Fourteenth Annual Conference

YUCOMAT 2012

Hunguest Hotel Sun Resort Herceg Novi, Montenegro, September 3-7, 2012

http://www.mrs-serbia.org.rs

PROGRAMME & THE BOOK OF ABSTRACTS

organised by

MATERIALS RESEARCH SOCIETY OF SERBIA

under the auspices of

FEDERATION OF EUROPEAN MATERIALS SOCIETIES (FEMS)

MATERIALS RESEARCH SOCIETY (MRS)

FOURTEENTH ANNUAL CONFERENCE

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WELCOME SPEECH BY THE PRESIDENT OF MRS-SERBIA

My Esteemed Colleagues,

Welcome to the 14th YUCOMAT! My heart is full of hopes that this year's conference will provide yet another enjoyable experience to all of you. I look forward to its abounding with this perfect cocktail made up of a little bit of intellectual stimulation, a little bit of constructive networking, all spiced up with having a laugh with newly made friends and colleagues and, finally, taking pleasure in the beautiful climate and nature offered by this Bay and its surroundings.

Every year I stand here and remind you of the immense path that we have crossed from the moment we conceived these meetings in the early 1990s, while the war raged across this whole region of the Balkans, until this very day when it thrives once again in peace and is moving towards the horizons of greater prosperity. At the first two conferences, in 1995 and 1997, only the greatest enthusiasts, adventurers and, I have to admit, friends, were the foreign attendees. This year, on the other hand, 80 % of participants come from abroad and only 20 % are domestic scientists, yielding the highest ratio of foreign-to-domestic participants that we have ever had. As you may guess, this is far from an ideal proportion, but it undoubtedly reflects the economic crisis that has hit hard both the global and the regional economies. I am highlighting this discrepancy because one of the biggest advantages of this conference certainly comes from its providing an opportunity for the fruitful encounters of opposites, be it a place where young scientists could network with their older and more experienced counterparts, for the potential benefit of both, or where domestic researchers meet with the foreign ones so as not only to exchange opinions on the matters of interest, but also to initiate potentially rewarding collaborations. Research in global science policy has taught us that this communication between the developed and underdeveloped countries is of vital importance for the promotion of healthy progress of the planet as a whole. In such collaborations, there is, of course, room for mutual interest that need not be either neocolonialist exploitation of the underprivileged or donation of resources that will find all but fertile grounds for the thriving of the local societies. In any case, we should keep in mind that the free dissemination of knowledge is of vital importance in ensuring that the pathways to progress – both global and local - remain open ahead of us.

Now, there is no doubt that to reach the levels of progress that typify developed countries, an increased pervasiveness of science in our society is needed. What I mean by pervasiveness in this context is that the outcomes of the locally conducted scientific research need not only be reported in international scientific journals with all the pomp that follows the publication process, but they should be utilized for the purpose of the technological advancement of our societies. For, remember, although materials science is a fundamental science, it also contains a very strong pragmatic component, which craves to be practically applied, lest it lose its purpose. However, with rather moderate funding for scientific research and almost completely torn links with local industries, materials science and, I am free to say, science in general in this region of the world can be said to exist in a bubble of a kind, as we quite rarely, if ever, see our findings be utilized for the sake of high-tech or biomedical progress at the local scale. The consequences of this state of affairs are rather disparaging: the recent statistical studies have counted thousands and thousands of Serbian PhDs who live and work in foreign research institutions, having been a part of a massive brain drain, allegedly more devastating than that in any other country of the world

when normalized to the overall number of graduates from the Serbian universities in the past two decades. Obviously, provided with little or no opportunities for the working conditions and social recognition enjoyed by many of their foreign counterparts, fresh graduates more often than not opt to search for a career abroad. Many countries, including, most notably, Korea (which is officially represented at this very meeting), have developed federal programs to stimulate researchers educated abroad to return and continue their scientific career in the country of their origins. Although such programs do not exist in Serbia, the meetings organized by our Materials Research Society, including primarily YUCOMAT, yield a good image of the materials science in Serbia to the foreign visitors and thus reverse the stereotypical seeing of the quality of scientific research in Serbia as inferior compared to the rest of the world.

As for sheer numbers, this year's YUCOMAT does not differ much from the previous ones, with 4 plenary sessions, 19 invited lectures, 3 oral presentation sessions, 122 posters and about 200 presentations overall that are bound to be presented by the participants from around 30 different countries, all packed during the five days of the conference. Just like during the previous years, a similarly diverse program of extracurricular events is offered to the attendees of the conference, both in this very venue and in terms of visits of the nearby touristic attractions. Make sure to attend the welcome cocktail this evening and be here for the poster sessions that will take place during the evening hours from Tuesday to Thursday. The excursion to Dubrovnik is appointed for Wednesday afternoon, while a cruise around the Bay will take place on Thursday afternoon. Coffee breaks are always a good opportunity for networking, for meeting new people, for discussing presentations or catching up on news from the scientific world with your fellow colleagues. In a few minutes from now, we will recognize the winners of the best PhD and Master of Science theses defended between this YUCOMAT and the previous one. During the Closing Ceremony on Friday we will announce the best oral and poster presenters.

As for the scientific content of the conference, we have given full priority to research topics that are currently considered as being on the frontier of the field. Nanomaterials, biomedical materials, high resolution and *in situ* imaging techniques, and advanced methods for synthesis and processing present only some of those exciting topics that will be given the central stage and most attention during this meeting. Last but not least, I am acknowledging the Organizing Committee, the International Advisory Board, the junior researchers from my group and Sasha, the conference secretary, for their efforts in assisting in the organization of this meeting. Note that this year's conference is dedicated to the Vice-President of our Materials Research Society, Dr. Slobodan Milonjić, who has greatly contributed to our mission and aims and has turned seventy this year. Once again, on behalf of all of them, I am expressing utmost gratefulness for having a chance to host you here and I hope that this conference will turn out to be a very pleasant experience for all of you. We wish to continue our trend of success and sustain in our mission, which, as I mentioned, is to connect the scientific body of a small and developing country with those of developed ones for the benefit of the entire planet. Having the YUCOMAT happen year after year reminds me that we are making small, but beautiful steps to better the world by our sciences and this is the reward for not only us, the organizers, but all the more for you, the attendees of this wonderful meeting.

I wish you a most splendid time at this year's YUCOMAT!

Dragan Uskoković

President of MRS-Serbia

MRS-Serbia

President: Dragan Uskoković
Vice-presidents: Slobodan Milonjić, Velimir Radmilović, Dejan Raković
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HISTORY:

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 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 and, similar to other MR societies in the world, the programme was made and objectives determined. 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. Until 2003, Conferences were held every second year and then they grew into Annual

Conferences that were traditionally held in Herceg Novi in September of every year. Following the political separation between Serbia and Montenegro, in 2007 Yu-MRS formed two new MRS: MRS-Serbia (official successor of Yu-MRS) and MRS-Montenegro (in founding). In 2008 MRS-Serbia became a member of FEMS (Federation of European Materials Societies).

GENERAL INFORMATION

DATE AND VENUE: The conference will be held on September 3-7, 2012, at the Hunguest Hotel Sun Resort, in Herceg Novi, Montenegro. Participants will also be accommodated there. The conference will begin on Monday, September 3rd, at 09.00 and end on Friday, September 7th, 2012, at 12.45.

REGISTRATION: Registration, registration fee payment, conference materials distribution, etc, will take place at the conference desk (Conference Secretariat) open on Sunday, September 2, Monday, September 3, and Tuesday, September 4, from 8.00 to 19.00, on Wednesday and Thursday 8.00-13.00 and 19.00-20.00, and on Friday from 8.00 to 12.00. At registration, the participants are requested to submit a proof of their advance registration fee payment and their registration form.

INSTRUCTION FOR AUTHORS: The conference will feature plenary sessions, oral sessions, poster sessions, Korea-Serbia Scientific Cooperation Workshop on Biomaterials and an Exhibition of synthesis and characterization equipment.
Time of papers' presentations to be given in ORAL SESSIONS is limited. Time available for delivery is 30 min for plenary and 15 min for other papers including discussion (5-10 min). Video-beam is available. PowerPoint presentations, recorded on CD or memo-stick, should be given at registration.
In POSTER SESSIONS, the authors are requested to display their papers minimum one hour before the session and to be present beside their posters during the session. Poster sessions venue will be open from Tuesday to Thursday, from 18.00-22.00.

CONFERENCE AWARDS: Materials Research Society of Serbia 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. Awarded researchers are granted free registration at the next YUCOMAT Conference.

ADDITIONAL ACTIVITIES: Korea-Serbia Scientific Cooperation Workshop on Biomaterials will be held on September 1-5th. An Exhibition of synthesis and characterization equipment will be held during the Conference. Traditional Cocktail Party on Monday evening and excursions on Wednesday afternoon to Dubrovnik (Croatia) and Thursday afternoon (boat trip around Boka Kotorska Bay) will be organized again.

Programme

GENERAL CONFERENCE PROGRAMME

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

Sunday, September 2, 2012

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

Monday, September 3, 2012

08^{00}-09^{00} **Registration**

09^{00} -9^{30} **OPENING CEREMONY**
- Introduction and Welcome

9^{30}-13^{00} **First Plenary Session**

13^{15} **Photo Session**

15^{00}-18^{45} **Symposium C**

19^{30}-21^{00} **Cocktail Party**

Tuesday, September 4, 2012

09^{00}-12^{30} **Second Plenary Session**

15^{00}-18^{45} **Symposium A**

20^{00}-22^{00} **Poster Session I** (Symposium A)

Wednesday, September 5, 2012

09^{00}-11^{00} **Third Plenary Session**

14^{00}-19^{00} **Excursion to Dubrovnik, Croatia**

20^{00}-22^{00} **Poster Session II** (Symposium B)

Thursday, September 6, 2012

09^{00}-10^{30} **Fourth Plenary Session**

11^{00}-12^{00} **Symposium E**

14^{00}-19^{00} **Boat-trip around Boka Kotorska Bay**

20^{00}-22^{00} **Poster Session III** (Symposiums C and E)

Friday, September 7, 2012

09^{00}-12^{45} **Symposium B**

12^{45}-13^{15} **Awards and Closing of the Conference**

FIRST PLENARY SESSION

Monday, September 3, 2012

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

09^{30}-10^{00} **ATOMIC CONFIGURATIONS AND OPTICAL PROPERTIES OF POINT DEFECTS IN GRAPHENE**
S.J. Pennycook[1,2,3], W. Zhou[2,1], J. Lee[1,2], J.C. Idrobo[1,2], M.P. Oxley[2,1], M. Kapetanakis[2,1], S.T. Pantelides[2,1]
[1]Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA, [2]Department of Physics and Astronomy, Vanderbilt University, Nashville, TN, USA, [3]Department of Materials Science and Engineering, University of Tennessee, Knoxville, TN, USA

10^{00}-10^{30} **APPLICATION OF TiO_2 NANOWIRES**
L. Forró
Laboratory of Physics of Complex Matter, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

10^{30}-11^{00} **NANOSTRUCTURE – BIOMOLECULE INTERACTIONS AND THEIR IMPLICATIONS FOR NEW MATERIALS AND HEALTHCARE**
R.W. Siegel
Rensselaer Nanotechnology Center and Materials Science and Engineering Department, Rensselaer Polytechnic Institute, Troy, New York, USA

Break: 11^{00}-11^{30}
Chairmen: R.W. Siegel and L. Forró

11^{30}-12^{00} **AN UPDATE ON THE ABERRATION–CORRECTED, MONOCHROMATED ENVIRONMENTAL TEM**
R. Sinclair, H.J. Jung, A.L. Koh
Department of Materials Science and Engineering, Stanford University, Stanford, CA, USA

12^{00}-12^{30} **ATOM-PROBE TOMOGRAPHY AND THE SCIENCE OF A NEW CLASS OF Al-Sc BASED ALLOYS**
D.N. Seidman[1,2], D.C. Dunand[1]
[1]Department of Materials Science and Engineering, Northwestern University, Evanston, IL, USA, [2]Northwestern University Center for Atom-Probe Tomography (NUCAPT), Evanston, IL, USA

12^{30}-13^{00} **VOLUMETRICALLY CONSTRAINED PHASE TRANSITIONS**
V.R. Radmilović[1], J.D. Sugar[2], J.T. McKeown[2], R. Gronsky[2], A.M. Glaeser[2]
[1]Nanotechnology and Functional Materials Center, Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Department of Materials Science and Engineering, University of California, Berkeley, California, USA

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

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

Session I: 15^{00}-18^{45}
Chairpersons: V. Uskoković and S. Lazić

15^{00}-15^{15} **IN-SITU TEM OBSERVATIONS OF ISLAND GRAIN SHRINKAGE IN GOLD MAZED BICRYSTAL THIN FILMS**
T. Radetić[1,3], D. Olmsted[2], C. Ophus[1], M. Asta[2], U. Dahmen[1]
[1]National Center for Electron Microscopy, Lawrence Berkeley National Lab, Berkeley, CA, USA, [2]Department of Materials Science and Engineering, University of California, Berkeley, CA, USA, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

15^{15}-15^{30} **CHARACTERIZATION OF SELF-ASSEMBLED GADOLINIUM NANOPARTICLES USING TEM-EELS**
P.J. Kempen[1], A.L. Koh[2], D. Ye[3], P. Pandit[3], J. Rao[3], R. Sinclair[1,2]
[1]Department of Materials Science and Engineering, Stanford University, Stanford, CA, USA, [2]Stanford Nanocharacterization Laboratory, Stanford University, Stanford, CA, USA, [3]Department of Radiology, Stanford University, Stanford, CA, USA

