydrogen absorption depend on microstructure. Electrical resistance of alloys is changed by the absorbed hydrogen. The correlation between the phases of crystal structure, the amount of the absorbed hydrogen and electrical resistance is established.

P.S.B.33

NEW CATALYSTS FOR ELECTROCHEMICAL OXYGEN EVOLUTION

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A catalyst for the reaction of oxygen evolution by the anodic oxidation of water was developed. Its microstructure and electrochemical properties were investigated. First, at a properly prepared titanium surface a compact adherent nanocrystalline film of titanium and ruthenium dioxide solid solution was thermally created. Then, over this layer, a film of a fine mixture of metallic platinum and iridium oxide crystals of nano-dimensions was, also, thermally formed. The catalyst had relatively high stability and high catalytic activity for the oxygen evolution reaction.

P.S.B.34

THE INFLUENCE OF AMOUNT OF Nd-Fe-B POWDER ON THE MECHANICAL PROPERTIES OF COMPOSITE POLYMER – MAGNETIC MEDIUM

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Multi-mode optical fiber with a composite polymer magnetic coating was investigated as an optical fiber magnetic sensor element (OFMSE) for detecting external magnetic fields. The composite coating was formed by dispersing the magnetic powder Nd-Fe-B in poly-(ethylene-co-vinyl acetate) – EVA solution in toluene. The composite coating can be made by adapting the existing process of manufacturing optical fibers in stage in which polymer coating is applied to the drawn fiber. The sensing element consists of two optical fibers held in close proximity to each other and is based on the principle of intensity modulation. In this study, the influence of the content of magnetic powder in the composite coating on uniformity and thickness of composite coating was investigated. Dependence of hardness of polymer-magnetic composite coating on amount of magnetic powder was tested as well.

P.S.B.35

HEAT TREATMENT EFFECTS IN A COPPER-BASED SHAPE MEMORY ALLOY

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The effects of various quenching treatments were studied on a Cu-Zn-Al alloy that is potentially usable for shape memory devices. The variation of grain growth rate as a function of betatizing heat treatment was observed. The growth order value **n** ranged from 0.45 to 0.48 for specimens annealed at temperatures between 780 and 900^{o}C. The activation energy of the grain growth process was estimated to be 86.2 kJmol^{-1}. The structure, mechanical behavior, phase transformation temperatures and shape memory capacity of quenched specimens were described. Step-quenched specimens were exhibited the best memory results for the alloy.

P.S.B.36

LASER BEAM INDUCED STRUCTURAL CHANGES IN MULTICOMPONENT NICKEL ALLOYS

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Multicomponent nickel alloy, alloyed with: Mn, Cr, Al, Fe, B, Zr and others, was subjected after mechanical under the vacuum heat treatments: solution heat treatment at 1080ºC for 1 hour, primary precipitation at 840ºC for 4 hours, secondary precipitation heat treatment at 760ºC for 3 hours and stress relief annealing at 700ºC for 1 hour. After heat treatments, laser surface treatment was applied and was related to the material deformation and damage formation on the material surface.

Preliminary investigations were carried out by laser drilling and resulting traces on material were recorded by scanning electron microscope to find out the influence of different energies and pulse length on structural changes in the material.

P.S.B.37

FINE-STRUCTURAL INVESTIGATIONS OF NICKEL BASED SUPERALLOYS AFTER VARIOUS HEAT TREATMENTS

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Investigations were carried out on nickel based superalloy Hastelloy S after applied thermomechanical treatments. The main aim of applied heat treatments was microstructural changing to obtain material that would, under the work conditions (high pressures and temperature), satisfied rigorous demands in view of high-temperature oxidation and corrosion, thermal strain, fatigue and creep resistance.

Besides mechanical, submicrostructural investigations were carried out, and showed presence of γ solid solution and several complex phases: γ'' intermetalic compound, TCP phases (sigma, Laves,η etc), carbides, nitrides, borides and others. These phases have directly influenced material properties, and their identification by contemporary techniques contributed to the choice of adequate heat treatment regime. In this paper was shown a diffusion-interfacial mathematical model that using Cahn-Hilliard equation satisfactorily describes coarsening and phase-separation kinetics.

P.S.B.38

NUMERICAL AND ANALYTICAL MODELLING OF ELASTIC-PLASTIC FRACTURE MECHANICS PARAMETERS

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Structural integrity and service reliability depend on fracture resistance of material. Cracks in material are the locations of stress concentration, and elastic-plastic deformation can occurs, causing the development of mixed-mode type of fracture ahead the crack tip. Crack behaviour in the elastic-plastic region is analyzed applying numerical and analytical simulation based on fracture mechanics parameters, characterising the response of material at crack tip. In order to verify obtained numerical results, corresponding fracture mechanics tests were performed using standard three-point bend – SEN (B) specimens. The comparison of results obtained by numerical modelling and fracture mechanics tests have shown acceptable level of agreement, enabling the application of proposed numerical model of crack growth in the mixed-mode fracture analysis for structural integrity assessment.

P.S.B.39

THE INFLUENCE OF AUSTEMPERING PARAMETERS ON THE MICROSTRUCTURAL AND MECHANICAL PROPERTIES OF LOW ALLOYED Ni-Mo DUCTILE IRON

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The term austempered ductile iron (ADI) refers to a new family of materials whose mechanical properties can vary by the correct selection of chemical composition and heat treatment variables. Its excellent combinations of strengths, fracture toughness and wear resistance make ADI suitable for wide variety of applications in automative, rail and heavy industry.

The present study investigated the influence of austempering temperature and austempering time on the microstructure and mechanical properties of low-alloyed Ni-Mo ductile iron. The effect of austempering parameters and alloying additions on the austemperability of treated iron has been estimated, too.

Specimens were austenitised at 850°C for 120 min, than austempered for 1, 10, 30, 60, 120, 240 and 360 min at 300, 350 and 400°C respectively, and examined by both the light and scanning electron microscopy . The structure consisted of bainitic ferrite and retained austenite. The volume fraction of austenite and carbon content of austenite has been evaluated by X-ray diffraction.

The volume fraction of retained austenite, bainitic ferrite, untransformed austenite and austenite carbon content was correlated with microstructural and mechanical properties. Optimum properties are obtained at austempering periods (60-120min) when both the amount of retained austenite and austenite carbon content are maximum.

P.S.B.40

THERMODYNAMICS AND PHASE EQUILIBRIA INVESTIGATION OF THE AuIn-Sb SYSTEM

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A great deal of effort has been put into the development of different lead-free solder alloys, due to the requirements for electronics and microelectronics applications, health concerns due to the toxicity and health hazard of lead and the heightened demands on the level of performance of solder joints for increased density and complexity of circuitry, driven by market demands. One among potential solder-candidates is the Au-In-Sb system. The results of thermodynamic study (Oelsen calorimetry, thermodynamic predicting) and phase equilibria investigation (DTA, SEM/EDX) of the alloys in the AuIn-Sb system are presented in this paper.

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P.S.B.41

PREDICTING APPROACH TO Ti-Al-Mn LIQUID ALLOYS THERMODYNAMICS

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Due to the combination of light weight and high strength, titanium-based intermetallics are of practical interest for aerospace and automotive industries, as well as for various high temperature applications. Since the alloys with lower content of aluminum are brittle and provide moderate resistance to oxidation, alloying with manganese enhances their ductility, strength, oxidation and corrosion resistance. Nevertheless, thermodynamic study of the Ti-Al-Mn system has not been completely reported in literature, while there are a lot of articles dealing with the thermodynamics of its consititutive binaries. Therefore, comparative thermodynamic study of liquid Ti-Al-Mn alloys is presented in this paper based on the calculations done by FactSage, Redlich-Kister-Muggianu and general solution model.

P.S.B.42

THE ROLE OF INTERMETALLIC PHASES IN FATIGUE CRACK PROPAGATION BEHAVIOR OF Al-Zn-Mg-Cu ALLOYS

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The aim of the present work is to determine the role of intermetallic (IM) phases in the fatigue crack propagation behavior of three different forged Al-Zn-Mg-Cu alloys in T73 condition. To generate differences in the volume fraction and coarseness of various IM particles, the (Fe+Si) impurity level is varied from 0.23 to 0.37 mass%. The fatigue crack propagation tests are conducted in air at ambient temperature and a stress ratio R of 0.1. Characterization of the fatigue fracture surfaces is performed using scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS). A quantified IM particles data for each alloy are then related to the fatigue properties and fractographic analysis results. It was found that almost all particles of the Fe-containing phases (primarily (Cu,Fe,Mn)Al_3 and Al_7Cu_2Fe) are fractured and not effective in hindering fatigue crack propagation. On the other hand, the Mg_2Si and soluble phases particles smaller than those of Fe-containing phases contribute beneficially to fatigue life. These particles increase the tortuosity of the crack path and retard the crack velocity. The crack velocity decreases as volume fraction of coarse Fe-containing particles increases, because more secondary cracks are produced decreasing the effective stress intensity at the main crack tip.

P.S.B.43

THEORETICAL ASSESSEMENT OF CALCIUM ARSENATES STABILITY: APPLICATION IN TREATEMENT OF ARSENIC CONTAMINATED WASTE

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Arsenic occurs naturally in about 245 minerals, which when subjected to weathering can release soluble arsenic into natural waters. It can also be found in waste streams from a variety of industrial processes. Arsenic is of environmental concern due its toxic, carcinogenic and mutagenic properties, and its removal from the environment represents an important measure in protection of human and animal health. Arsenate apatite $Ca_5(AsO_4)_3OH$ represents one of the most insoluble chemical forms of arsenic. For this reason, several approaches for transformation of other more soluble forms of arsenic into arsenate apatite have been proposed. Arsenic immobilization by arsenate formation is successfully applied in treatment of industrial waste containing this toxic element. Contrary, treatment of soil contaminated with arsenic by apatite amendments increases its mobility and bioavailability. The mechanism underlying these opposite effects still remains elusive. We previously demonstrated that the ion-ion interaction potential (IIIP), representing the main term of the cohesive energy, can be successfully applied for assessment of mineral stability [Raicevic et al., Sci. Total. Environ., 355 (2006) 13-24; Raicevic et al., J. Hazard. Mater., B117 (2005) 41-53]. Here we calculated the IIIP parameter for different calcium arsenates: $Ca_5(AsO_4)_3OH$, $Ca_4(AsO_4)_2(OH)_2$, $Ca_3(AsO_4)_2$ $Ca_5H_2(AsO_4)_2$ and $CaHAsO_4$. The obtained results demonstrated that arsenate apatite with the IIIP value of -0.578 Ry represents the most stabile chemical form among these compounds. Based on this finding, we proposed a mechanism of formation of arsenate apatite in the presence of hydroxyapatite which could explain the suitability of this approach for treatment of industrial waste and its limitations for *in situ* treatment of soil and water contaminated with arsenic.

P.S.B.44

KINETIC- SPECTROPHOTOMETRIC DETERMINATION OF TRACES OF W (VI) IN SOLUTION

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The present work describes a selective method for the determination of ultramicro amounts of tungsten W(VI) based on its inhibitory effect in the oxidation of 4-hidroxycoumarine by $KMnO_4$ in the presence of hydrochloric acid. Under optimal conditions the sensitivity of the method is 20 ng/cm^3. The probable relative error is -4.8-13 % for the concentration range from 250 to 20 ng/cm^3 W(VI),respectively. Kinetic equations were proposed for the investigated process. The effects of certain foreign ions upon the reaction rate were determined for the assessment the selectivity of the method. The method has relatively good selectivity.

P.S.B.45

KINETIC DETERMINATION OF TRACES OF V(V) IN SOLUTION

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The present work describes a selective method for the determination of ultramicro amounts of molybdenum V(V) on the basis of its inhibitory effect on the reaction 4-hidroxycoumarine oxidation by $KMnO_4$ in the presence of hydrochloric acid. The reaction was followed spectrophotometrically by measuring the decrease in the absorbance of $KMnO_4$ at 525 nm. The examination system obeys Beer's law in the range of concentration of V(V) from 0.5 to 5 ppm. Under optimal concentration the sensitivity of the method is 5ppm of V(V). The probable relative error is in interval 3.45-14.40% for the range of concentration5-0.5ppm V(V), respectively.

The interference effects of the foreign ions have been determined for the assessment the selectivity of the method. The method has relatively good selectivity. Kinetic equations were proposed for the investigated process.

P.S.B.46

A MODEL OF GAMMA-RAY IRRADIATION EFFECTS IN SILICON DIOXIDE FILMS AND ON SILICON DIOXIDE - SILICON INTERFACE

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The gamma-ray irradiation cause the positive charge traps formed in silicon dioxide films and on silicon dioxide - silicon interface of MOS devices and the threshold voltage shift of MOS transistors. Here, Monte Carlo modeling was used to develop an approach for estimating gamma-ray induced traps spatially distributed in silicon dioxide films. This is combined with model of energy distributed traps on silicon dioxide - silicon interface. The developed model enables the gamma-ray induced charge and threshold voltage shift determination as a function on gamma-ray doses. The threshold voltage measurements at a single specified current, both of radiation sensitive and radiation hardened MOS transistors irradiated with different doses of gamma-ray are compared with developed model and good agreement are obtained.

P.S.C.1

USE OF PHONON CONFINEMENT MODEL IN THE SIMULATION OF RAMAN SPECTRA OF NANOSTRUCTURED MATERIALS

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The simulation of Raman spectra is an important technique in systematic characterization of nanostructured materials. The effects of frequency shift and asymmetric broadening play an important role in modeling the spectra. Several approaches for calculating Raman spectra by using phonon confinement model are discussed in this work. The phonon confinement model is considered both from the viewpoint of different confinement function and the confinement strength, as well as the dimensionality of the confinement model. The influence of particle size distribution on the shape of the spectra is discussed and some possible distributions such as Gaussian, asymmetric Gaussian and log-normal distribution are compared. The phonon dispersion relations and the choice of the approximation of its shape are also studied. The results of the phonon confinement model are compared to experimental spectra of CeO_2 and anatase TiO_2 nanopowders, with particle size 7 and 13 nm, respectively. This work points out the possibility of qualitative modeling of Raman spectra of nanostructured materials as a function of confinement effect, particle size and the dispersion relation.

P.S.C.2

MODELING AND INVESTIGATION OF SiGe BASED MOSFET STRUCTURE TRANSPORT CHARACTERISTICS

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SiGe based MOSFET (Metal Oxide Semiconductor Field Effect Transistor) structures have received much attention as devices which have some better properties than standard silicon based ones: high amount of carriers in transistor channel under the low gate voltages, high drift velocity of holes, built-in channel in order to overwelm hot carriers effect, manufacturing process is compatibile with still existing CMOS production plants. The focus of this paper is to highlight investigation and modeling of transport characteristics in strained SiGe based MOSFET structure, which might be of fundamental importance for understanding its operating characteristics. In other words, transport characteristics model has direct impact on transistor's current-voltage characteristics. In the investigation, carriers mobility dependence on electric field is considered especially. Developed model is based on the physics of the device thus it is accurate and, at the same time, relatively simple. By using the proposed model simulations were performed. Obtained results are in a very good agreement with the still existing ones, available in literature.

P.S.C.3

CONDUCTION MECHANISM BASED MODEL OF ORGANIC FIELD EFFECT TRANSISTOR STRUCTURE

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In this paper, carriers mobilty model of olygomer and polymer semiconductor based OFET (Organic Field Effect Transistor) structures, is presented. Starting from the conduction mechanism in the mentioned organic materials, a carriers mobility model as a function of temperature, electric field and trap density $\mu(T, E, N_T)$ is presented. This gave a base for a new threshold voltage model of OFET structures V_T, which is also presented. Based on the presented models, simulations $\mu(T, E, N_T)$ and V_T were performed and obtained results compared with the results available in literature.