15^{30}-15^{45} **WHITE LIGHT EMISSION FROM FLUCTUATING NANOCLUSTERS**
T.J. Pennycook[1,2*], J.R. McBride[3], S.J. Rosenthal[3,1,2], S.J. Pennycook[2,1], S.T. Pantelides[1,2,4]
[1]Department of Physics and Astronomy, Vanderbilt University, Nashville, TN, USA, [2]Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA, [3]Department of Chemistry, Vanderbilt University, Nashville, TN, USA, [4]Department of Electrical Engineering and Computer Science, Vanderbilt University, Nashville, TN, USA, [*]Present address: SuperSTEM, Daresbury, UK

15^{45}-16^{00} **A TRANSPORT-BASED INTEGRATED EXCITON MULTIPLEXER – TOWARDS OPTICAL SIGNAL PROCESSING USING EXCITONS**
S. Lazić[1,2], A. Violante[1], R. Hey[1], P. V. Santos[1], K. Cohen[3], R. Rapaport[3]
[1]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany, [2]Dpto. de Física de Materiales, Universidad Autónoma de Madrid, Madrid, Spain, [3]Racah Institute of Physics, Hebrew University of Jerusalem, Jerusalem, Israel

16^{00}-16^{15} **CALCIUM PHOSPHATE NANOPARTICLES WITH TUNABLE DRUG RELEASE KINETICS FOR THE ADVANCED TREATMENT OF BONE INFECTION**
V. Uskoković, T. Desai
Therapeutic Micro and Nanotechnology Laboratory, Department of Bioengineering and Therapeutic Sciences, University of California, San Francisco, CA, USA

16^{15}-16^{30} **WAYS OF PHASE TRANSFORMATIONS IN NANOCRYSTALLINE ALLOYS AT HEAVY TREATMENTS**
A.Ye. Yermakov, Yu.N. Gornostyrev, I.K. Razumov
Institute of Metal Physics of the Ural Branch of RAS, Ekaterinburg, Russia

16^{30}-16^{45} **SEVERE PLASTIC DEFORMATION (SPD) A NEW TOOL TO REACH HIGH THERMOELECTRIC PERFORMANCE**
G. Rogl[1,2,3], A. Grytsiv[1], P. Rogl[1], E. Bauer [2], M. Zehetbauer[3]
[1]Institute of Physical Chemistry, University of Vienna, Wien, Austria, [2]Institute of Solid State Physics, TU-Wien, Wien, Austria, [3]Physics of Nanostructured Materials, University of Vienna, Wien, Austria

16^{45}-17^{00} **TEM/HRTEM INVESTIGATION OF ROOM TEMPERATURE DEFORMATION IN Al/QC COMPOSITE**
B. Markoli[1], F. Zupanič[2], T. Bončina[2], H. Guo[3], J. Ciston[3], P. Ercius[3], V.R. Radmilović[3], A.M. Minor[3]
[1]Dept. of Materials and Metallurgy, Faculty of Natural Sciences and Engineering, University of Ljubljana, Slovenia, [2]Institute of Technology of Materials, Faculty of Mechanical Engineering, University of Maribor, Slovenia, [3]National Center for Electron Microscopy, Lawrence Berkeley National Laboratory, Berkeley, CA, USA

Break: 17^{00}-17^{30}
Chairpersons: T. Radetić and P.J. Kempen

17^{30}-17^{45} **NANOSTRUCTURED MATERIALS BASED ON THE ORGANIC AND THE INORGANIC SYSTEMS**
N.V. Kamanina, P.V. Kuzhakov, P.Ya. Vasilyev, V.I. Studeonov
Vavilov State Optical Institute, St. Petersburg, Russia

17^{45}-18^{00} **SELF-ORGANIZED TiO_2 NANOTUBE ARRAYS: USE IN DYE-SENSITIZED SOLAR CELLS**

K. Žagar[1], I. Jerman[2], B. Orel[2], D. Verhovšek[3], M. Čeh[1]
[1]Jožef Stefan Institute, Department for Nanostructured Materials, Ljubljana, Slovenia, [2]National Institute of Chemistry Slovenia, Laboratory for the Spectroscopy of Materials, Ljubljana, Slovenia, [3]Cinkarna Celje, d.d. Inc., Celje, Slovenia

18^{00}-18^{15} **A FAST TWO-STEP DRY SYNTHESIS OF COPPER FERRITE NANOPARTICLES**

O.V. Belousova[1], Yu.G. Morozov[1], M.V. Kuznetsov[2]
[1]Institute of Structural Macrokinetics and Materials Science Russian Academy of Sciences, Chernogolovka, Moscow Region, Russia, [2]Mordovian State University, Saransk, Russia

18^{15}-18^{30} **STRUCTURE AND MAGNETIC PROPERTIES OF NANOCRYSTALLINE ZINC FERRITE BASED MATERIALS**

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

18^{30}-18^{45} **EFFECT OF STANNOXANE NANO-BUILDING BLOCKS OF DIFFERENT FUNCTIONALITY IN EPOXY NANOCOMPOSITES**

A. Strachota[1], F. Ribot[2,3], L. Matějka[1], M. Perchacz[1], B. Strachota[1], M. Šlouf[1], L. Starovoytova[1], J. Pleštil[1]
[1]Institute of Macromolecular Chemistry Academy of Sciences of the Czech Republic, Praha, Czech Republic, [2]UPMC, Chimie de la Matière Condensée de Paris (UMR 7574), Collège de France, Paris, France, [3]CNRS, Chimie de la Matière Condensée de Paris (UMR 7574), Collège de France, Paris, France

SECOND PLENARY SESSION

Tuesday, September 4, 2012

Session II: 09^{00}-12^{30}
Chairmen: W. Jäger and E. Olsson

09^{00}-09^{30} **CONDITIONS FOR HIGH-RESOLUTION ELECTRON MICROSCOPY OF RADIATION-SENSITIVE OBJECTS**
H. Rose
University of Ulm, Ulm, Germany

09^{30}-10^{00} **LOW-VOLTAGE TEM TO EXPLORE PHYSICS AND CHEMISTRY OF LOW-DIMENSIONAL MATERIALS ON THE ATOMIC SCALE**
U.A. Kaiser
University of Ulm, Ulm, Germany

10^{00}-10^{30} **TOWARDS ATOMIC RESOLUTION STEM OF ENERGY-RELATED MATERIALS**
F. Hofer, W. Grogger, G. Kothleitner, E. Fisslthaler, W. Haas, Th. Haber, F. Schmidt
Institute for Electron Microscopy and Fine Structure Research, Graz, Austria

Break: 10^{30}-11^{00}
Chairmen: F. Hofer and U.A. Kaiser

11^{00}-11^{30} **TRANSMISSION ELECTRON MICROSCOPY FOR HIGH-EFFICIENCY SOLAR CELLS**
W. Jäger
Microanalysis of Materials, Institute of Materials Science, Christian-Albrechts-Universitaet zu Kiel, Kiel, Germany

11^{30}-12^{00} ***IN SITU* CHARCTERISATION OF DYNAMICS OF CHARGES AND MATTER AT INTERFACES BY ELECTRON MICROSCOPY**
E. Olsson
Department of Applied Physics, Chalmers University of Technology, Gothenburg, Sweden

12^{00}-12^{30} **APPLICATIONS OF ABERRATION CORRECTED TEMs IN ENERGY SCIENCE**
J. Mayer, M. Beigmohamadi, J. Barthel, S. Roitsch
Central Facility for Electron Microscopy, RWTH Aachen University, Aachen, Germany, and Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons, Research Centre Juelich, Juelich, Germany

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

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

Session I: 15^{00}-18^{45}
Chairmen: S. Milonjić and V. Bobnar

15^{00}-15^{15} **COMBUSTION SYNTHESIS OF COMPLEX OXIDES FOR GAS-SENSING APPLICATIONS**
M.V. Kuznetsov
Mordovian State University, Saransk, Russia

15^{15}-15^{30} **EFFICIENT BULK PRODUCTION OF JANUS PARTICLES BY BIPOLAR ELECTROCHEMISTRY**
J. Roche, G. Loget, A. Kuhn
Université de Bordeaux, ISM, UMR 5255, ENSCBP, Pessac, France

15^{30}-15^{45} **FORMATION OF CAST METAL-MATRIX COMPOSITES BASED ON TERNARY BORIDES OBTAINED BY SHS**
V. Sanin, D. Ikornikov, D. Andreev, V. Yukhvid
Institute of Structural Macrokinetics and Materials Science RAS, Chernogolovka, Moscow Region, Russia

15^{45}-16^{00} **COLOR STABILITY OF MODEL POLYURETHANES WITH COVALENTLY BOUND STABILIZERS**
J. Podešva[1], V. Špaček[2], J. Kovářová[1], J. Spěváček[1]
[1]Institute of Macromolecular Chemistry, v.v.i., Academy of Sciences of the Czech Republic, Prague, Czech Republic; [2]SYNPO, a.s., Pardubice, Czech Republic

16^{00}-16^{15} **CORROSION RESISTANCE OF OXIDE COATINGS ON ALUMINUM OBTAINED BY PLASMA ELECTROLYTIC OXIDATION IN SODIUM TUNGSTATE SOLUTION**
R. Vasilić[1], S. Stojadinović[2], J. Bajat[3], V. Mišković-Stanković[3]
[1]Faculty of Environmental Governance and Corporate Responsibility, Educons University, Sremska Kamenica, Serbia, [2]Faculty of Physics, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

16^{15}-16^{30} **BONDING ADDITIVES – A THERMOANALYTICAL APPROACH**
J. Kovářová, J. Podešva
Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic v.v.i., Prague, Czech Republic

16^{30}-16^{45} **COERCIVITY ENHANCEMENT *VIA* GRAIN-BOUNDARY DIFFUSION PROCESS**
M. Soderžnik[1], P. McGuiness[1, 2], S. Kobe[1]
[1]Jožef Stefan Institute, Department for Nanostructured Materials, Ljubljana, Slovenia, [2]NAMASTE Centre of Excellence, Ljubljana, Slovenia

16^{45}-17^{00} **PROGRESS IN THE CHARACTERISATION OF THE MATERIALS' BEHAVIOUR BY THE DISK PRESSURE TESTING**
E. Lamani[1], P. Jouinot[2]
[1]Polytechnic University of Tirana, Albania, [2]Institut Supérieur de Mécanique de Paris, Laboratoire d'Ingénierie des Systèmes Mécaniques et des Matériaux, Saint Ouen, France

Break: 17^{00}-17^{30}
Chairmen: A.Ye. Yermakov and M.V. Kuznetsov

17^{30}-17^{45} **NEW PRECURSORS FOR DEPOSITION OF NANOSIZED NICKEL FILMS**
N.B. Morozova[1,2], S.I. Dorovskikh[1,2], A.N. Mikheev[1,2], A.V. Arzhannikov[2], M.K.A. Thumm[2]
[1]Nikolaev Institute of Inorganic Chemistry SB RAS, Novosibirsk, Russia, [2]Novosibirsk State University, Novosibirsk, Russia

17^{45}-18^{00} **THE PREPARATION AND CHARACTERISATION OF NICKEL FERRITE THIN FILM**
S.M. Busurin[1], P.A. Tsygankov[2], O.D. Boyarchenko[1], M.L. Busurina[1], A.E. Sytchev[1]
[1]Institute of Structural Macrokinetics and Materials Science RAS, Chernogolovka, Moscow region, Russia, [2]Bauman Moscow State Technical University, Moscow, Russia

18^{00}-18^{15} **SOME ASPECTS IN PZT FILMS PREPARATION**
S. Timoshenkov, V. Vodopyanov, A. Borisov, N. Korobova
Department of Microelectronics, National Research University of Electronic Technology, Moscow, Russia

THIRD PLENARY SESSION

Wednesday, September 5, 2012

Session III: 09^{00}-11^{00}
Chairmen: J. Wittig, R.A. Andrievski and L.L. Shaw

09^{00}-09^{30} **NANOMATERIALS FOR ONBOARD HYDROGEN STORAGE APPLICATIONS**
L.L. Shaw
Department of Mechanical, Materials and Aerospace Engineering, Illinois Institute of Technology, Chicago, IL, USA

09^{30}-10^{00} **NANOGLASSES AND AMORPHOUS/NANOCRYSTALLINE MATERIALS: SOME NEW APPROACHES**
R.A. Andrievski
Institute of Problems of Chemical Physics, Chernogolovka, Russia

10^{00}-10^{30} **THE INFLUENCE OF STACKING FAULT ENERGY ON THE DEFORMATION MECHANISMS OF Fe-Mn AUSTENITIC STEELS**
J. Wittig
Vanderbilt University, Nashville, Tennessee, USA

10^{30}-11^{00} **STRUCTURAL AND DIELECTRIC INVESTIGATIONS OF ADVANCED RELAXOR POLYMER SYSTEMS**
V. Bobnar[1], A. Eršte[1], X.-Zh. Chen[2], X. Li[3], G. Casar[1], S. Glinšek[1], X. Qian[3], Q.-D. Shen[2], Q. Zhang[3]
[1]Jožef Stefan Institute and Jožef Stefan International Postgraduate School, Ljubljana, Slovenia, [2]Polymer Science and Engineering Dept. and Key Laboratory of Mesoscopic Chemistry of MOE, School of Chemistry and Chemical Engineering, Nanjing University, China, [3]Department of Electrical Engineering and Materials Research Institute, The Pennsylvania State University, University Park, Pennsylvania, USA

FOURTH PLENARY SESSION

Thursday, September 6, 2012

Session IV: 09^{00}-10^{30}
Chairmen: J. De Yoreo and F.-H. Lin

09^{00}-09^{30} **PHYSICAL INSIGHTS INTO NATURE'S WAY OF MAKING MATERIALS**
J. De Yoreo
Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA, USA