P.S.C.4

PHONON THERMODYNAMICS IN CRYSTALLINE NANOFILMS

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The dispersion law of phonons as well as density of states in ultrathin films were analyzed. It turned out that phonons in thin film require activation energy for exciting. This leads to extremely small specific heat and specific conductivity at low temperatures. Counsequences of quoted facts were discussed in detail and their influence to kinetic and thermodinalmical propertis of thin films are estimated.

P.S.C.5

INFRARED AND PHOTOLUMINESCENCE STUDY OF RAPID THERMALLY ANNEALED SiO_x THIN FILMS

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Silicon suboxide, SiO_x thin films with different oxygen content ($1.15 \leq x \leq 1.7$) were prepared by thermal evaporation of silicon monoxide in vacuum. These films were rapidly annealed at 1100^0C at various times (15 s and 30 s). The composition and the oxygen bonding configuration were investigated using infrared (FTIR) and photoluminescence (PL) spectroscopy. In the FTIR spectra of SiO_x samples annealed for 15 s, the observed blue shift of the asymmetric stretching Si-O mode with x content can be interpreted in terms of increasing oxygen content and film density upon annealing. With increasing annealing time a new mode at 1104 cm^{-1} appeares followed by a continuous shift of the asymmetric mode to lower energies. Therefore, IR spectra of these films are significantly affected by oxygen content i.e. by defect states that could be ascribed to NBOHC-type defect. PL spectra excited by 442 nm line of He-Cd laser were measured at room temperature. PL intensities decrease with an increase of annealing time. The redshift of PL spectra is evident for all compositions. The spectra of samples annealed for 15 s can be resolved into two PL bands at about 2.18 and 2.4 eV, while for 30 s only one PL band in the range between 2.15 and 2.18 eV exists in all spectra. The changes in the PL spectra with increasing annealing time for different compositions are discussed in light of possible origin of the observed PL modes and correlated with analyzed changes in IR spectra.

P.S.C.6

POLYANILINE NANOTUBES

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Aniline has been oxidized with ammonium peroxydisulfate in the aqueous solution of acetic acid. The oxidation had two subsequent phases: the oxidation of neutral aniline molecule at low acidity was followed by the oxidation of anilinium cation after the acidity became higher. Both phases of oxidation gave different products, aniline oligomers and polyaniline nanotubes, respectively. The rod-like crystals of aniline oligomers are produced at first at low acidity, pH > 4. Their molecular weight has been assessed by gel-permeation chromatography to be several thousands. Sulfuric acid is a by-product of oxidation and pH decreases as the reaction proceeds. A high-molecular-weight polyaniline is produced as nanotubes in more acidic media.

The nano-sized crystallites on the surface of aniline oligomers serve as starting templates for the nucleation of PANI nanotubes. It is proposed that the further growth of nanotubes proceeds by the self-organization of polymer chains. The phenazine units located at the start of PANI chains stack into columnar supramolecular assemblies and thus bind the chain-ends together. As the PANI chains grow, the neighbouring chains zip by intramolecular ionic interactions between sulfonate groups and imine nitrogens in PANI. The hydrogen bonding, which is identified in FTIR spectra, may further stabilize the structure. The polymerization of aniline produces PANI nanotubes having a typical outer diameter of 100–200 nm, inner diameter of *ca* 50 nm, and length extending to a few micrometres. The role of the electron transfer between the aniline and oxidant molecules undergoing a redox reaction through the conducting PANI structure is proposed to be of fundamental importance in the formation of extended morphologies, like nanotubes.

P.S.C.7

A KINETIC STUDY OF A GUEST-HOST INTERACTION INSIDE A 3-D ZINCOPHOSPHATE

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Open-framework metal phosphates have been intensively investigated owing to their versatile structural chemistry and widespread application in the fields of catalysis, molecular adsorption, ion exchange, and important technologies such as electronics and optoelectronics. Mostly, the three-dimensional structures display nano-sized regular and accessible cages and channels, which enable open-framework phosphates to act as nanoreactors, also allowing only molecules of appropriate shapes and size to enter the pores.

These compounds are usually structure-directed by organic amines, which stay in the interlayer area interacting with inorganic host through hydrogen bonds and van der Waals interactions. A thermal treatment (calcination) is necessary to remove organic species and to leave the lattice accessible for application. However, the guest-host interactions are sometimes so strong that their breaking affects the skeleton.

In this work we investigate the interactions of ammonium cations with the 3-D zinc phosphate framework. This system has been chosen for at least two reasons: 1) ammonium ions are the only volatile species inside the framework, and 2) the position of the ions is crystalographically determined. These facts suggest that the thermal analysis is quite the appropriate method for studying the interactions of ammonium ions with the framework. The analysis has included a kinetic study of the thermal degradation of ammonium species inside the porous framework.

The zincophosphate was prepared by a hydrothermal crystallization of a mixture containing $Zn(NO_3)_2$, $(NH_4)_2HPO_4$, and disodium salt of terephthalic acid. Single crystal analysis showed that the obtained crystalline phase is $Na_{0.75}(NH_4)_{0.25}ZnPO_4$, which is consistent with the elemental analyses. This also confirmed the fact that the bulk product is a single crystalline phase. It has tetrahedral topology built from a 3-D network of ZnO_4 and PO_4 units connected via Zn-O-P links. Two types of channels enclosed by six-ring windows are occupied by the guest cations. The positions of Na^+ and NH_4^+ species are found to be different. It has been suggested that this particular combination of three smaller and one large univalent cation exerts co-templating effect leading to novel tetrahedral topology.

The ammonia loss during the thermal treatment of $Na_{0.75}(NH_4)_{0.25}ZnPO_4$ has been studied in nitrogen atmosphere under non-isothermal conditions. The experiments have been performed at six different heating rates: 2, 5, 7, 10, 12 and 15 K/min and the data have been studied by the non-parametric kinetics method (NPK). The activation energy of E_a = 336±9 kJ/mol has been obtained for ammonium species removal. This relatively high value of E_a reflects the fact that ammonium ions are rather entrapped inside the cavities of the phosphate framework and it also indicates that the NH_4^+ ions are bound to the framework through strong N-H…O hydrogen bonds.

P.S.C.8

ELECTRICAL PROPERTIES OF AGED EPOXY – HEMATITE NANOCOMPOSITE

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In this study influence of accelerate ageing on the electrical properties of epoxy – hematite nanocomposites has been investigated. In order to prepare the nanocomposites, desired amounts of previously synthesized hematite (Fe_2O_3) nanorods was added to epoxy resin. After that curing agent is added to the mixtures with continuous stirring (epoxy-curing agent ratio was 3:1 by weight). These are cast under carefully controlled conditions to ensure good dispersion and the minimization of voids. The obtained planar specimens, with an approximate thickness of 1 mm, were aged up to 270 h in an Emmerson single vessel oxygen apparatus at 90 ºC and 5 MPa pressure. The measurements showed significant influence of the hematite nanorods on the electrical properties of the epoxy. The electrical resistivity of the nanocomposite was not affected to a high extent by accelerated ageing. However, aging do affect the functional dependence of resistivity from temperature.

P.S.C.9

SYNTHESIS AND CHARACTERIZATION OF α-Fe_2O_3/PMMA NANOCOMPOSITE

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The α-Fe_2O_3 nanorods were synthesized by forced hydrolysis of $FeCl_3$ and characterized by TEM and X-ray. The length of the nanorods was 200 – 400 nm and the diameter was 5-10 nm. The PMMA nanocomposite was prepared by bulk polymerization of methyl methacrylate in which α-Fe_2O_3 nanorods were previously dispersed. AIBN was used as the initiator and the polymerization was carried out at 60 °C. The influence of concentration of α-Fe_2O_3 nanorods on thermal properties of PMMA was investigated using TGA and DSC. The obtained results revealed significant improvement of thermal stability of polymer as well as shift of the glass transition temperature towards higher values.

P.S.C.10

SYNTHESIS OF AgI NANOWIRES IN WATER IN OIL MICROEMULSIONS

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Silver iodide nanowires (NWs) were synthesized in water in oil microemulsions by using cyclohexane/triton X-100/n-pentanol system. Most likely, surfactant molecules form rod-like aggregates that can serve as template for growth of two dimensional inorganic materials on nano-scale. It was found that the length of the AgI NWs increases as a function of aging time, while the diameter decreases. Final length of the AgI NWs is several microns, while the diameter is smaller than 4 nm. Morphological changes of AgI NWs are accompanied by optical changes. Large blue shift of excitonic peak from bulk value at 420 nm to 326 nm was observed as a consequence of the size quantization effects.

P.S.C.11

OPTICAL PROPERTIES OF Ag NANOPARTICLES INCORPORATED IN POLYMERS

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Silver nanoparticles (NPs) were synthesized using either strong reducing agents or radiation chemical route. Diameter of Ag NPs was determined by using transmission electron microscopy (5-10 nm). The Ag NPs were incorporated in hydrophobic polymers such as PS and PMMA, as well as hydrophilic polymers such as PVA and PVA hydrogel. Influence of the polymer matrix on the optical properties of Ag NPs was investigated.

P.S.C.12

MELTING KINETICS OF PVA-Ag NANOCOMPOSITES SYNTHESIZED BY GAMMA IRRADIATION

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A novel radiolytic technique is used to prepare PVA/Ag as well as PVA hydrogel/Ag nano-composites. Using differential scanning calorimetry (DSC) the melting behavior and melting kinetics of the PVA/Ag nanocomposites are investigated and compared to those of pure PVA. There are strong dependences of the degree of crystallinity, peak melting temperature, half time of melting and Ozawa exponent on the Ag content and the heating rate. The activation energy of melting calculated with Kissinger model is markedly changing with the content of Ag in nanocomposite and with the preparation route. In terms of the obtained melting kinetics results, the interaction between the constituents is discussed.

P.S.C.13

MAGNETIC PROPERTIES OF Fe_2O_3 NANORODS

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Hematite nanorods (NRs) were synthesized by forced hydrolysis of $FeCl_3$. Length of Fe_2O_3 NRs was found to be 200-400 nm, while diameter was 5-10 nm (aspect ratio > 40). Temperature dependance of magnetization in zero-field and field-cooled regimes showed behavior typical for nanoparticle magnetics, which is bifurcation between these two curves for temperatures below maximum in the zero-field branch. Position of this maximum at $T_{max} \sim 260$ K is almost field independent, while isothermal magnetization dependence below and above this temperature shows linear dependence versus magnetic field in the ± 5 T range.

P.S.C.14

SYNTHESIS AND CHARACTERIZATION OF RUTILE TiO_2 NANOPOWDERS DOPED WITH Fe(III) IONS

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Titanium dioxide nanopowders doped with different amounts of Fe(III) ions, were prepared by coprecipitation method, at room temperature. After precipitation, obtained dispersions were heated at 50-60°C; this temperature was kept constant for 16 h. Obtained materials were characterized by structural (XRD, TEM, SEM) and optical (UV/Vis, Raman) techniques. XRD analysis revealed rutile crystalline phase for doped and undoped titanium dioxide obtained in the same manner. Diameter of the particles was 5-10 nm. Doping process moved absorption threshold of TiO_2 into visible spectrum range. That can be explained by formation of new d-bands in the interactions of the interstitial Fe(III) ions in the TiO_2 lattice, with host material.

P.S.C.15

SYNTHESIS AND CHARACTERIZATION OF TiO_2 NANOPOWDERS DOPED WITH NITROGEN

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Titanium dioxide nanopowders doped with nitrogen were prepared by wet and dry method. First method involved coprecipitation of TiO_2 and TiON simultaneously, during alkaline hydrolysis of Ti(IV) isopropoxide in ammonium hydroxide and subsequent calcination at 400°C. Ammonium hydroxide was the source of nitrogen ions in doping process. Dry method is based on penetration of nitrogen ions in the TiO_2 nanoparticles, during thermal treatment on 400°C of mixture of $Ti(OH)_4$ and carbamide. Carbamide was the source of nitrogen ions. Obtained materials were characterized by structural (XRD, TEM, SEM, XPS) and optical (UV/Vis, Raman, IR) techniques. Structural methods revealed that doping processes have resulted in anatase crystalline phase of titanium dioxide. Diameter of the particles was 10-15 nm. UV/Vis spectra of doped materials showed the possibility of photocatalytic activity of TiO_2 in visible spectral range.

P.S.C.16

STRUCTURAL AND MAGNETIC PROPERTIES OF THE ZnMnO SYSTEM

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ZnMnO semiconductor crystallites with nominal manganese concentration x = 0.01, 0.02, 0.04 and 0.10, were synthesized by a solid state sintering route using oxalate precursors. Sintering procedure was carried out in air at different temperatures in the range 400 – 900 °C. The samples were investigated by X-ray diffraction, magnetization measurements and electron paramagnetic resonance. X-ray analysis reveals that dominant crystal phase in the ZnMnO system corresponds to the wurtzite structure of ZnO. In the sample with x = 0.10 sintered at 500 °C a new phase of the spinel structure, $ZnMn_2O_4$, appears. In the EPR spectra recorded at room temperature a broad resonance originating from the coupled Mn spins and hyperfine structure lines arising from the isolated Mn ions are observed.

P.S.C.17

SPECIFIC FEATURES OF THE MAGNETIZATION REVERSAL OF THE NANOCRYSTALLINE ALLOY $Fe_{72}Al_5Ga_2P_{10}C_6B_4Si_1$

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The structure of as-quenched and annealed bulk $Fe_{72}Al_5Ga_2P_{10}C_6B_4Si_1$ amorphous alloy has been studied. The domain structure and magnetic properties of amorphous and nanocrystalline samples were investigated at room temperature. After the crystallization the structure is nanocrystalline, the nanocrystal sizes are up to 50 nm and depend on time and temperature of annealing. It was shown that the formation of the nanocrystalline structure entails a dramatic decrease in domain size (down to 1-4 μm) as compared with amorphous sample (~ 1mm). The observed variations of the magnetic structure and properties correlate with the phase composition of the forming nanocrystalline structure. The change of the relation of crystalline phases makes alteration of magnetic structure and properties of the alloy. Specific features of the magnetization reversal are discussed. The financial support of the Russian Science Support Foundation and RFBR (project 06-02-16677) is gratefully acknowledged

P.S.C.18

CHARACTERIZATION OF BISMUTH TITANATE CERAMIC POWDERS

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The bismuth titanate is a typical layer-structured ferroelectric material and belongs to the Aurivilius compounds family. The bismuth titanate ceramic material could be obtained by the mechanically activated synthesis after thermal treatment slightly lower then in conventional solid-state reaction. In investigated case bismuth titanate was prepared through mechanochemical synthesis starting from bismuth oxide and titanium oxide in anatas form. Mixture of oxides was milled in zirconium oxide jar in the planetary ball-mill during 1 to 12 hours. The relation between powders and zirconium oxide balls during milling was 1:20. Bismuth titanate with good crystallinity was formed after 180 min. The XRD, Raman, IR and SEM analysis were performed. Electrical and ferroelectrical properties were carried out. Very well defined hysteresis loop was obtained for bismuth titanate prepared from mechanically synthesized powders.