09^{30}-10^{00} **TRICOPOLYMER/FIBRINGLUE COMPOSITE AS SCAFFOLD FOR ARTICULAR CARTILAGE TISSUE ENGINEERING**
F.-H. Lin
Institute of Biomed Eng., National Taiwan University, Taipei, Taiwan

10^{00}-10^{30} **NANOMATERIALS: ARE THEY SAFE?**
M. Filipič
National Institute of Biology, Department for Genetic Toxicology and Cancer Biology, Ljubljana, Slovenia

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

SYMPOSIUM E: BIOMATERIALS

Session I: 11^{00}-12^{00}
Chairmen: D. Raković and N. Ignjatović

11^{00}-11^{15} **MULTIFUNCTIONAL NANO SCALE DRUG DELIVERY PARTICLES BASED ON VITAMIN D3-LOADED HYDROXYAPATITE IN BONE TISSUE ENGINEERING**
N. Ignjatović[1], Z. Ajduković[2], V. Uskoković[3], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]University of Niš, Faculty of Medicine, Clinic of Stomatology, Department of Prosthodontics, Niš, Serbia, [3]Therapeutic Micro and Nanotechnology Laboratory, Department of Bioengineering and Therapeutic Sciences, University of California, San Francisco, USA

11^{15}-11^{30} **THE DYNAMICS OF THE DISSOLUTION OF THE ULTRAFINE IBUPROFEN IN COMPARISON WITH INITIAL SUBSTANCE**

S.A. Myz[1], A.G. Ogienko[2], T.P. Shakhtshneider[1], E.V. Boldyreva[1], A.Yu. Manakov[3], V.V. Boldyrev[1], A.A. Ogienko[4], A.S. Yunoshev[5], A.A. Krasnikov[6], A.V. Ildyakov[3], E.G. Zevak[2], A.I. Ancharov[1]

[1]Institute of Solid State Chemistry and Mechanochemistry, SB RAS, Novosibirsk, Russia, [2]Research and Education Centre "Molecular Design and Ecologically Safe Technologies" at the Novosibirsk State University, Novosibirsk, Russia, [3]Nikolaev Institute of Inorganic Chemistry SB RAS, Novosibirsk, Russia, [4]Institute of Cytology and Genetics SB RAS, Novosibirsk, Russia, [5]Lavrentiev Institute of Hydrodynamics SB RAS, Novosibirsk, Russia, [6]Central Siberian Botanical Garden SB RAS, Novosibirsk, Russia

11^{30}-11^{45} **NITROSYL [2Fe-2S] PROTEINS ACTIVE SITES BIOMIMETICS AS A NEW NO DONATING AGENTS FOR THE TUMOR DISEASES THERAPY**

N.A. Sanina

Institute of Problems of Chemical Physics RAS, Chernogolovka, Russia

11^{45}-12^{00} **BIODEGRADABLE MICROCARRIERS BASED ON CHITOSAN AND POLYESTERS FOR TISSUE ENGINEERING**

T. Demina[1], T. Akopova[1], Ch. Sevrin[2], M. Drozdova[3], E. Markvicheva[3], A. Zelenetskii[1], Ch. Grandfils[2]

[1]Enikolopov Institute of Synthetic Polymer Materials, Russian Academy of Sciences, Moscow, Russia, [2]Research Centre of Biomaterials, University of Liège, Belgium, [3]Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry of Russian Academy of Sciences, Moscow

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATIONS

Friday, September 7, 2012

Session I: 09^{00}-12^{45}
Chairmen: P. Rogl and Lj. Korugic-Karasz

09^{00}-09^{15} **PERITECTIC MELTING OF ß-BORON IN THE B-C BINARY – A LONG STANDING PUZZLE SOLVED**
P.F. Rogl[1], T. Tanaka[2], S. Takenouchi[3], J. Vrestal[4]
[1]Institute of Physical Chemistry, University of Vienna, Wien, Austria, [2]Boride Research Group, Scientific Information Office, National Institute for Materials Science, 1-2-1 Sengen, Tsukuba, Ibaraki, Japan, [3]Materials Analysis Station, Research Network and Facility Service Division, National Institute for Materials Science, 1-1 Namiki, Tsukuba, Ibaraki, Japan, [4]Central European Institute of Technology (CEITEC), Masaryk University, Kamenice, Brno, Czech Republic

09^{15}-09^{30} **RUDDLESDEN-POPPER TYPE PHASES AS SEEN BY HIGH-TEMPERATURE ^{57}FE MÖSSBAUER SPECTROSCOPY**
P. Gaczyński[1], T. Klande[2], A. Feldhoff[2], K.-D. Becker[1]
[1]Institute of Physical and Theoretical Chemistry, Braunschweig University of Technology, Braunschweig, Germany, [2]Institute of Physical Chemistry and Electrochemistry, Leibniz University Hannover, Hannover, Germany

09^{30}-09^{45} **THERMOELECTRIC PROPERTIES OF PPV-BASED BLOCK COPOLYMERS AND THEIR COMPOSITES**
Lj. Korugic-Karasz[1], Patrick S. Taylor[1], Paul M. Lahti[2], Frank Karasz[1]
[1]Department of Polymer Science and Engineering, [2]Department of Chemistry, University of Massachusetts-Amherst Amherst, Massachusetts, USA

09^{45}-10^{00} **POLYMERIC MATERIALS FROM ALGAE OIL**
Z.S. Petrović, J. Hong, I. Javni, O. Bilić
Kansas Polymer Research Center, Pittsburg State University, Pittsburg, KS, USA

10^{00}-10^{15} **THE EFFECT OF ELECTRIC POTENTIAL ON MATERIAL MICROHARDNESS AND DISLOCATION DENSITY IN ZINC MONOCRYSTALS**
D.V. Orlova, V.I. Danilov, L.B. Zuev
Institute of Strength Physics and Materials Science, SB RAS, Tomsk, Russia

10^{15}-10^{30} **POLYURETHANE – Fe POWDER FILMS: PREPARATION AND CHARACTERIZATION**

M. Špírková[1], R. Bureš[2], M. Fáberová[2]
[1]*Institute of Macromolecular Chemistry AS CR, v.v.i., Prague, Czech Republic,* [2]*Institute of Materials Research SAS, Košice, Slovak Republic*

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

Chairmen: Z. Petrović and M. Špírková

11^{00}-11^{15} **FORMATION OF HYPEREUTECTIC ALUMINIUM-BASED ALLOYS OR NICKEL ALUMINIDES USING SACRIFICIAL NICKEL COATINGS**

L. Čelko[1,2], L. Klakurková[1,2], K. Slámečka[1,2], B. Smetana[3], S. Zlá[3], M. Žaludová[3]
[1]*Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic,* [2]*CEITEC – Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic,* [3]*Faculty of Metallurgy and Materials Engineering, VŠB – Technical University of Ostrava, Ostrava, Czech Republic*

11^{15}-11^{30} **FLY ASH GEOPOLYMER BASED IMMOBILIZATION OF ELECTRIC ARC FURNACE DUST**

I. Nikolić[1], R. Zejak[2]
[1]*University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montenegro,* [2]*University of Montenegro, Faculty of Civil Engineering, Podgorica, Montenegro*

11^{30}-11^{45} **NOVEL HYBRID INORGANIC-ORGANIC ONE-DIMENSIONAL CHAIN SYSTEMS TAILORED WITH MONOCARBOXYLIC ACIDS**

I. Djerdj[1], J. Popović[1], J. Stare[2], S.D. Škapin[3], B. Kozlevčar[4], D. Pajić[5,6], Z. Jagličić[5,7], Z. Crnjak Orel[2]
[1]*Ruđer Bošković Institute, Zagreb, Croatia,* [2]*National Institute of Chemistry, Ljubljana, Slovenia,* [3]*Institute Jožef Stefan, Ljubljana, Slovenia,* [4]*Faculty of Chemistry and Chemical Technology, University of Ljubljana, Ljubljana, Slovenia,* [5]*Institute of Mathematics, Physics and Mechanics, Ljubljana, Slovenia,* [6]*Department of Physics, Faculty of Science, University of Zagreb, Zagreb, Croatia,* [7]*Faculty of Civil and Geodetic Engineering, University of Ljubljana, Ljubljana, Slovenia*

11^{45}-12^{00} **EFFECT OF CLAY ON REACTION-INDUCED PHASE SEPARATION IN MULTIPHASE EPOXY**

I. Kelnar, J. Rotrekl
Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Prague, Czech Republic

12^{00}-12^{15} **SYNTHESIS AND CHARACTERIZATION OF POLYANILINE-SILOXANE COMPOSITES**

K. Depa[1], A. Strachota[1], J. Stejskal[1], P. Bober[1], J. Prokeš[2], M. Trchová[1], M. Šlouf[1]
[1]*Institute of Macromolecular Chemistry Academy of Sciences of the Czech Republic, Praha, Czech Republic,* [2]*Faculty of Mathematics and Physics, Charles University in Prague, Praha, Czech Republic*

12^{15}-12^{30} **ANALYSIS OF CUTOUT FIBER AS SOURCE OF DELAMINATION IN COMPOSITES SYSTEM USING FEM**

R.A. Al-Madani[1], A. Elmahmody[2], M. Jarnaz[3]
[1]*Al-Jabel Algharbi University, Engineering Faculty, Gharian, Libya,* [2]*Al-Fateh University, Engineering Faculty, Tripoli, Libya,* [3]*Academy of Graduate Studies, Tripoli, Libya*

12^{30}-12^{45} **STUDY of MICROStRUCTURES AND PHASE TRANSFORMATIONS IN THE CeO_2-Er_2O_3 SYSTEM**

E.R. Andrievskaya[1, 2], O.A. Kornienko[1], A.V. Sameljuk[1]
[1]*Institute of Materials Science Problems, National Ukrainian Academy of Sciences, Kiev, Ukraine,* [2]*National Technical University Kiev Polytechnic Institute, Kiev, Ukraine*

12^{45}-13^{15} **CLOSING CEREMONY**

POSTER SESSION I

Tuesday, September 4, 2012, 20^{00}-22^{00}

SYMPOSIUM A: ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS

P.S.A.1. **THE SORPTION SEQUENCE OF IONS FROM AQUEOUS SOLUTIONS ON OXIDES**
S.K. Milonjić
The Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

P.S.A.2. **SYNTHESIS AND CHARACTERIZATION OF SILICA CORE/NANO-FERRITE SHELL PARTICLES**
M.P. Nikolić[1], K.P. Giannakopoulos[2], M. Bokorov[3], V.V. Srdić[1]
[1]Department of Materials Engineering, Faculty of Technology, University of Novi Sad, Novi Sad, Serbia, [2]Institute of Microelectronics, National Centre for Scientific Research "Demokritos", Athens, Greece, [3]Department of Biology and Ecology, Faculty of Natural Sciences, University of Novi Sad, Novi Sad, Serbia

P.S.A.3. **HYDROTHERMAL SYNTHESIS OF ZnO POWDERS WITH A TAILORED PARTICLE MORPHOLOGY AND IMPROUVED OPTICAL CHARACTERISTICS**
A. Stanković[1], Z. Stojanović[1], Lj. Veselinović[1], I. Bračko[2], S. Skapin[2], S. Marković[1], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Jožef Štefan Institute, Ljubljana, Slovenia

P.S.A.4. **NANOSIZED OXIDE PARTICLE SYNTHESIS BY ULTRASONIC SPRAY PYROLYSIS FOR ENHANCED GOLD PLATING**
J. Bogović[1], S. Stopić[1], B. Friedrich[1], J. Song[2], C. Koch[2], L. Wang[2], A. Fuhrmann[3], A. Moebius[3]
[1]IME Process Metallurgy and Metal Recycling of the RWTH Aachen University, Aachen, Germany, [2]OWL University of Applied Sciences, Lemgo, Germany, [3]Enthone GmbH, Langenfeld, Germany

P.S.A.5. **FLEXIBILITY OF ULTRASONIC SPRAY PYROLYSIS PROCESS FOR THE SYNTHESIS OF CORE-SHELL NANOPARTICLES**
S. Stopić, J. Bogović, B. Friedrich
IME Process Metallurgy and Metal Recycling of the RWTH Aachen University, Aachen, Germany

P.S.A.6. **MICROSCOPY IN THE DESIGN OF NEW DRUG FORMS**
A.A. Ogienko[1,2], S.A. Myz[1,3], E.V. Boldyreva[1,3]
[1]Research and Education Centre "Molecular Design and Ecologically Safe Technologies" at the Novosibirsk State University, Novosibirsk, Russia, [2]Institute of Cytology and Genetics SB RAS, Novosibirsk, Russia, [3]Institute of Solid State Chemistry and Mechanochemistry, SB RAS, Novosibirsk, Russia

P.S.A.7. **DESIGN OF NEW DRUG FORMS BY CRYO-NANOTECHNOLOGY**
A.G. Ogienko[1,2], E.V. Boldyreva[1,3], A.Yu. Manakov[1,2], A.S. Yunoshev[1,4], A.A. Ogienko[1,5], S.A. Myz[1,3], E.G. Zevak[1,2], A.I. Ancharov[1,3], V.V. Boldyrev[1,3]
[1]Research and Education Centre "Molecular Design and Ecologically Safe Technologies" at the Novosibirsk State University, Novosibirsk, Russia, [2]Nikolaev Institute of Inorganic Chemistry SB RAS, Novosibirsk, Russia, [3]Institute of Solid State Chemistry and Mechanochemistry, SB RAS, Novosibirsk, Russia, [4]Lavrentiev Institute of Hydrodynamics SB RAS, Novosibirsk, Russia, [5]Institute of Cytology and Genetics SB RAS, Novosibirsk, Russia

P.S.A.8. **SYNTHESIS AND MAGNETIC PROPERTIES OF THE SOLID SOLUTIONS $Zn_{0,9}Cd_{0,1}GeAs_2$**
I.V. Fedorchenko[1], A. Kochura[2], A.N. Aronov[1], S.F. Marenkin[1]
[1]Kurnakov Institute of General and Inorganic Chemistry RAS, Moscow, Russia, [2]South - West State University, Kursk, Russia

P.S.A.9. **TOPOLOGICAL-NETWORK NANOCLUSTERING IN OVER-STOICHIOMETRIC ARSENIC SULPHIDES**
O. Shpotyuk[1,2], M. Hyla[2], Ya. Shpotyuk[1]
[1]Lviv Scientific Research Institute of Materials of SRC "Carat", Lviv, Ukraine, [2]Institute of Physics of Jan Dlugosz University, Czestochowa, Poland

P.S.A.10. **PREPARATION OF LITHIUM-SELECTIVE NANOCOMPOSITE SORBENT**
A.D. Ryabtsev, E.V. Mamylova
JSC "Ekostar-Nautech", Novosibirsk, Russia

P.S.A.11. **NANODISPERSED Li4Ti5O12/C COMPOSITE AS AN ULTRA-FAST ANODE MATERIAL FOR LI-ION BATTERIES**
M. Vujković, I. Stojković, N. Cvjetićanin, S. Mentus*
*Faculty of Physical Chemistry, Belgrade University, Belgrade, *Serbian Academy of Science and Arts, Belgrade, Serbia*

P.S.A.12. **NANOCRYSTALLIZATION OF ION CONDUCTING GLASS-CERAMICS IN THE SYSTEM Li_2O-Al_2O_3 -GeO_2-P_2O_5**
S.D. Matijašević[1], M.B. Tošić[1], S.R. Grujić[2], V.D. Živanović[1], J.N. Stojanović[1], J.D. Nikolić[1], S.N. Zildžović[1], S.V. Ždrale[2]
[1]Institute for Technology of Nuclear and Other Mineral Raw Materials, Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

P.S.A.13. **TAILORING OF MULTIFUNCTIONAL $KAlSiO_4$ - $KAlSi_2O_6$ BASED CERAMIC MATERIALS**
B. Antić[1], M. Bošković[1], P. Vulić[2], V. Spasojević[1], A. Kremenović[2]
[1]VINCENT, Institute of Nuclear Sciences "Vinča", Belgrade, Serbia, [2]Faculty of Mining and Geology, University of Belgrade, Belgrade, Serbia

P.S.A.14. **SYNTESIS AND CHARACTERIZATION OF IRON-CONTAINING ZEOLITES: ZSM-5, BEA AND CLINOPTIOLITES**
A. Jović[1], V. Dondur[1], Lj. Damjanović[1], A. Radulović[2], V. Rakić[3]
[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia; [2]Institute of General and Physical Chemistry, Belgrade, Serbia; [3]Faculty of Agriculture, University of Belgrade, Belgrade-Zemun, Serbia

P.S.A.15. **SYNTHESIS AND CHARACTERIZATION OF Pt NANOCATALYST ON TIN OXIDE BASED SUPPORT FOR OXYGEN REDUCTION**
Lj.M. Gajić-Krstajić[1], N.R. Elezović[2], B.M. Babić[3], V. Radmilović[4], N.V. Krstajić[4], Lj.M. Vračar[4]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia, [3]Vinča Institute of Nuclear Sciences, University of Belgrade,Belgrade, Serbia, [4]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

P.S.A.16. **FABRICATION TECHNOLOGY OF Bi1−xNdxFeO3 CERAMICS**
J. Dzik, B. Wodecka-Dus, K. Osinska, H. Bernard, A. Lisinska-Czekaj, D. Czekaj
University of Silesia, Department of Materials Science, Sosnowiec, Poland

P.S.A.17. **SPECTROSCOPY INVESTIGATION OF NANOSTRUCTURED ZINK FERRITE OBTAINED BY MECHANOCHEMICAL SYNTHESIS**
Z.Ž. Lazarević[1], Č. Jovalekić[2], A. Milutinović[1], M. Romčević[1], D. Sekulić[3], M. Slankamenac[3], S. Baloš[3], N.Ž. Romčević[1]
[1]Institute of Physics, University of Belgrade, Zemun, Belgrade, Serbia, [2]The Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia

P.S.A.18. **PREPARATION OF TUNGSTEN BRONZES ON TITANIUM BY PLASMA ELECTROLYTIC OXIDATION PROCESS**
S. Stojadinović[1], R. Vasilić[2], M. Petković[1], B. Kasalica[1], I. Belča[1], Lj. Zeković[1]
[1]Faculty of Physics, University of Belgrade, Belgrade, Serbia, [2]Faculty of Environmental Governance and Corporate Responsibility, Educons University, Sremska Kamenica, Serbia

P.S.A.19. **STRUCTURE MODIFICATIONS OF MULTILAYERED Al/Ti SYSTEMS INDUCED BY LASER IRRADIATIONS**
D. Peruško[1], J. Kovač[2], S. Petrović[1], M. Čizmović[1], M. Mitrić[1], M. Obradović[1], D. Pjević[1], M. Milosavljević[1]
[1]Vinča Institute of Nuclear Sciences, Belgrade University, Belgrade, Serbia, [2]Jožef Stefan Institute, Ljubljana, Slovenia

P.S.A.20. **SYNTHESIS, MICROSTRUCTURE AND THE CRYSTALLINE STRUCTURE OF BARIUM TITANATE CERAMICS DOPED WITH LANTHANUM**
B. Wodecka-Dus, J. Dzik, D. Czekaj
University of Silesia, Department of Materials Science, Sosnowiec, Poland

P.S.A.21. **ELECTRICAL AND THERMOMAGNETIC PROPERTIES of NiFeWCu AMORPHOUS POWDER**
Z. Vuković, M. Plazinić, J. Živanić, S. Djukić
Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, Čačak, Serbia

P.S.A.22. **MAGNETIC PROPERTIES OF BULK NANOSTRUCTURED $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$ ALLOYS PRODUCED BY DYNAMIC COMPACTION AND PLASMA SPRAY DEPOSITION**
L. Kuzovnikova[1], E. Denisova[1], A. Kuzovnikov[2], R. Iskhakov[1], A. Lepeshev[3]
[1]Kirensky Institute of Physics SB RAS, Krasnoyarsk, Russia, [2]JSC «Pulse technologies», Krasnoyarsk, Russia, [3]Siberian Federal University, Krasnoyarsk, Russia

P.S.A.23. **STRUCTURE AND MAGNETIC PROPERTIES OF ELECTRODEPOSITED COMPOSITE $Ni_{79,1}Co_{18,6}Cu_{2,3}$ ALLOY**
L. Ribić-Zelenović[1], P. Mašković[1], A. Maričić[2], M. Spasojević[1]
[1]Faculty of Agronomy, University of Kragujevac, Čačak, Serbia, [2]Tehnical Faculty, University of Kragujevac, Čačak, Serbia

P.S.A.24. **MICROSTRUCTURE AND MAGNETIC PROPERTIES OF A NOVEL COMPOSITE POWDER**
M. Spasojević[1], A. Maričić[2], D. Gospavić[1], L. Ribić-Zelenović[1]
[1]Faculty of Agronomy, Čačak, University of Kragujevac, Čačak, Serbia, [2]Technical Faculty, Čačak, University of Kragujevac, Čačak, Serbia

P.S.A.25. **EFFECT OF MECHANICAL ACTIVATION ON MAGNETIC AND ELECTRICAL PROPERTIES OF ELECTRODEPOSITED Ni-28Fe-4W POWDER**
N. Ćirović[1], L. Ribić-Zelenović[2], A. Maričić[1], M. Spasojević[2]
[1]Technical Faculty, Čačak, University of Kragujevac, Čačak, Serbia, [2]Faculty of Agronomy, Čačak, University of Kragujevac, Čačak, Serbia

P.S.A.26. **INFLUENCE OF THERMAL EFFECTS ON STRUCTURAL CHANGES IN NANOCRYSTALLINE AlSi10Mg ALLOY**
B. Jordović[1], A. Maričić[1], B. Nedeljković[1], D. Sretenović[2]
[1]Technical Faculty Čačak, University of Kragujevac, Čačak, Serbia, [2]Technical School of Professional Studies, Čačak, Serbia

P.S.A.27. **INFLUENCE OF STRUCTURAL STATE OF A DOPING ALLOY ON THE PROPERTIES OF HEAT-RESISTANT ALUMINUM CAST IRON**
V.P. Ermakova, O.Yu. Sheshukov, L.A. Marshuk
Institute of Metallurgy of the Ural Branch of RAS, Ekaterinburg, Russia

P.S.A.28. **EFFECT OF ALLOYING ELEMENTS ON THE DISSOLUTION OF $CuAl_2$ PHASE IN Al-Cu-Si ALLOYS**
B. Zlatičanin[1], S. Kovačević[2]
[1]University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montenegro, [2]Central School of Chemical Technology "Spasoje Raspopović", Podgorica, Montenegro

P.S.A.29. **THE APPLICATIONS OF CONTROL WITH NDT TECHNIQUES IN PASHALIMAN SHIPYARD**
M. Shehu, Dj. Ilia, K. Lapa, P. Cacaj
DIMN, Department of Mechanical & Naval Engineering, University of Vlora, Albania

P.S.A.30. **PROBLEMS IN THE THEORY OF ELECTROCAPILLARITY FOR SOLID-LIQUID INTERFACE**
E.M. Gutman
Dept. of Materials Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel

P.S.A.31. **TRANSPORT COEFFICIENTS IN MIXTURES Ar/H2**
Ž. Nikitović, V. Stojanović, Z.Lj. Petrović
Institute of Physics, University of Belgrade, Belgrade, Serbia

P.S.A.32. **QUANTIFICATION OF POLY(VINYLPYRROLIDONE) BY "ON-LINE" PYROLYSIS COUPLED TO GAS CHROMATOGRAPHY**
B. Jovančićević[1], V. Antić[2], M. Antić[2], J. Schwarzbauer[3]
[1]Faculty of Chemistry, University of Belgrade, Belgrade, Serbia, [2]Faculty of Agriculture, University of Belgrade, Zemun, Serbia, [3]Institute of Geology and Geochemistry of Petroleum and Coal, RWTH Aachen University, Aachen, Germany

P.S.A.33. **INFLUENCE OF ELECTRODE MATERIAL ON GAS FILLED SURGE ARRESTERS PREBREAKDOWN CURRENT IN γ AND X RADIATION FIELD**
B. Lončar[1] , S.J. Stanković[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

P.S.A.34. **INCREASE OF COLD-RESISTANCE OF STEEL BY TITANIUM MODIFICATION**
V.P. Ermakova, O.Yu. Sheshukov, V.S. Gulyakov, I.V. Nekrasov, L.A. Marshuk
Institute of Metallurgy of the Ural Branch of RAS, Ekaterinburg, Russia

P.S.A.35. **INFLUENCE MONTMORILLONITE NANOCOMPOSITES ON DEFORMATION PROPERTIES OF POLYSTYRENE KRASTEN 171**
M. Mihaliková[1], E. Čižmárová[2]
[1]Department of Materials Science, Faculty of Metallurgy, Technical University of Košice, Slovak Republic, [2]Czech Technical University in Prague, Faculty of Mechanical Engineering, Departments of materials engineering, Czech Republic

P.S.A.36. **INFLUENCE OF NANO-STRUCTURED FILLERS ON PHASE RELATIONS IN ELASTOMER BLENDS**
M.M. Plavšić[1], R. Aleksić[1], J. Budinski-Simendić[2], V. Radojević[1], I. Pajić-Lijaković[1], M.B. Plavšić[1]
[1]Faculty of Technology and Metallurgy, Belgrade University, Belgrade Sebia, [2]Faculty of Technology, University of Novi Sad, Novi Sad, Serbia

P.S.A.37. **PROPERTIES OF THE BITUMEN AFTER WINTER STORAGE**
S.G. Mamylov[1], A.I. Donchouck[2], O.I. Lomovsky[1]
[1]Institute of Solid State Chemistry and Mechanochemistry SB RAS, Novosibirsk, Russia, [2]OOO "Sibstroytseny", Novosibirsk, Russia

P.S.A.38. **KINETIC INVESTIGATIONS OF DECONVOLUTEDPROCESSES OF THERMAL DEGRADATION OFCo(II), Cd(II) AND Zn(II) COMPLEXES WITH *N*-BENZYLOXYCARBONYLGLYCINATO LIGAND**

M. Šumar Ristović[1], A. Grković[2], V. Blagojević[2], K. Anđelković[1], D. Poleti[3], D.M. Minić[1]

[1]Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia, [2]Faculty of Chemistry, University of Belgrade, Belgrade, Serbia, [3]Department of General and Inorganic Chemistry, Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

P.S.A.39. **INDENTATION AND SCRATCH TESTING AT NANOSCALE OF NEAT AND GRAFTED POLYETHYLENE NANOCOMPOSITES AS A FUNCTION OF CRYSTALLINITY**

D.B. Stojanović[1], A. Kojović[1], A. Orlović[1], I. Balać[2], V. Radojević[1], P.S. Uskoković[1], R. Aleksić[1]

[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia

P.S.A.40. **THE CORRELATION BETWEEN THE MECHANICAL STRAIN DEGREE AND ELECTRON STATE DENSITY CHANGE AT FERMI LEVEL IN Č-4580 STEEL WIRES SAMPLES**

A. Kalezić-Glišović, N. Mitrović, S. Radonjić, A. Maričić

Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Alloys, Technical Faculty Čačak, Čačak, Serbia

P.S.A.41. **DESIGN OF CHARACTERISTIC BRAIN SIGNALS IN MATLAB**

M. Milovanović[1], P. Lukić[2], Z. Golubović[2]

[1]Military Medical Academy, Belgrade, Serbia, [2]University of Belgrade, Faculty of Mechanical Engineering, Belgrade, Serbia