P.S.C.19

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF HYDROGEN STORAGE IN MAGNESIUM BASED COMPOSITES

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Due to its high hydrogen storage capacity, light weight, low cost and abundance in the earth's crust, magnesium and magnesium based alloys are the most promising candidates for hydrogen storage materials. However, the hydriding/dehydriding reaction takes place at high temperature and the kinetic is relatively slow. One of the ways to improve the kinetics of magnesium based hydrogen storage materials is the addition of metals and/or metallic oxides. It has been revealed that ball milling of MgH_2 powders with small amounts of 3d-transition metals or their oxides leads to marked improvements of the hydrogen absorption/desorption kinetics. The aim of this study was to investigate the influence of Ti and Co addition on the sorption properties of MgH_2. Ball milling of MgH_2 and catalysts was performed under argon using stainless steel vial and balls in a Turbula Type T2C Mixer from WAB (Basel, Switzerland), with different weight ratios among the blend components. The powders were characterized by XRD to assess the details of the phase structure by Rietveld analysis, while microstructural studies were performed by SEM. Thermal stability and hydrogen desorption properties were also investigated by thermal analysis methods. In order to obtain deeper insight into bonding mechanisms of transition metal in MgH_2 fully relaxed structure, we have performed ab initio electronic structure calculation of MgH_2 + X (X=Ti, Co) using Full Potential Linearized Augmented Plane Wave method, implemented in WIEN2K code.

P.S.C.20

POLYMERIZATION OF ANILINE: A REDOX REACTION ON THE POLYANILINE MEMBRANE

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Polyaniline (PANI), a conducting polymer, is typically prepared by the oxidation of aniline hydrochloride in the aqueous medium. Aqueous solution of aniline hydrochloride is mixed with a solution of an oxidant, ammonium peroxydisulfate as a rule. Protonated PANI is obtained as a green precipitate, ammonium sulfate and sulfuric acid are by-products. Let us design the experiment, in which two solutions of reactants are separated with a semipermeable membrane made from regenerated cellulose. Both reactants meet at the membrane at first and produce a PANI membrane where both reactants meet.

The redox reactions on the PANI membrane have been reported in the literature by reducing the iron (III) ions with ascorbic acid. Such processes are based on the exchange of electrons between reactants. It was proposed that the electron transfer can be, in principle, mediated by the PANI membrane, which is electrically conducting. In the present case, the molecules of a reductant (aniline) and an oxidant (peroxydisulfate) can thus react *without any mutual contact*, but through the PANI-assisted electron exchange. That is why PANI is produced entirely on one side of the membrane. The electroneutrality of the system is maintained by the simultaneous transport of protons through the PANI membrane, which is not only electron-conducting but also proton-conducting. Protons are generated from the hydrogen atoms, which are abstracted from aniline molecules; they constitute sulfuric acid. The conductivity of PANI prepared in this way was 4 S cm^{-1}.

P.S.D.1

STRUCTURAL CHARACTERIZATION OF ERBIUM - DOPED LAS GLASS CERAMIC OBTAINED WITH GLASS MELTING TECHNIQUE

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The samples of transparent glass-ceramics in the ternary system Li_2O-Al_2O_3-SiO_2 (LAS), with Er_2O_3 as luminescent dopant, have been investigated. The initial glass was obtained with the classical melting technique. In order to induce the ceramization of the glass, TiO_2 and ZrO_2 were added in small amount as nucleating agents. The thermal treatments were aimed to promote the formation of titanium zirconate solid solution precipitates. The spatial distribution of the precipitates throughout the material, their morphology and composition were investigated with HRTEM, EELS and EFTEM. The obtained results demonstrate that with glass-melting preparation technique it is possible to achieve rather small nanoparticles with high number density, by choosing the appropriate glass composition, nucleating agents and annealing treatments.

P.S.D.2

EUROPIUM AND ERBIUM DOPED Li_2O-Al_2O_3-SiO_2 GLASS CERAMIC - CHARACTERIZATION WITH TEM TECHNIQUES

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Particularly favorable properties of glass ceramics are developed on the basis of two key advantages of these materials: the variation of the chemical composition and of the microstructure. Therefore, detailed information, both structural and chemical is necessary to get insight in the novel glass ceramic materials of which two examples, obtained with sol-gel synthesis, are presented. The aim of this work was to provide a better understanding of the crystallization in the Li_2O-Al_2O_3-SiO_2 system when ZrO_2 is added in small quantity as a nucleating agent, and Eu_2O_3 or Er_2O_3 as luminescent dopants. The main interest was to observe the distribution of luminescent ions and to verify weather ZrO_2 crystallized in a rare-earth-stabilized cubic form, relevant to the luminescence behavior of glass-ceramics. TEM, HRTEM, and associated spectroscopy techniques (EDX, EELS, and EFTEM) are used as experimental methods. The 3-D reconstruction, done from HAADF-STEM imaging, proved to be a very valuable tool in determines the morphology of nanosize precipitates.

P.S.D.3

DETERMINATION OF MATERIAL BEHAVIOUR OF PLLA POLYMER IN HA$_P$/PLLA BIOCOMPOSITE MATERIAL USING NANOINDENTATION AND FINITE ELEMENT METHOD

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In this work, a combination of nanoindentation experiment and finite element modeling will be proposed in order to obtain accurate material behavior of the hydroxyapatite (HAp)/poly-L-lactide (PLLA) composite. Knowing these properties is important since the processing conditions used in hot pressing of composites with thermoplastic matrix strongly influence final mechanical properties of material in the solid state. Material behaviour model is determined by modulus of elasticity, yield stress and work-hardening rate. A bi-linear material behaviour is adopted for the polymer phase of the HAp/PLLA composite. This combined method is proposed to determine material behaviour before (modulus of elasticity) and after yield point (work hardening rate) of polymer phase after the hot-pressing of the composite.

P.S.D.4

STRAIN ENERGY RELEASE RATE OF DELAMINATION IN CARBON FIBRES/EPOXY RESIN COMPOSITES

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Mode I strain energy release rate of delamination G_{IC} in unidirectional carbon fibres/epoxy resin composites has been determined before and after gamma irradiation to various doses. From the alpha peak on loss modulus curve deduced from dynamic mechanical analysis in flexure, the glass transition temperature T_g of epoxy matrix was determined. The delamination surfaces of tested coupons were observed by scanning electron microscopy. The variations of G_{IC} values with irradiation dose were correlated to T_g values, to the features of delamination microfractographs, as well as to the variation of matrix or fibre/matrix dominated mechanical properties of studied composite.

P.S.D.5

EFFECT OF NANOSILICA ON THE DYNAMIC MECHANICAL PROPERTIES OF THE STYRENE BUTADIENE RUBBER

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Nanocomposites based on styrene butadiene rubber (SBR) and silica fillers of different morphological parameters (surface area, structure and surface activity) were prepared. Dynamic mechanical thermal analysis (DMTA) were performed on these composites over a range of temperatures (-120°C to +90°C), frequencies (0.01 Hz to 100 Hz) and strains (0.01% to 10%). Differential Scanning Calorimetry (DSC) and Modulated Temperature Differential Scanning Calorimetry (MT-DSC) were performed on these composites over a range of temperatures (-120°C to +200°C). Using the combinations of these analysis it is possible studied the role of active fillers in the rubber matrix for a better understanding of the rubber reinforcing mechanism. In particular the influence of basic properties of silica fillers, such as specific surface area, structure and surface activity on the dynamic modulus and hysterezis, were investigated with the dynamic mechanical analyzer which allows a testing of the strength of the filler network and the filler-polymer interaction in the green compound as well as in the vulcanizate in a wide range of shear amplitudes, temperatures and frequencies.

The present study was undertaken to give a more detailed analysis of the influence of silica fillers morphological parameters (surface area, structure and surface activity) on viscoelastic properties of filled rubber composites.