P.S.A.42. **ADVANTAGES AND APPLICATIONS OF USING ATOMIC FORCE MICROSCOPY**

I. Vozga[1], J. Kacani[1], V. Kasemi[2]

[1]Polytechnic University of Tirana, Mechanical Engineering Faculty, Tirana, Albania, [2"]Ismail Qemali" University of Vlora, Vlora, Albania

P.S.A.43. **INFLUENCE OF STRETCHING ON DIELECTRIC, ELECTROMECHANICAL AND ELECTROCALORIC RESPONSE OF P(VDF-TrFE-CFE) TERPOLYMER**

G. Casar[1], X. Li2, A. Eršte[1], S. Glinšek[1], X. Qian[2], Q. Zhang[2], V. Bobnar[1]

[1]Jožef Stefan Institute and Jožef Stefan International Postgraduate School, Ljubljana, Slovenia, [2]Department of Electrical Engineering and Materials Reasearch Institute, The Pennsylvania State University, University Park, Pennsylvania, USA

POSTER SESSION II

Wednesday, September 5, 2012, 20^{00}-22^{00}

SYMPOSIUM B: ADVANCED MATERIALS FOR HIGH-TECHNOLOGY APPLICATIONS

P.S.B.1. **TEMPERATURE DEPENDENCE OF GRAPHENE ELECTRICAL CONDUCTIVITY**
S.K. Jaćimovski[1], D.I. Raković[2], J.P. Šetrajčić[3,*], I.J. Šetrajčić[3], V.M. Zorić[3]
[1]Academy of Criminalistic and Police Studies, Belgrade, Serbia, [2]University of Belgrade, Faculty of Electrical Engineering, Serbia, [3]University of Novi Sad, Faculty of Sciences, Department of Physics, Vojvodina – Serbia, [*]Academy of Sciences and Arts of the Republic of Srpska – B&H

P.S.B.2. **IMPACT OF SHAPE OF EXTENDED OBJECTS ON JAMMING AND PERCOLATION ON A LATTICE**
Lj. Budinski–Petković[1], I. Lončarević[1], M. Petković[2], J.R. Šćepanović[3], Z.M. Jakšić[3], S.B. Vrhovac[3]
[1]Faculty of Engineering, University of Novi Sad, Novi Sad, Serbia, [2]RTRK, Novi Sad, Serbia, [3]Institute of Physics Belgrade, University of Belgrade, Zemun, Belgrade, Serbia

P.S.B.3. **SINTERING OF OXIDE POWDER SYSTEMS PRODUCED BY CHEMICAL PRECIPITATION AND PLASMA SPRAY SYNTHESIS**
A.V. Kozlova [1], S.P. Buyakova [1,2], S.N. Kulkov [1,2]
[1]Tomsk State University, Tomsk, Russia, [2]Institute of Strength Physics and Material Science SB RAS, Tomsk, Russia

P.S.B.4. **SINTERING EFFECTS ON MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF CCTO CERAMICS**
S. Marković[1], M. Lukić[1], Č. Jovalekić[2], S.D. Škapin[3], D. Suvorov[3], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Institute for Multidisciplinary Research, Belgrade, Serbia, [3]Jožef Stefan Institute, Ljubljana, Slovenia

P.S.B.5. **SYNERGISTIC EFFECT OF HYDROXYAPATITE NANOPOWDERS' HIGH CRYSTALLINITY AND NON-ORDERED PARTICLES' BOUNDARY REGIONS ON LOW-TEMPERATURE SINTERING**
M.J. Lukić, Lj. Veselinović, S. Marković, D. Uskoković
Institute of Technical Sciences of SASA, Belgrade, Serbia

P.S.B.6. **SYNTHESIS AND CHARACTERIZATION OF $LiFePO_4$/C COMPOSITE OBTAINED BY CELLULOSE TEMPLATE**

D. Jugović[1], M. Mitrić[2], M. Milović[1], B. Jokić[3], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

P.S.B.7. **SYNTHESIS AND CHARACTERIZATION OF Li_2FeSiO_4/C COMPOSITE**

M. Milović[1], D. Jugović[1], M. Mitrić[2], B. Jokić[3], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia, [3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

P.S.B.8. **SYNTHESIS OF ZIRCONIUM TUNGSTATE BY COPRECIPTATION ROUTE**

E.S. Dedova[1], S.N. Kulkov[1,2]
[1]Institute of Strength Physics and Material Science SB RAS, Tomsk, Russia, [2]Tomsk State University, Tomsk, Russia

P.S.B.9. **CATHODIC REDUCTION OF NITRO-1,4-DIHYDRO-4-OXOQUINOLINES STUDIED BY EPR AND UV-vis-NIR SPECTROELECTROCHEMISTRY**

K. Lušpai, A. Staško, P. Rapta, V. Brezová
Institute of Physical Chemistry and Chemical Physics, Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava, Bratislava, Slovak Republic

P.S.B.10. **ELECTRON STRUCTURE, VALENCE STATE AND MAGNETIC PROPERTIES OF THE NEW TERNARY INTERMETALLIC COMPOUNDS: EXPERIMENTAL AND THEORY**

I.D. Shcherba[1], I. Kravchenko[2], D. Uskoković[3], V.M. Antonov[4], M.V. Sacharevych[5], A.O. Stosyk[5], B.M. Jatcyk[6]
[1]Institute of Technology, Pedagogical of University, Crakow, Poland, [2]University of Florida Nano Fabritech Engineering, USA, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia, [4]Academy of Science, IMF, Kyiv, Ukraine, [5]Lviv National University by Ivan Franko, Lviv, Ukraine, [6]University of Forestry and Wood Technology, Lviv, Ukraine

P.S.B.11. **STRUCTURAL CHARACTERIZATION AND ELECTRICAL PROPERTIES OF SINTERED MAGNESIUM-TITANATE CERAMICS**

S. Filipović[1], N. Obradović[1], J. Krstić[2], M. Šćepanović[3], V. Pavlović[1], V. Paunović[4], M.M. Ristić[5]

[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Belgrade, Serbia, [3]Institute of Physics, University of Belgrade, Belgrade, Serbia, [4]Faculty of Electronic Engineering, University of Niš, Niš, Serbia, [5]Serbian Academy of Sciences and Arts, Belgrade, Serbia

P.S.B.12. **KINETICS OF CRYSTALLIZATION PROCESS OF BULK METALLIC GLASS FeCrMoGaPCB PREPARED BY COOPER MOLD CASTING**

N. Mitrović[1], B. Čukić[1], N. Obradović[2], M. Kićanović[1], M. Stoica[3]

[1]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, University of Kragujevac, Čačak, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia, [3]IFW Dresden, Inst Complex Mat, Dresden, Germany

P.S.B.13. **MAGNETIC AND STRUCTURAL PROPERTIES OF IRON-COBALT BASED ALLOYS**

N. Mitrović[1], B. Zlatkov[2], E. Gašanin[1], M. Mitrić[3], B. Nedeljković[1], S. Randjić[1], V. Pavlović[4], H. Danninger[5]

[1]Joint Laboratory for Advanced Materials of SASA, Section for Amorphous Systems, Technical Faculty Čačak, University of Kragujevac, Čačak, Serbia, [2]Volkswagen Aktiengesellschaft, Wolfsburg, Germany, [3]The Vinča Institute of Nuclear Sciences, University of Belgrade, Serbia, [4]Faculty of Agriculture, University of Belgrade, Belgrade, Serbia, [5]Institute of Chemical Technologies and Analytics, Wien, Austria

P.S.B.14. **THE ROLE OF TECHNOLOGICAL INPUT PARAMETERS ON A QUALITY OF PLASMA SPRAYED THERMAL BARRIER COATINGS**

L. Klakurková[1,2], L. Čelko[1,2], K. Slámečka[1,2], E. Dvořáček[3], T. Podrábský[1,2], J. Švejcar[1,2]

[1]Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic, [2]CEITEC – Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic, [3]S.A.M. – Metallizing Co., Ltd., Brno, Czech Republic

P.S.B.15. **MICROMECHANICAL INCLINOMETER FOR TRANSPORT SYSTEMS**

S. Timoshenkov, V. Kalugin, D. Litmanovich, K. Tikhonov, N. Korobova

Department of Microelectronics, National Research University of Electronic Technology, Moscow, Russia

P.S.B.16. **IDENTIFICATION WIND TURBINE BLADE STRUCTURAL DAMAGES BY MAGNETIC FORCE MICROSCOPY**
D. Bekrić[1], I. Mileusnić[2], I. Djuričić[2], Lj. Petrov[3], Dj. Koruga[2]
[1]Faculty of Mechanical Engineering, University of Belgrade, Serbia, [2]NanoLab, Faculty of Mechanical Engineering, University of Belgrade, Serbia, [3]Innovative Center, Faculty of Mechanical Engineering, University of Belgrade, Serbia

P.S.B.17. **INFLUENCE OF SHAFT-TO-BEARING CONTACT PROPERTIES ON CUP ANEMOMETER PERFOMANCE**
M. Zlatanović
Faculty of Electrical Engineering, University of Belgrade, Beolgrade, Serbia

P.S.B.18. **THE STRUCTURE OF HOT DIP GALVANIZED COATINGS OBTAINED ON THE 23MnNiCrMo52 STEEL**
H. Kania[1], P. Liberski[1], Z. Guzy[2]
[1]Silesian University of Technology, Gliwice, Poland, [2]Mining Tools and Equipment Factories Capital Group FASING Plc, Katowice, Poland

P.S.B.19. **THE INFLUENCE OF Si CONTENT IN STEEL ON THE GROWTH KINETICS AND STRUCTURE OF HOT DIP Zn-31Al-3Mg COATINGS**
H. Kania
Silesian University of Technology, Gliwice, Poland

P.S.B.20. **RELAXATION PROPERTIES IN LATTICE GAS MODEL WITH EXTENDED PARTICLES**
J.R. Šćepanović[1], I. Lončarević[2], Lj. Budinski-Petković[2], M. Petković[3], Z.M. Jakšić[1], S.B. Vrhovac[1]
[1]Institute of Physics, University of Belgrade, Zemun, Belgrade, Serbia, [2]Faculty of Engineering, University of Novi Sad, Serbia, [3]RTRK, Novi Sad, Serbia

P.S.B.21. **REDUCTIVE DEGRADATION OF THE NEW EXPLOSIVE MATERIAL FOX-7**
L. Šimková, J. Klíma, J. Urban, J. Ludvík
J. Heyrovský Institute of Physical Chemistry ASCR, Prague, Czech Republic

P.S.B.22. **CHARACTERIZATION OF SLURRY ALUMINIDE DIFFUSION COATINGS ON INCONEL 713LC**
T. Podrábský[1,2], L. Čelko[1,2], L. Klakurková[1,2] K. Slámečka[1,2], S. Pospíšilová[1,2], J. Švejcar[1,2]
[1]Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic, [2]CEITEC – Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic

P.S.B.23. **INTERNAL FRICTION AND ACTUATION IN SHAPE MEMORY ALLOYS**
C.M. Craciunescu[1], I. Mitelea[1], A. Ercuta[1,2], V. Budau[1]
[1]Politehnica" University of Timisoara, Timisoara, Romania, [2]Vest University of Timisoara, Romania

P.S.B.24. **LIFETIME ANALYSIS OF RHODAMINE B/PMMA FLUORESCENCE EMISSION**
D. Šević[1], M.S. Rabasović[1], V. Radojević[2], I. Radović[2], R. Aleksić[2], B.P. Marinković[1]
[1]Institute of Physics, University of Belgrade, Serbia, [2]Faculty of Technology and Metallurgy, University of Belgrade, Serbia

P.S.B.25. **DISPERSION OF REFRACTIVE INDEX AND OPTICAL BANDGAP OF THE NON-CRYSTALLINE CHALCOGENIDES IN CdS-As_2S_3 SYSTEM**
K.O. Čajko, S.R. Lukić-Petrović, I.O. Guth, M.V. Šiljegović, R.V. Kisić
University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia

P.S.B.26. **SYNTHESIS AND STRUCTURE OF THE FIRST VANADIUM(V) COMPLEX WITH THE SCHIFF BASE OF PYRIDOXAL AND AMINOGUANIDINE**
M.M. Lalović, V.M. Leovac, Lj.S. Vojinović-Ješić, V.I. Češljević
Department of Chemistry, Biochemistry and Environmental Protection, Faculty of Sciences, Novi Sad, Serbia

P.S.B.27. **THE REACTIVITY OF EPOXY RESIN MODIFIED WITH LOW MOLECULAR WEIGHT SILOXANE COMPOUNDS**
P. Murias[1], H. Galina[1], H. Maciejewski[2]
[1]Rzeszów University of Technology, Faculty of Chemistry, Department of Industrial and Materials Chemistry, Rzeszów, Poland, [2]Institution Poznań Science and Technology Park, Adam Mickiewicz University Foundation, Poznań, Poland

P.S.B.28. **KINETIC-SPECTROPHOTOMETRIC METHOD FOR DETERMINATION OF INSECTICIDE DIFLUBENZURON**
E.T. Pecev-Marinković, Z.M. Grahovac, S.S. Mitić, A.N. Pavlović, M.N. Mitić
Faculty of Sciences and Mathematics, Department of Chemistry, Niš, Serbia

P.S.B.29. **POLYCARBONATE-BASED POLYURETHANE ELASTOMERS: RELATION BETWEEN STRUCTURE AND PROPERTIES**
R. Poręba[1], Z. Hrdlička[2], A. Kuta[2], M. Špírková[1]
[1]Nanostructured Polymers and Composites Department, Institute of Macromolecular Chemistry AS CR, v.v.i., Prague, Czech Republic, [2]Department of Polymers, Institute of Chemical Technology Prague, Prague, Czech Republic

P.S.B.30. **EPDM/CSM/RWP RUBBER BLEND COMPOSITES**
G. Marković[1], M. Marinović-Cincović[2], V. Jovanović[3], S. Samaržija-Jovanović[3], J. Budinski-Simendić[4]
[1]Tigar, Pirot, Serbia; [2]University of Belgrade, Institute of Nuclear Sciences Vinča, Belgrade, Serbia, [3]Faculty of Natural Science and Mathematics, University of Priština, Serbia, [4]University of Novi Sad, Faculty of Technology, Serbia

P.S.B.31. **PROBABILISTIC ASPECT OF THE RUPTURE OF FRAGILE POLYMERS: CASE OF THE PHENOLIC RESIN**
S. Achouri[1,2], B. Redjel[1], D. Berdjane[2], S. Bouhouche[2]
[1]Laboratory of Civil Engineering, University of Annaba, LP 12, Annaba, [2]Research Center Scientific and Technical in Welding and Control - Urasm-CSC- Annaba LP 196, Algeria

P.S.B.32. **DYNAMIC DESTRUCTION OF LAYERED MATERIALS**
A. Tovpinets, M. Dmitrieva
Immanuel Kant Baltic Federal University, Kaliningrad, Russia

P.S.B.33. **DIFFERENT NON DESTRUCTIVE METHODS TO DETECT AND EVALUATE DEFECTS IN COMPOSITE MATERIALS**
E. Sotja (Konda), D. Sotja, G. Nardoni, M. Zeqo, E. Bebi, P. Nardoni
Polytechnic University of Tirana, Mechanic Department, Tirana, Albania; Institute I&T Nardoni, Brescia, Italy

P.S.B.34. **MEASURE RATE OF REFUND OF CRITICAL ENERGY IN COMPOSITE MATERIAL SHOCK**
S. Achouri[1, 2], B. Redjel[2], D. Berdjane[1], S. Bouhouche[1]
[1]Scientific and Technical Research center in Welding and Control-Urasm-Csc-Annaba LP 196 Annaba, [2]Laboratory Civil Engineering, University of Annaba, Annaba, Algeria

P.S.B.35. **MICROSTRUCTURAL CHANGES IN NICKEL AND COBALT BASE SUPERALLOYS AFTER THERMOMECHANICAL TREATMENTS APPLIED**
A. Milosavljević[1], S. Petronić[2], S. Polić-Radovanović[3], S. Nedeljković[1], M. Perović[4], D. Bajić[5]
[1]Faculty of Mechanical Engineering, Belgrade, Serbia, [2]Innovation Center, Faculty of Mechanical Engineering, Belgrade, Serbia, [3]CIK, Belgrade, Serbia, [4]Chamber of Economy of Montenegro, [5]Faculty of Mechanical Engineering, University of Podgorica, Montenegro

P.S.B.36. **THE CHOICE OF CONSTRUCTION MATERIAL AND ITS IMPACT ON SOME MAIN CHARACTERISTICS OF THE SHIP**
B. Xhaferaj, K. Lapa, S. Sinanaj
Faculty of Technical Science - University of Vlora, Vlore, Albania

P.S.B.37. **FINITE ELEMENT ANALYSIS OF METAL TO METAL BONDED BUTT JOINT OF COMPOSITE STRUCTURAL ELEMENTS**
A.O. Houssein, K.K. Dinesh
Al Jabel Algharbi University, Faculty of Engineering - Jadoo, Libya

P.S.B.38. **SIGNATURES OF ANTIBONDING GROUND STATES IN NEUTRAL EXCITON SPECTRA OF VERTICALLY COUPLED NANORINGS IN ELECTRIC FIELD**
V. Arsoski[1], M. Tadić[1], F.M. Peeters[2]
[1]School of Electrical Engineering, University of Belgrade, Belgrade, Serbia, [2]Department of Physics, University of Antwerp, Antwerp, Belgium

P.S.B.39. **CALCULATION OF ELEVATOR SAFETY COEFFICIENT: ADVICE ON SAFETY AND HAZARD IMPLICATIONS**
M. Kullolli, A. Hasanaj
Polytechnic University of Tirana, Albania

P.S.B.40. **ALTERNATING CURRENT/DIRECT CURRENT ELECTRICAL PROPERTIES OF CARBON NANOFIBER/EPOXY RESIN COMPOSITES**
A.G. Bannov[1], N.F. Uvarov[1,2], G.G. Kuvshinov[1,3]
[1]Novosibirsk State Technical University, Novosibirsk, Russia, [2]Institute of Solid State Chemistry, Siberian Branch of Russian Academy of Science, Novosibirsk, Russia, [3]Department of Environmental Engineering, General and Inorganic Chemistry, Sochi State University, Sochi, Russia

P.S.B.41. **ESTABLISHING OF OPTIMUM FORMING TEMPERATURE ON 100CrMo7-3 AND 100CrMnSi6-4 BEARING STEELS UNDER PARTIAL HEATING CONDITIONS**
P. Doležal[1], J. Zapletal[1], L. Klakurková[1,2], L. Čelko[1,2], T. Podrábský[1,2]
[1]Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic, [2]CEITEC – Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic

P.S.B.42. **SUPERPOROUS HYDROGELS OF CHITOSAN, ITACONIC ACID AND METHACRYLIC ACID**
M. Lučić, N. Milosavljević, N. Milašinović, J. Filipović, M. Kalagasidis Krušić
University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

P.S.B.43. **DISPERSED ALUMINA INFLUENCE ON PROPERTIES OF Cu-ODS ALLOY OBTAINED BY ORIGINAL METHOD**

P. Tomić[1], M. Davidović[2], K.Kutin[2], Z. Nedić[3], B. Gligorijević[2]
[1]Environment Protection Fund of the Republic of Srpska, Banja Luka, Bosna and Hercegovina, [2]Institute Goša, Belgrade, Srebia, [3]University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia

POSTER SESSION III

Thursday, September 6, 2012, 20^{00}-22^{00}

SYMPOSIUM C: NANOSTRUCTURED MATERIALS

P.S.C.1. **COMPUTATIONAL STUDY OF SUMANENES SUBSTITUTED WITH NITROGEN**

S. Armaković[1], I.J. Šetrajčić[1], J.P. Šetrajčić[1,*]
[1]University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Vojvodina, Srbija, [*]Academy of Sciences and Arts of Republic of Srpska, Banja Luka, Republic of Srpska, B&H

P.S.C.2. **OPTICAL SPECIFICITY OF SYMMETRIC MOLECULAR NANO-FILMS**

J.P. Šetrajčić[1,*], D. Rodić[1], S. Armaković[1], D.Lj. Mirjanić[2,*], A.J. Šetrajčić-Tomić[3], S.S. Pelemiš[4]
*[1]University of Novi Sad, Faculty of Sciences, Department of Physics, Vojvodina – Serbia, [2]University of Banja Luka, Faculty of Medicine, Republic of Srpska – B&H, [3]University of Novi Sad, Faculty of Medicine – Pharmacy, Vojvodina – Serbia, [4]University of East Sarajevo, Faculty of Techology Zvornik, Republic of Srpska – B&H, * Academy of Sciences and Arts of the Republic of Srpska, Banja Luka, B&H*

P.S.C.3. **OPTICAL PROPERTIES OF ASYMMETRIC MOLECULAR NANO-FILMS**

B. Škipina[1], J.P. Šetrajčić[2,*], D.Lj. Mirjanić[3,*], I.J. Šetrajčić[2], V.M. Zorić[2], S.M. Vučenović[4]
*[1]University of Banja Luka, Faculty of Techology, Republic of Srpska – B&H, [2]University of Novi Sad, Faculty of Sciences, Department of Physics, Vojvodina – Serbia, [3]University of Banja Luka, Faculty of Medicine, Republic of Srpska – B&H, [4]University of Banja Luka, Faculty of Sciences, Republic of Srpska – B&H, *Academy of Sciences and Arts of the Republic of Srpska, Banja Luka, B&H*

P.S.C.4. **ORGANIC/INORGANIC HYBRIDS IN BIOSENSORS**

I. Vozga[1], J. Kacani[1], V. Kasemi[2]
[1]Polytechnic University of Tirana, Mechanical Engineering Faculty, Tirana, Albania, [2]"Ismail Qemali" University of Vlora, Vlora, Albania

P.S.C.5. **MECHANICAL APPLICATIONS OF NANOMATERIALS**

I. Vozga[1], J. Kacani[1], V. Kasemi[2]
[1]Polytechnic University of Tirana, Mechanical Engineering Faculty, Tirana, Albania, [2]"Ismail Qemali" University of Vlora, Vlora, Albania

P.S.C.6. **MULTILAYER NANOFIBROUS CONSTRUCTS WITH INCORPORATED GENTAMICIN FOR CONTROLLED DRUG RELEASE**
J. Sirc[1], P. Kozlik[2], D. Stranska[3], S. Kubinova[4], R. Hobzova[1], J. Michalek[1]
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P.S.C.7. **PAL SPECTROSCOPY AS A TOOL TO CHARACTERIZE NANOSTRUCTURED VOIDS IN PHYSICALLY-AGED GLASSY CHALCOGENIDES**
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P.S.C.8. **THERMAL DEGRADATION OF POLYCARBONATE-BASED POLYURETHANES AND THEIR NANOCOMPOSITES**
R. Poręba[1], M. Špírková[1], J. Pavličević[2], J. Budinski-Simendić[2], K. Mészáros Szécsényi[3], B. Hollo[3]
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P.S.C.9. **SYNTHESIS AND CHARACTERIZATION OF SHAPE MEMORY HYBRIDS BASED ON EPOXY RESIN**
S. Ponyrko, L. Matejka
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P.S.C.10. **RAMAN SCATTERING FROM ZnO(Mn) NANOPARTICLES**
B. Hadžić[1], M. Gilić[1], M. Petrović-Damjanović[1], N. Romčević[1], J. Trajić[1], D. Timotijević[1], M. Romčević[1], I. Kuryliszyn-Kudelska[2], W. Dobrowolski[2], U. Narkiewicz[3], D. Sibera[3]
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P.S.C.11. **ATOMIC MICROSCOPY OF ConTec LC ADHESIVE**
V.D. Mirjanić, S. Čupić
University of Banja Luka, Faculty of Medicine, Department of Dentistry, Banja Luka, Republic of Srpska, B&H

P.S.C.12. **CHARACTERIZATION OF MICROBIAL MORPHOTYPES IN DENTAL CALCULUS DEPOSITS BY NANO PROBE MICROSCOPY AND OPTO-MAGNETIC SPECTROSCOPY**

I. Hut[1], Dj. Grga[2], M. Marjanović[2], D. Šarac[1], Lj. Petrov[1], Dj. Koruga[1]
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P.S.C.13. **FRICTION CHARACTERISTICS DEGRADATION OF SELF LUBRICATED SHAFT-TO-BEARING CONTACT SURFACE**

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P.S.C.14. **CHARACTERIZATION COMMERCIAL AND NANOPHOTONIC RIGID GAS PERMEABLE CONTACT LENSES BY OPTO-MAGNETIC SPECTROSCOPY AND OPTICAL POWER MEASUREMENT**

A. Debeljković[1], D. Stamenković[2], N. Jagodić[2], L. Matija[1], Dj. Koruga[1]
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P.S.C.15. **WATER – MATERIALS SURFACE INTERACTION ON MACRO, MICRO AND NANO SCALES**

Dj. Koruga[1], G. Pollack[2], R. Tsenkova[3], L. Matija[1], Z. Golubović[1], J. Munćan[1], S. Nijemčević[4], A. Debeljković[1]
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P.S.C.16. **STRUCTURAL AND DIELECTRIC PROPERTIES OF NICKEL FERRITE AND NICKEL FERRITE-STRONTIUM TITANATE CERAMICS**

B. Mojić[1], S.M. Ognjanović[1], J. Vukmirović[1], I. Tokić[1], Ž. Cvejić[2], V.V. Srdić[1]
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P.S.C.17. **SPRAY PYROLYSIS SYNTHESIS OF FTO-SUPPORTED ELECTROCHROMIC FILMS**

S.A. Serenko[1], N.F. Uvarov[1,2,3], Yu.G. Mateyshina[2,3], A.S. Ulihin[3]
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P.S.C.18. **HYDROTHERMAL SYNTHESIS OF MAGNETIC NANOPARTICLES AND FABRICATION OF MAGNETIC COMPOSITE PARTICLES USING POLY(L – LACTIDE)**

Z. Stojanović[1], M. Otoničar[2], S. Marković[1], D. Uskoković[1]
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P.S.C.19. **EFFECT OF INITIAL POWDER DISPERSITY ON THE PHYSICAL AND MECHANICAL PROPERTIES OF SiC CERAMICS SINTERED AT HIGH PRESSURE**

V.S. Urbanovich[1], A.M. Makei[1,] P. Klimczyk[2], L. Jaworska[2], B. Matović[3], S. Bošković[3], V.S. Niss[4], L.V. Sudnik[5]
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SYMPOSIUM E: BIOMATERIALS

P.S.E.1. **ADVANCED BIOPOLYMERS CHARACTERIZED WITH PAL SPECTROSCOPY**
O. Boyko[1,2], Y. Shpotyuk[3], J. Filipecki[2]
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P.S.E.2. **BAND GAP PHOTONIC STRUCTURES IN DICHROMATE BIOPOLYMER**
S. Savić-Šević, D. Pantelić, B. Jelenković
Institute of Physics, University of Belgrade, Serbia