P.S.D.6

THERMAL STABILITY OF THE ELECTRICAL RESISTIVITY OF EVA - CARBON BLACK COMPOSITES

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Ethylene-co-vinyl acetate (EVA) composites with different vol% of carbon black (CB) were obtained by melt mixing at 32 rpm in Brabender rheometer. The samples were melt pressed at 150 ºC into 1 mm thick sheets by using an AMS 10-ton (10^4 N) hot melt press. The measurements of the electrical resistivity were carried out during thermal treatment which consists of two identical cycles. In a cycle sample is heated from room temperature to 55 ºC kept on that temperature for 30 ºC and then cooled down to room temperature. The next cycle started after 30 min. The results showed that there is an instability of electrical resistivity of the composite during prolonged treatment at constant elevated temperature. This behavior depends on the vol% of CB in the composite. In order to clarify the observed effects, DSC measurements were performed by using the same conditions as in the case of electrical measurements.

P.S.D.7

THE ADHESION OF CROSSLINKING MATERIALS BASED ON WOOD FLOUR FILLED BUTADIENE ACRYLONITRILE/CHLOROSULPHONATED POLYETHYLENE RUBBER BLENDS

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The effect of wood flour on rubber-to-metal bonding, cure characteristics and tensile properties behavior of butadiene-acrylonitrile and chlorosulphonated polyethylene rubber blends (NBR/CSM) was investigated in the concentration range of 0 to 50 phr. As a most probable explanation of the effect of the wood flour on the cure characteristics is accepted, the influence of the wood flour polar groups as well as of the presenting as wood flour humidity water molecules, the specific mechanical properties of the wood flour-filled NBR/CSM compounds could be connected (to some extend) with a specific interface interaction between the wood flour particles and the polymer matrix.

P.S.D.8

DISPERSION STRENGTHENED Cu-Ti_2 COMPOSITE FOR ELECTRICAL USE PROCESSED BY MECHANICAL ALLOYING

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The copper-based alloy with 3vol.% TiB_2 was prepared by mechanical alloying in an agitated ball mill under an argon atmosphere using 5mm diameter hardened steel balls. The weight ratio of powder mixture to steel balls was 1:35. Compacts were processed by hot-pressing in argon atmosphere followed by cold rolling. The results show that the compacts from 5h milled powders possess a good combination of high hardness and good electrical conductivity, whereas cold rolling improves hardness of compacts. It was also found that compacts retain much of hardness after high temperature exposure in an inert atmosphere.

P.S.D.9

ELECTROCHEMICAL STUDY OF AN AgO/TiO$_2$ COMPOSITE LAYER IN ALKALINE SOLUTIONS

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Silver dispersed on solid electronically conducting support is nowadays interesting catalysts for oxygen reduction in aqueous alkaline solutions, but the determination of its active amount presents a problem. In this study, by potentiodynamic polarization of freshly polished titanium in dilute AgNO3 solution, silver and TiO2 were codeposited, in a form of randomly distributed Ag-rich islands, consisting of submicron silver agglomerates ocluded by TiO$_2$. The cyclovoltammogram of an Ag/TiO$_2$ composite layer in an aqueous 0.1 M NaOH solution, in the voltage region 0 –0.9 V vs SCE, indicate the redox processes similar to those registered with the bulk polycrystalline silver electrode. The origin of the peaks in this voltage region is well known in view of the fact that the redox system Ag/Ag$_2$O-AgO in alkaline solutions presents the fundamentals of silver-zinc alkaline batteries. As known from earlier investigations, for compact silver electrode, the charge exceeding 0.13 C cm^{-2}, may be consumed for oxide formation. The later value corresponds to roughly 8.10^{17} silver atoms per square centimeter of geometric surface area. This is almost three order of magnitude higher than the number of silver atoms composing the outer low-index plane of an Ag monocrystal. If we turn back to the Ag/TiO2 electrode, it is reasonable to assume that, in the potential region more anodic than 0 V vs. SCE, silver completely undergoes the oxidation, and therefore the determination of charge under corresponding peaks was proposed in this work as a method to estimate active loading of silver in a form of fine dispersion.

P.S.D.10

SIMPLE MODEL FOR COMPACTION OF VERTICALLY TAPPED GRANULAR MATERIALS

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Granular materials are complex disordered systems of great importance for many technological applications. Despite a great number of experimental and theoretical investigations in this field, a completely satisfactory explanation of the compaction process in a vibrated granular material is still not provided, nor a unique conclusion concerning the temporal behavior of the density change exists. 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. Granular compaction is an example of a non-local temporal phenomena with a slowly decaying memory and the fractional kinetic equation gives a good description of the process. A simple model of granular compaction that captures this relaxation dynamics is presented.

P.S.D.11

ELECTROCHEMICAL PROPERTIES OF Ni /(Ni+MoO$_x$) ACTIVE CATHODES FOR HYDROGEN EVOLUTION IN ALKALINE SOLUTIONS

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Ni/(Ni+MoO$_x$) active cathodes were prepared by simultaneous electrodeposition of Ni and MoO$_x$ on a rough Ni substrate from an electrolyte solutions (Watts bath) in which MoO$_3$ particles were suspended by vigorous stirring. Electrodeposits were characterized by means of cyclic voltammetry, X-ray diffraction, SEM and EDX. The electrocatalytic activity of the layers for hydrogen evolution from alkaline solutions was determined by quasi-stationary polarization curves. Activity increases with MoO$_x$ in the Ni deposit u to a limiting value. It was found that the enhanced electrocatalytic activity of the cathodes was mainly ascribable to the increase of active sites or the content of MoO$_x$ particles. Furthermore, the performance of the Ni/(Ni+MoO$_x$) active cathodes was evaluated for the use in water-alkaline electrolysis in a laboratory scale. The hydrogen overvoltage of the cathodes was confirmed to be very low. Stability tests showed that Ni+MoO$_x$ co-deposits are stable under condition of constant as well as under repeated short-circuiting.

P.S.E.1

NANO-DESIGN OF BIOPOLYMER NETWORKS AND THEIR INTERACTIONS WITH CELLS

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There are many demands for polymer network systems in various biomedical and bio-engineering applications. Different types of networks have been investigated as materials for controlled release devices and implants. Of a special interest are alginate networks used for cell immobilization, cell transplantation and tissue engineering. Such polymer networks replace many functions of native tissue, organizing cells into three-dimensional architecture, providing mechanical integrity to the new tissue and providing a hydrated space for the diffusion of nutrients and metabolites to and from the controlled space with cell aggregates within.

However, ionically cross-linked alginate hydrogels loose more than 60% of their initial mechanical strength, within 15 h of exposure to physiological buffers. For these reasons the design of fine alginate membranes, for example encapsulation of cell aggregates on nano-level, is performed in this contribution. Dynamic-mechanical properties, important for engineering application of obtained systems are presented. But, that raises some new issues concerning cell interactions influencing orchestration in many cellular functions including proliferation, differentiation, migration, anchoring etc., also to be considered in the paper.

P.S.E.2

DEGRADATION OF POLYLACTIDES AND ENZYME CATALYSES

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Polylactide homo- and coplymers are at present of high interest because of their numerous applications in bio-medical and engineering fields, due to their biocompatibility and biodegradability. Polylactides have been investigated as materials for degradable sutures, capsules for controlled release of drugs, for medical implants and for degradable plastic products in polymer engineering.

For the all presented applications of polylactides is necessary to adduce material properties and stability to be good enough during use but, to degrade easily when it is withdrawn to waste or not more necessary as an implant. For that reasons the effects of material morphology influencing mechanical properties have been studied in parallel with degradation experiments. According to experiments, both in vitro and in vivo the degradation of partially crystalline films and implants proceeds in a selective manner, with the amorphous regions being degraded before the degradation of the crystalline region. The selectivity can be attributed to the less ordered packing of the amorphous regions that permits easier access of enzymes to the polymer chain. The size, shape and number of the crystallites have affected the rate of degradation. But, some differences in completely amorphous sample degradation have been observed and will be discussed in the paper in more detail.