P.S.E.3. **MALDI-TOF MASS SPECTROMETRY CHARACTERIZATION OF COLLAGEN**
D. Aćimović, Z. Rogić Miladinović, J. Cvetićanin, Dj. Trpkov, O. Nešković
Institute of Nuclear Sciences Vinča, University of Belgrade, Belgrade, Serbia

P.S.E.4. **COLLAGEN STRUCTURE AND MORPHOLOGY ANALYSIS BY TEM AND AFM**
Z. Rogić Miladinović, D. Aćimović, Dj. Trpkov, J. Cvetićanin, N. Bibić, Z. Rakočević, O. Nešković
Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

P.S.E.5 **A NEW KINETIC SPECTROPHOTOMETRIC METHOD FOR TOTAL POLYPHENOLS DETERMINATION IN WHITE WINES**
S.S. Mitić, M.N. Mitić
Faculty of Sciences and Mathematics, Department of Chemistry, University of Niš, Niš, Serbia

P.S.E.6. **OPTO-MAGNETIC SPECTROSCOPY STUDY OF COLORECTAL, CERVICAL AND SKIN CANCER SPECIMENS**
A. Dragičević[1], B. Jeftić[1], I. Mileusnić[1], Z. Krivokapić[2], M. Papić-Obradović[3], J. Bandić[4], L. Matija[1]
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P.S.E.7. **EYE POSITIONING SYSTEM LENS INVESTIGATION BY SCANNING PROBE MIRCROSCOPY**

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P.S.E.8. **SYNTHESIS OF GOLD NANOPARTICLES BY ULTRASONIC SPRAY PYROLYSIS AND HYDROGEN REDUCTION**

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P.S.E.9. **EFFECT OF SILVER(I) AND COPPER(II) IONS ON CONTROLLED RELEASE AND ANTIMICROBIAL ACTIVITY OF SILVER AND COPPER/POLY(2-HYDROXYETHYL ACRYLATE/ITACONIC ACID) HYBRID HYDROGELS**

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P.S.E.10. ***IN VITRO* ANTITUMORAL ACTIVITY OF PLATINUM(IV) COMPLEXES WITH *O,O'*-DIALKYL-(*S,S*)-ETHYLENEDIAMINE-*N,N'*-DI-2-(4-METHYL)PENTANOATE LIGANDS ON HUMAN BREST CANCER**

J.M. Vujić[1], G.N. Kaludjerović[2], T.P. Stanojković[3], S.R. Trifunović[4]
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P.S.E.11. **PHYTOCHEMICAL SCREENING, ANTIMICROBIAL AND ANTIOXIDANT ACTIVITIES OF PLANT SPECIES *SESELI RIGIDUM WALDST. & KIT.***

P.Z. Mašković[1], S.R. Solujić[2], N.T. Manojlović[3], J. Mladenović[1], J. Pantović[1], M. Cvijović[1], G. Aćamović-Djoković[1]
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P.S.E.12. **ZnO BIOCOMPATIBILITY ASPECTS**

O. Sych[1], N. Pinchuk[1], V. Khranovskyy[2], R. Yakimova[2]
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P.S.E.13. **MICROSTRUCTURAL CHARACTERISATION OF ORTHODONTIC Ni-Ti WIRE**

R. Rudolf[1,2], J. Ferčec[1], E. Marković[3], B. Glišić[3], I. Šćepan[3], D. Stamenković[3], L. Zorko[1]
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P.S.E.14. **OPTIMIZATION OF POLYMERIZATION SHRINKAGE ANALYSIS OF DENTAL COMPOSITES USING A 3D OPTICAL METHOD IN EXTRACTED TEETH**

M. Milošević[1], N. Mitrović[3], V. Miletić[2], D. Manojlović[2], T. Savić-Stanković[2], T. Maneski[3]
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P.S.E.15. **DENTAL IN VITRO EXPERIMENTS USING 3D DIGITAL IMAGE CORRELATION METHOD**

N. Mitrović[1], M. Milošević[2], I. Tanasić[3], L. Tihaček-Šojić[3], A. Sedmak[1], A. Petrović[1], T. Maneski[1]
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P.S.E.16. **THE APPLICATON OF THE DEVICE "LIFE SYSTEM" IN THE TREATMENT OF MULTIPLE SCLEROSIS**

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P.S.E.17. **REGENERATION BONE TISSUE BY NEW NANOPARTICULES SYSTEM BASED ON HYDROXIAPATITE AS SYSTEMS FOR LOCAL DELIVERY OF VITAMIN D3**

Z. Ajduković[1], M. Petrović[1], N. Ignjatović[2], V. Savić[3], D. Mihailović[4], D. Uskoković[2]

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P.S.E.18. **HYDROXYAPATITE AND HYDROXYAPATITE SUBSTITUENTS IN STRENGTHENING OF THE JAW BONE TEGMENTA**

Z. Ajduković[1], N. Ignjatović[2], V. Savić[3], S. Najman[3], D. Mihailovic[4], J. Rajković[5], N. Petrović[1], D. Uskoković[2]

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P.S.E.19. **MECHANICAL PROPERTY IN INFLECTION 3 POINTS OF A COMPOSITE MATERIAL OF ORTHOPEDIC USE**

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P.S.E.20. **OPTICAL ABSORPTION PROPERTIES AND APPLICATIONS OF FULLERENES**

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P.S.E.21. **MONOLAYERS AND NANOAGGREGATES OF POLYMERS IN THE SYNTHESIS OF GOLD NANOPARTICLES**

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P.S.E.22. **FREEZE-DRYING METHOD TO PRODUCE A RANGE OF PCL PARTICLES WITH TAILORED MORPHOLOGICAL PROPERTIES**
N. Filipović[1], M. Stevanović[1], P. Stupar, J. Petković[2], M. Filipič[2], D. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Department of Genetic Toxicology and Cancer Biology, National Institute of Biology, Ljubljana, Slovenia

P.S.E.23. **ENHANCED ANTIMICROBIAL EFFICACY BY CO-DELIVERY OF PGA CAPPED SILVER NANOPARTICLES AND ASCORBIC ACID WITH POLY(LACTIDE-CO-GLYCOLIDE)**
M. Stevanović[1], M. Milenković[2], J. Petković[3], M. Filipič[3], D.P. Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]Department of Microbiology and Immunology, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia, [3]Department of Genetic Toxicology and Cancer Biology, National Institute of Biology, Ljubljana, Slovenia

P.S.E.24. **NANOFILTRATION IN BIOMEDICINE**
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P.S.E.25. **COMPARATIVE STUDY OF THE EFFECTS OF DIFFERENT NANOMATERIALS ON THE VIABILITY OF HUMAN OSTEOBLAST-LIKE CELLS**
S. Stojanović[1], S. Najman[1], Z. Ajduković[2], N. Ignjatović[3], D. Uskoković[3]
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P.S.E.26. **ADIPOSE DERIVED MESENCHYMAL STEM CELLS AS A MODEL FOR STUDY OF OSTEOINDUCTIVE ACTIVITY OF BONE SUBSTITUTING BIOMATERIALS**

S. Najman[1,5], S. Stojanović[1], J. Najdanović[1],J. Živković[1], D. Petrović[2], I. Vučković[2], V. Cvetković[3], Lj. Sekulović[1,4], D. Tričković-Vukić[5], M. Vukelić[1], P. Vasiljević[3], M. Trajanović[6]

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Abstracts

Oral Presentation

PL.S.I.1.

ATOMIC CONFIGURATIONS AND OPTICAL PROPERTIES OF POINT DEFECTS IN GRAPHENE

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The successful correction of lens aberrations has greatly advanced the ability of the scanning transmission electron microscope (STEM) to provide direct, real space imaging at atomic resolution [1]. In monolayer materials such as BN and graphene, atom-by-atom characterization of atomic position, atomic species and optical and electronic properties has become a practical reality [2]. Stable point defect complexes consisting of substitutional Si and N atoms lead to localized surface plasmon resonances at the sub-nanometer scale, acting as an atomic antenna in the petaHertz (10^{15} Hz) frequency range. Chains of defects could therefore be used to form nanoscale plasmonic waveguides [3]. Atomic resolution imaging of valence excitations will also be shown tentatively identified as C 2p-3d, bound to bound transitions. Finally, the use of the STEM probe to excite the dynamics of small clusters will be illustrated with a Si_6 magic cluster embedded in a small hole in monolayer graphene. Movies in the microscope reveal the metastable configurations of the cluster. Density functional calculations reveal the energy landscape of the various configurations. These results suggest a new way to explore atomic scale dynamics in small clusters.

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PL.S.I.2.

APPLICATION OF TiO_2 NANOWIRES

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We can synthesize the anatase phase of TiO_2 at different length scales: bulk single crystals, single crystalline nanotubes/ nanowires and nanoparticles. These forms of anatase offer the possibilities for fundamental research, applications in photovoltaics, spintronics and in biophysical studies.

This presentation will focus on the synthesis and application of single crystalline anatase nanowires. Our method, beyond the high structural quality, allows the doping and manipulation of nanowires in order to have active nano-sized materials. For example, nanowires were fused into a 3D fibrous network. It was used in a photovoltaic cell with solid electrolyte. This architecture possesses a high roughness factor, significant light scattering and up to several orders of magnitude faster electron transport which plays an important role in a high conversion efficiency.

PL.S.I.3.

NANOSTRUCTURE – BIOMOLECULE INTERACTIONS AND THEIR IMPLICATIONS FOR NEW MATERIALS AND HEALTHCARE

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Worldwide developments over the past two decades have greatly increased our ability to synthesize and assemble nanoscale building blocks to create advanced materials and devices with novel properties and functionalities. Beyond the novel bulk properties of nanostructured materials, which are derived from their confined sizes and their very large surface-to-volume ratios, nanostructured surfaces have been shown to elicit more favorable and selective bio-molecular and cellular responses than surfaces at coarser length scales. These nanoscale attributes are enabling a variety of nanostructures to form the bases for a new field in healthcare, nanomedicine, as well as creating opportunities for new hierarchical hybrid nanocomposite materials. A fundamentally important issue in both of these areas is to clearly understand, and to eventually control, nanostructure-biomolecule interactions. In order to elucidate the bases for observed changes of protein conformation and function on nanostructured surfaces, a number of model experiments are being carried out, the results of which will be presented and discussed in the broader context of enabling new materials and developing nanomedicine for improved healthcare.

PL.S.I.4.

AN UPDATE ON THE ABERRATION–CORRECTED, MONOCHROMATED ENVIRONMENTAL TEM

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A brief update will be given on the new aberration-corrected transmission electron microscope (TEM) in the Stanford Nanocharacterization Laboratory (SNL). This instrument represents a new generation of characterization equipment, capable not only of extreme high resolution imaging but also spectroscopy at atomic resolution. Three topics will be discussed: quantum plasmonic behavior in silver nanoparticles down to 1.7nm diameter, band gap variations within semiconductor quantum dots, and nanomaterial/gas interactions in the environmental cell. It will be seen that remarkable quantum experimentation can be carried out with this new capability.

PL.S.I.5.

ATOM-PROBE TOMOGRAPHY AND THE SCIENCE OF A NEW CLASS OF Al-Sc BASED ALLOYS

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We have developed and studied from a fundamental scientific point-of-view novel Al-Sc-ME-TM-RE (ME = metal: Li, Mg, Si; TM = transition element: Ti, Y, Zr; RE = rare earth element: La and lanthanides) alloys, which exhibit excellent coarsening- and creep resistance at temperatures upwards of 673 K. We rely crucially on the use of atom-probe tomography (APT), which provides direct space three-dimensional information concerning microstructure and chemical compositions on a subnanometer scale. APT provides the necessary physical quantities to understand and model the high-temperature mechanical properties. Specifically, the following microstructural properties of precipitates are measured: (a) volume fraction; (b) mean radius; (c) number density; (d) size distributions in three-dimensions; and (d) chemical compositions of the matrix and precipitate phases as a function of aging temperature and time. This quantitative information is utilized, for example, in the Mohles code to understand the mechanism(s) of plastic deformation at ambient and elevated temperatures.

PL.S.I.6.

VOLUMETRICALLY CONSTRAINED PHASE TRANSITIONS

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Based on many theoretical models that help us to predict the role of surfaces, interfaces, and defects during microstructure evolution, at this point we have a sound understanding of phase transitions in bulk materials [1]. However, if phase transitions occur in volumetrically constrained systems, such as metallic thin films in inert environments, bounding surfaces and interfaces can restrict the growth of product phases [2]. An imposed geometric constraint, such as a fully encapsulated thin film, can be used to control the chemical partitioning of the product phases by suppression of the composition modulation in directions where the linear dimension of the confinement is smaller than the wavelength of the modulation, resulting in 2-D or 1-D nanometer-scale domain structure formation. Since spinodal decomposition occurs by atomic redistribution along specific, elastically soft crystallographic directions [3], the directed decomposition process can interact with the volumetric constraints to produce structures with unique crystallography, morphology, scale, and properties. This talk will be presenting a method to fabricate confined, oriented, single crystals of ternary alloys within an inert sapphire matrix. Pulsed-laser deposition of a polycrystalline CuNiFe film fills lithographically defined surface cavities in a sapphire single crystal [4]. Solid-state diffusion bonding of two sapphire crystals internalizes the metal-filled cavities. Electron microscopy confirms that subsequent heat treatment converts the thin, fully constrained films into single crystals of specific orientation. This is caused by nucleation-controlled liquid-phase epitaxy during cooling from above the alloy melting temperature [5].

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O.S.C.1.