P.S.E.3

FRAKTON SCALING AND DYNAMICAL PROPERTIES OF ELASTOMER MATERIALS

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Excluded volume theory of P.J. Flory and contributions of P.G. deGennes to the network percolation theories, (comp. *Scaling Concepts in Polymer Physics*, by P. G. deGennes, Cornell Univ. Press, Ithaca 1979) provided a broad background for investigation of scaling of polymer organization in space with change of chain conformations. The filling of space by irregular object that can not be described by Euclidean geometry is also elaborated in detail by Mandelbrot and others (e.g. *The Fractal Geometry of Nature*, by B.B. Mandelbrot, Feeeman and Co. San Francisco 1982). It is a great challenge for materials science to correlate these approaches to the properties of polymer networks as fractal objects.

In this contribution are considered relations of modulus of energy accumulation and loss modulus to the frequency of shear deformations of the sample, for different elastomer networks. The scaling low is obtained and theoretically considered fracton dimension that follows from it.

P.S.E.4

THERMAL DEGRADATION OF Zn(II) AND Ni(II) COMPLEXES WITH 2,6-DIACETYLPYRIDINE BIS(SELENOSEMICARBAZONE)

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Novel ligand system 2,6-diacetylpyridine-bis(selenosemicarbazone), H_2dapsesc, was used for preparation of Zn(II) and Ni(II) complexes. During the reaction of H_2dapsesc with $Ni(AcO)_2 \cdot 4H_2O$ a part of the side chains of the ligand was modified resulting in formation of the Ni(II) complex with 2-{1-[6-(1-selenosemicarbazonoethyl)-2-pyridyl]ethylidene}hydrazine carbonitrile (H_2hcn). Chemical composition of the ligand and of complexes was confirmed by the elemental analysis and the structures of all the substances were determined by IR, ^{1}H-NMR and ^{13}C-NMR spectroscopy. The structure of the Ni(II) complex was confirmed by the X-ray structural analysis. The geometry of the [Zn(dapsesc)]·DMSO is trigonal bipyramidal, while [Ni(hcn)] has square planar geometry. For the purpose of thermal stability determination, TG and DSC analysis of all substances was done. Thermal analysis showed that Zn(II) and Ni(II) complexes were stable up to 350°C when they gradually decompose forming stable compounds. Based on determined weight losses in correlation with structural characterization the mechanism of thermal degradation was discussed. Individual step enthalpies of all these processes were also determined.

P.S.E.5

EMULSION STABILITY EVALUATION USING FRACTAL DIMENSIONS APPROACH

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There are many developed strategies in emulsion stability evaluation, in purpose to determine the "life circle" of emulsions. Some of them are based on the rheological properties of emulsions under stress. There are very few which relay on the direct emulsions observations. In this paper we are presenting a developed method for emulsion stability evaluation by the direct observation using an "Image analysis" of optical emulsion properties. As the stability quantification measure we propose the fractal dimension approach. Method is based on the measure of emulsion transmittance properties, which are directly dependent on the emulsion stability at the moment of measurement. As a test, the emulsion type oil in the water (O/W) was used. System is classified as the stable emulsion and our intention was to find moment when emulsion start to break. Emulsion transmittance properties were measured with the application of system for acquisition of visual information's, which is based on the CCD camera and fast PC configuration equipped with the capturing software. The acquired sets of visual information's were analyzed by the OZARIA software package. The so-called box counting method determined the fractal dimensions. For these experiments the 100 boxes of different sizes were used. Experimental emulsions were measured after 7, 14, 21, and 28 days from the moment of creation. Slightly increase of fractal dimensions were observed which indicates that the emulsions are still in the stable region, or form the fractal point of view emulsion are still regular and no significant irregularities were observed. From the first experiments the applied methodology proved to be sensitive enough to be applied for the determination of emulsion stability quantification.

P.S.E.6

THE EFFECT OF PROCESSING PARAMETARS ON CHARACTERISTICS OF PLLA MICROSPHERES

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Biodegradable micro- and nanospheres made of poly-l-lactide (PLLA) are very potent drug or antigen delivery systems with inherent potential for drug and antigen targeting. The objective of this study is to formulate modified PLLA microparticles with defined size and shape that can efficiently bind bioactive component. This study investigates the effects of some process variables on the size distribution of particles prepared by precipitation method. The main focus is to study the effect of polymer molecular weight, PVA concentration and cosolvent selection on the shape, size, degree of crystallinity and X-ray diffraction (XRD) of the particles. Methanol and ethanol are selected as cosolvents. Scanning electron microscopy (SEM), X-ray diffraction (XRD) and differential scanning calorimetry (DSC) are used to characterize the particles. Optimal particles are achieved with higher PVA concentration and lower polymer molecular weight.

P.S.E.7

INVESTIGATION OF ANTIMICROBIAL ACTIVITY OF ESSENTIAL OILS FOR IMPREGNATION IN BIOMEDICAL TEXTILE

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Essential oils obtained from many plants have recently gained popularity and scientific interest. Antimicrobial activity of two essential oils (*Rosmarinus officinalis* and *Abies sibirica*) as active components of biomedical textile was investigated. Antimicrobial activity was detected using the agar well diffusion method against the following isolates: *Staphylococcus aureus* (ATCC 25923, Belgrade) and *Escherichia coli* (ATCC 25922).

To achieve a controlled release of antimicrobial activity and to enable utilization of higher concentrations of active ingredient, the essential oils were first immobilized in beads based on alginate, gelatine and yeast cells, and then bounded to medical textile. The maximum oil content (91%) was achieved in alginate capsules. The release of essential oils was followed by determination of viable bacterial cells during seven days incubation of beads in saline. *Rosmarinus officinalis* and *Abies sibirica* immobilized in the beads showed a significantly prolonged activity, with some gel-dependent variation.

P.S.E.8

EFFECTS BIOCOMPOSITES HAp/PLLA ON THE BONE MARROW CELLS OF BALB/C MICE GROWN IN VITRO

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The bone marrow stromal cells can to differentiate into bones cells in vitro conditions. The aim of this study was to investigate effects biocomposites HAp/PLLA(430) on the proliferation and differentiation bone marrow cells grown *in vitro*. 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 with 5% CO_2. After 7 days they were analysed with light microscope.

All cells were classified in three phenotypes: dendritic, fibroblastoid and epitheloid. Investigated biocomposite material HAp/PLLA(430) was shown suppression effect on growth of bone marrow cells. The number of fibroblastoid and epitheloid phenotypes was less than 50% in the presence of Hap/PLLA(430). Changes in cell morphology with slowdown of growth suggest that presence of biocomposites HAp/PLLA(430) can induce differentiation of bone marrow cells *in vitro.*

P.S.E.9

EVALUATION OF COMPOSITE BIOMATERIALS APPLICATION IN JAW BONE RECOVERY

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Today, usage of synthetic polymer biomaterials has a remarkable trend for propagation in biomedicine and dentistry. Thereby, demand for production new polymer biomaterials is more and more significant. Hydroxyapatite (HAp), as a natural bone constituent, is broadly used in all dentistry branches. Besides its good bioactive properties, HAp is brittle and has no elasticity. Therefore, it is upgraded by combining with polymers. In frame of these investigations, application of composite biomaterials in reconstruction of osteoporotic alveolar rat bone is evaluated. The evaluation of damaged osteoporotic bone regeneration is done by pathohystological analysis. This investigation showed best results in regeneration and rehabilitation of osteoporotic damaged alveolar bone after application of nanobiocomposite Calciumphosphate/poly-D,L-lactide-co-glycolide (CP/DLPLG). At the site of implantation, CP/DLPLG nanobiocomposite substantially accelerates regeneration and reparation of damaged alveolar bone and relates to formation of new bone tissue similar to mature bone. Due to its impressive osteoconductive effect, applied nanobiocomposite can entirely restore missing alveolar bone. Therefore, CP/DLPLG nanobiocomposite belongs to a group of biomaterials which notably accelerate bone tissue regeneration and can represent biomaterial of choice for alveolar bone defects rehabilitation.

P.S.E.10

RADIOPROTECTIVE ACTIVITY OF FULLERENOL C_{60} $(OH)_{24}$ ON HUMAN MALIGNANT HAEMATOPOIETIC CELL LINES

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Aim of this study was to investigate radioprotective activity of fullerenol C_{60} (OH) $_{24}$ applicated in nano and micromolar concentrations on the panel of human malignant haematopoietic cell lines treated with high-dose irradiaton.

K562, HL60, Raji, JURKAT and PC cell lines were irradiated with 24Gy (LD50) (control samples). Cells were treated with a range of fullerenol concentrations (from 10 nmol /mL to 1μmol/mL) and one hour later cells were irradiated with LD50 (experimental samples). Total cell number in both control and fullerenol treated samples was determined 24 h after x-ray exposure by due exclusion assay (DET). Additionally, surviving of K562 cells pretreated with 10 nmol/mL fullerol and irradiateed with 24Gy was evaluated through 24, 48 and 72 h after X-ray exposure. The morphological changes of survived K562 cells were evaluated by light microscopy on MGG stained cyto-spin slides.

The results showed that fullerenol at micromolar concentrations was cytotoxic for all cell lines. The rate of cytotoxicity in experimetal samples ranged from 56% to 79% and was fullerenol concentration and cell line depended. RAJI cells were the most sensitive at all applicated concentrations of fullerenol. Only concentration of 10 nmol/mL of fullerenol showed radioprotective effect on RAJI and K562 cell lines.

P.S.E.11

FULLERENOL-POLIDENTATE LIGAND

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Results presented in this paper are gained through research of synthesis and physical determination of Fe^{3+} complexes with polydentat ligand fullerenol $C_{60}(OH)_{24}$. Fullerenol is water soluble with symmetrical arrangement of hydroxyl groups on a C_{60} sphere. In acid environment (pH=2) in concentration range from 0.0100 mol/dm^3 to 0.3525 mol/dm^3 solution of Fe^{3+} is precipitated with fullerenol solution which had a concentration range from 2.215 10^{-3} mol/dm^3 to 7.088 10^{-3} mol/dm^3. DSC analyses of complex showed dominant endothermic peak at t=142.67°C with ΔH=-5949.03 mJ (loss of covalent bonds of hydroxylic groups and water) and a smaller peak at t=434.79ºC with ΔH=-283.10 mJ (sublimation of C_{60}). Residue after burning was 82.95% (complex and occluded iron in Fe_2O_3 form). IR spectrum of the formed complex is identical with fullerenol spectrum. On the basis of obtained preliminary experimental results, the structure of mixed cross-linked complex $[Fe(fullerenol)n(H_2O)m]^{3+}$ $[Fe(H_2O)_6]^{3+}$ is assumed with molar ratio fullerenol:Fe^{3+}=1:77,65.

P.S.E.12

USING AN ELECTOOPTICAL LIQUID CRYSTAL MESOPHASE TO ORIENTATE AND TEST OF HUMAN ERYTHROCYTES

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The unique electro-optic effects in liquid crystals are scrupulously being studied to use in laser physics, systems for surface processing and flaw detection, display and medicine. The physical phenomena resulting from forces exerted on a liquid-crystal mesophase on account of the electric, magnetic, thermal fields and deformation are due to the weak intermolecular interaction of the structural elements of liquid-crystal media. To take an advantage of such factors as the presence of weak dispersion forces between the molecules of liquid crystals and the high orienting ability, we recently proposed a nonlinear liquid-crystal anisotropy medium for visualizing, fixing, and orienting human red blood cells. The mechanism of liquid crystal self-organization [1] due to interaction with erythrocytes has been discussed.

[1] A.A. Kamanin, N.V. Kamanina // accepted for publication in *Tech. Phys. Lett., 2006*

P.S.E.13

THE INFLUENCE OF THE NETWORK FORMERS FIELD STRENGTH ON THE CRYSTALLIZATION MECHANISM OF GLASS

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The glasses generally crystallize either by the surface or volume mechanism. Although both crystallization mechanisms can occur simultaneously and competitively, one mechanism usually dominates. Assuming the activation energy of crystallization E to be independent of particle size and temperature (at least in the temperature regime of the DTA scans), the ratio $Tp^2/(\Delta T)_p$ was used as a qualitative measure for evaluating the crystallization mechanism of glass. Three different glasses K-Ge, K-Si, and Ca-P were chosen for investigation and experiments on the powder samples granulations of 0-1 mm were performed. In these glasses are the network former cations Ge, Si and P with the field strength ΔF of 1.45, 1.57 and 2.1 respectively. The results shown a significant difference of $Tp^2/(\Delta T)_p$ behaviour . In the size range of 0-0.075 mm, the parameter $Tp^2/(\Delta T)_p$ decreases , so that the surface mechanism of crystallization is dominant for all glasses. The minimum of the parameter $Tp^2/(\Delta T)_p$ appears at 0.075 mm for K-Si glass , while for the K-Ge and Ca-P glasses at 0.15 mm. The largest minimum was appeared for Ca-P glass with the highest ΔF and a least deep one has K-Ge glass with the smallest ΔF. These minimums designate the start of change of the crystallization mechanism from the surface to volume one. The wider range of particle size of 0.5 mm has Ca-P glass where the parameter $Tp^2/(\Delta T)_p$ increases and the surface crystallization mechanism changed with the volume one, while K-Ge glass has the least particle size range of 0.1 mm . In the range above these particle sizes, the parameter $Tp^2/(\Delta T)_p$ has constant value for all glasses, nevertheless the highest values correspond to Ca-P glass and the smallest one for K-Ge glass. This study shown that beside the powder particle size of the samples and the kind of glass network formers, cations field strength affected very complex on the crystallization mechanism of glasses.

P.S.E.14

SYNTHESIS AND BIOCOMPABILITY OF HYDROTHERMALY OBTAINED NANOSTRUCTURED CALCIUMHYDROXYAPATITE

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In this paper hydrothermal synthesis of calciumhydroxyapatite and its biocompatibility evaluation by the in vivo assessment of the muscle tissue reaction after the implantation has been analyzed. The synthesized powders of hydroxyapatite are preferentially carbonated hydroxyapatite of the B type in the form of agglomerates that accommodate two-modal size pores of 1.5-10 nm and 50-200 nm. The structure of calciumhydroxyapatite particles are consisted from crystallites of 8-22 nm in size, bind within the prime particles which size is between 10 and 63 nm that in turn form bigger agglomerates of 200 nm in size and these were further clustered building up the agglomerates 5-20 μm in size. Biocompatibility assessment revealed that only mild to moderate inflammatory reaction was seen around the calciumhydroxyapatite implants. Calciumhydroxyapatite failed to show any substantional toxicity.

P.S.E.15

CHEMICAL STABILITY STUDY OF SOME DENTAL MATERIALS IN WEAKLY ACIDIC SOLUTIONS

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Various inorganic materials in the form of fillings, crowns and implants are used in dental prosthetic practice from both orthodontic and aesthetic reasons. In this work the stability of some commercial prosthetic materials (hydroxyapatite, zinc-phosphate cements and glass-ionomer cements) in 4% acetic acid was investigated. The content of heavy metals (Pb, Cd, Cu, and Zn) leached for 24 hours at 25°C in CH_3COOH was determined. The metals content in acetate solutions was measured by potentiometric stripping analysis (PSA) technique with dissolved oxygen being used as oxidizing agent.

The measurement results showed that 0.7-30 ppm of Cu and 2-115 ppm of Zn leached under defined conditions, highest values being for hydroxyapatite. The amount of lead leached under the same conditions was 0.3-4.5 ppm while Cd was not detected.

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