IN-SITU TEM OBSERVATIONS OF ISLAND GRAIN SHRINKAGE IN GOLD MAZED BICRYSTAL THIN FILMS

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The mechanism and kinetics of grain boundary migration under capillary forces was investigated by observing the shrinkage of island grains with 90° <110> tilt grain boundaries in thin Au mazed bicrystal films using in-situ diffraction contrast imaging and high resolution electron microscopy. The grains remained strictly cylindrical throughout shrinkage and there was no measurable grain rotation. The final collapse of the grains left behind dislocation debris. Characterization of the anisotropy of grain boundary inclinations showed an increasing preference for low-index facets during thermal annealing. Grain boundary migration was controlled by nucleation and propagation of steps on the facets. The experimental results were compared with molecular-dynamics simulations. *This work was performed at NCEM, which is supported by the Office of Science, Office of Basic Energy Sciences of the U.S. Department of Energy under Contract No. DE-AC02—05CH11231.*

O.S.C.2.

CHARACTERIZATION OF SELF-ASSEMBLED GADOLINIUM NANOPARTICLES USING TEM-EELS

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Self-forming Gadolinium chelate nanoparticles provide a unique ability to create short T1 relaxation time nanoparticles for MRI imaging. These nanoparticles only form in the presence of specific enzymes or chemical markers making them ideal for use as targeted MRI contrast agents for cancer diagnosis. Due to the amorphous organic nature of these nanoparticles, characterizing them particularly *in vitro* is difficult and requires the use of advanced electron microscopy techniques. Transmission electron microscopy with electron energy loss spectroscopy is well suited to image these nanoparticles both as is and *in vitro*. The efficacy of various imaging techniques will be discussed. This research is supported by the Center for Cancer Nanotechnology Excellence and Translation (CCNE-T) grant funded by NCI-NIH to Stanford University U54CA151459 Gambhir.

O.S.C.3.

WHITE LIGHT EMISSION FROM FLUCTUATING NANOCLUSTERS

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Recently it was found that CdSe nanocrystals which emit size-tunable monochromatic light when small, emit white light when made ultrasmall. The transition from monochromatic to white light emission occurs at a diameter of around 2 nm. A broad distribution of nanocrystal sizes has been ruled out as the cause, and experiments have shown that individual nanoparticles emit white light. We will present a combination of state of the art scanning transmission electron microscopy (STEM) and density functional theory (DFT) to show that excitation sets the ultrasmall nanocrystals into a disordered fluxional state. The fluctuations cause the band gaps of the ultrasmall nanoclusters to vary continuously across the visual range on a femtosecond time scale. Transitions across all these different band gaps result in the white light emission.

O.S.C.4.

A TRANSPORT-BASED INTEGRATED EXCITON MULTIPLEXER – TOWARDS OPTICAL SIGNAL PROCESSING USING EXCITONS

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Spatially indirect excitons (*IXs*) – bound state of an electron and a hole localized in different quantum wells of a double quantum well (DQW) structure – are potential medium for the processing of optical information in the solid-state. During the last years, different concepts have been put forward for the control and manipulation of *IXs* in semiconductor DQWs, including optical, electric, magnetic and strain fields as well as via remote dipolar interactions of *IX* fluids. Recently, advanced electrostatic control techniques for *IXs* have been introduced for the storage as well as for the realization of logic operations (e.g. switching, AND/OR operations, etc.) [1,2]. However, the range of these functionalities is rather small (limited to only a few μm) compared to the dimensions required in photonic and optoelectronic circuitry. In this contribution, we demonstrate that novel functionalities can be obtained by combining the electrostatic manipulation with the controlled transfer of *IX* fluids by surface acoustic waves (SAWs). We prove the feasibility of exciton-based complex signal processing with the realization of an exciton acoustic multiplexer (EXAM): an integrated multiport routing device for optical communication based on the acoustic transfer of *IXs* between network ports separated by millimeter distances. Each port is connected to the others by an array of transport channels driven by SAWs, which provides a conveyor belt for the long-range *IX* transport. *IX* fluxes can be exchanged between two arbitrarily chosen communication ports by appropriately switching acoustic beams. The spatial and energetic distributions of *IXs* as well as their dynamics during acoustic transport were tracked by imaging the photoluminescence emitted via exciton recombination along the transport channel. Our experimental results are well-reproduced by a theoretical model of self-interacting *IX* fluids in a dynamic potential landscape, thus demonstrating the ability to design, simulate and test almost any complex *IX* based device. In particular, the EXAM combines several optoelectronic functionalities on a single chip, such as photon to exciton and exciton to photon conversion, *IX* (information) transport in moving acoustic potentials [3], on/off switching of *IX* flow using exciton optoelectronic transistors (EXOTs) [1,2] and signal multiplexing. Moreover, we show that it can be integration with other building blocks into "all-exciton" optoelectronic circuits capable of performing multiple electronic operations using *IXs* as operation medium.

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O.S.C.5.

CALCIUM PHOSPHATE NANOPARTICLES WITH TUNABLE DRUG RELEASE KINETICS FOR THE ADVANCED TREATMENT OF BONE INFECTION

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As a consequence of the continually aging population on Earth, an upcoming rise in the prevalence of bone disease has been predicted. Osteomyelitis, i.e., inflammation of bone, affects approximately 0.02 % of human population and is typically treated by prescribing long-term antibiotic therapies and, frequently, surgical debridement to cope with significant bone loss. The multifunctional drug delivery material developed in this study aims at improving the contemporary medical approach to treating osteomyelitis from two angles: (a) by enabling local delivery of antibiotics at a sustained and tunable rate it may overcome the need for repetitive administration of systemically distributed antibiotics; and (b) by relying on an osteogenic drug delivery carrier it may promote natural remineralization of the portion of the bone lost to disease. The drug release kinetics was investigated on two model drug compounds with different chemical structure, size and adsorption propensity: bovine serum albumin and fluorescein. The antibiotic-containing calcium phosphate powders prepared within this study were shown to exhibit satisfying antibacterial performance in blood-heart infusion broths inoculated with Staphylococcus aureus, the main causative agent of osteomyelitis. At the same time, the positive cell response and osteogenic effect of the antibiotic-loaded CAP particles was confirmed on MC3T3-E1 osteoblastic cell cultures. The immediate benefit of success along this line of research would be elimination of the need for both the implantation of temporary or lasting prosthetics and long-term antibiotic therapies with inevitable systemic side effects. The project is supported by the NIH/NIDCR grant K99-DE021416.

O.S.C.6.

WAYS OF PHASE TRANSFORMATIONS IN NANOCRYSTALLINE ALLOYS AT HEAVY TREATMENTS

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The practical and fundamental properties of nanomaterials are crucially determined by the phase transformations in the nanocrystalline alloys after different treatments. Taking into account the thermodynamic and kinetic conditions one can propose three main scenarios of phase transformations: a) moving away of an alloy state far beyond from thermodynamic equilibrium state without changing of chemical composition (amorphization, disordering); b) synthesis of non-equilibrium and metastable phases with variable composition (supersaturated solid solutions, abnormal decomposition of equilibrium phases with unlimited solubility, the formation of segregations on the grain boundaries to form new phases); c) realization of equilibrium phases including inaccessible ones in standard conditions (high pressure phases, low-temperature phases).

We are partly acknowledged to RFBR Foundation (#10-02-323a) for financial support.

O.S.C.7.

SEVERE PLASTIC DEFORMATION (SPD) A NEW TOOL TO REACH HIGH THERMOELECTRIC PERFORMANCE

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For thermoelectric devices bulk materials with a high figure of merit ZT are indispensable. Skutterudites reach ZTs >1 after ball milling and hot pressing. Lowering the thermal conductivity has proven a key issue to increase ZT. High pressure torsion (HPT) is known as an outstanding technique to produce ultrafine grained materials under SPD. P- and n-type skutterudites have been deformed showing an oriented lamellar shaped nanograined structure with a crystallite size of about 50 nm and an enhanced dislocation density (for the 1st time visible in TEM images), resulting in a reduction of the thermal conductivity. Although the electrical resistivity is much higher, after HPT ZT was increased up to 30%. Mechanical (e.g. hardness, strength or fracture toughness, thermal expansion coefficient) and magnetic properties change after SPD.

O.S.C.8.

TEM/HRTEM INVESTIGATION OF ROOM TEMPERATURE DEFORMATION IN Al/QC COMPOSITE

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In our work, Al-Mn-Be alloys with additions of Cu were synthesized using vacuum-induction melting under Ar. These alloys were cast with three different cooling rates to fabricate metal matrix composites reinforced with suitably sized quasicrystalline (QC) particles by means of reliable and cost effective process techniques (e.g. casting). We then explored mechanical behaviour of synthesized alloys on a macro-scale and on a sub-micron scale by in-situ nanocompression and nanotensile tests in a JEOL JEM 3010 electron microscope at room temperature. Finally, we examined deformed and non-deformed QC particles by HRTEM using an FEI Titan electron microscope.

O.S.C.9.

NANOSTRUCTURED MATERIALS BASED ON THE ORGANIC AND THE INORGANIC SYSTEMS

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The influence of nanoobjects, such as nanotubes, fullerenes, quantum dots, shungites, graphene oxides, etc. on the spectral, photorefractive, photoconductive properties as well as their effect on some surface peculiarities of the organic and inorganic materials are discussed under conditions when these nanoobjects are used as nanosensitizers or as nanocoatings. It is showing that the nanoobjects-modified thin film holographic grating, spatial light modulators, thin film polarizers, etc. can be employed in optical instrumentation, laser, telecommunication, display technologies, and medicine.

The results are supported by RFBR grant #10-03-00916.

O.S.C.10.

SELF-ORGANIZED TiO_2 NANOTUBE ARRAYS: USE IN DYE-SENSITIZED SOLAR CELLS

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Self-organized TiO_2 nanotubes fabricated by anodization are very attractive and superior photoanodes for dye-sensitized solar cells (DSSCs) due to reduced intertube connections, vertical electron transport, slower electron recombination and enhanced light scattering. Therefore in our work we report on the synthesis and characterization of highly-ordered TiO_2 nanotube arrays and their application in DSSCs. TiO_2 nanotubes were fabricated by anodic oxidation of titanium foil at a constant potential in fluoride containing electrolyte. The anodizing time was changed to control the thickness of nanotube arrays. The samples were subsequently annealed at 400 °C to obtain anatase phase and treated with $TiCl_4$ solution to increase the surface area and improve the solar cell efficiency. Resulting nanotubes were characterized by X-ray powder diffraction and electron microscopy techniques. Obtained TiO_2 nanotube arrays were close packed with opened top on one end and closed bottom on the other end. The tubes had outer diameters of approximately 100 nm, inner diameters of 50 nm and length from 2-30 μm depending on anodization time. The nanotubes were polycrystalline and composed of well-crystallized anatase grains. To evaluate the photocatalytic performance the DSSCs were assembled. The light to electricity photoconversion efficieny for $TiCl_4$ treated samples was 2.1% which is significant improvement from untreated TiO_2 nanotubes. The TiO_2 nanotube arrays thus present highly promising material for use in DSSCs.

O.S.C.11.

A FAST TWO-STEP DRY SYNTHESIS OF COPPER FERRITE NANOPARTICLES

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Copper ferrite nanoparticles (40-50 nm in sizes) were prepared by combination of the levitation-jet aerosol technique and a combustion oxidation process. At the first stage pure Cu and Fe (1:2) wired metals were HF co-evaporated in helium gas flow. Due to the vapor condensation a well-mixture of individual nanoparticles of copper and iron was obtained in this first-step product only. At the second stage the mixture was fast burned in a self-propagation mode by a propane-butane torch initialization. The after-burn nanoparticles keep your specific surface characterized by BET. SEM and XRD of the two-step powders show slightly-defined shapes with a little change in sizes of the nanoparticles and true $CuFe_2O_4$ composition all of the samples. VSM magnetic measurements discover the ferromagnetic behavior with saturation magnetization equal up to 45 emu/g. High-temperature magnetic measurements found the Curie temperature of the nanoparticles is close to the bulk one in 728 K. The copper ferrite nanoparticles were successfully tested as a LPG gas sensor multiferroic material at elevated temperatures.

O.S.C.12.

STRUCTURE AND MAGNETIC PROPERTIES OF NANOCRYSTALLINE ZINC FERRITE BASED MATERIALS

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The fascinating structural, magnetic and electronic behaviour of ferrite compounds have long been of interest to solid state scientists. These materials exhibit a complex relationship between preparation method, form (single-, poly- or nano-crystalline), composition, crystal structure and physical properties. Zinc ferrites, $ZnFe_2O_4$ and zinc ferrite nanoparticles substituted with indium and yttrium, $Zn_{1-x}In_xFe_2O_4$ and $ZnY_xFe_{2-x}O_4$ ($0 \leq x \leq 0.6$), were synthesised by coprecipitation method. The main goal of this research was to establish the relationship between the synthesis, composition, structure and properties of these materials. We have investigated the effect of composition on the cation distribution in the spinel structure, and on the magnetic properties with a view to obtain magnetic ceramics with improved properties compared to their bulk counter parts. The results of X–ray and TEM analyses confirmed the nanoscale dimensions and spinel structure of the samples. Raman and Mössbauer spectroscopy studies were used to investigate the cation distribution between the tetrahedral and octahedral sites and the formation of the partially inverse spinel. The study of the magnetic properties showed that the hysteresis loops do not saturate even in the presence of high magnetic fields, confirming the superparamagnetic single domain nature of the samples. These observations imply that particle size and composition variations (e.g. addition of yttrium and indium) cause significant structural rearrangements which affect the magnetic behaviour of these materials.

O.S.C.13.

EFFECT OF STANNOXANE NANO-BUILDING BLOCKS OF DIFFERENT FUNCTIONALITY IN EPOXY NANOCOMPOSITES

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In this contribution, the authors present a study about the effect of the functionality of butylstannoxane nano-building blocks in epoxy composites. In a previous work, amino-H-tetrafunctional stannoxane incorportaed into epoxies was shown to display an interesting anti-oxidative effect in addition to mechanical reinforcement [1]. This contribution focusses mainly on the comparison of branching 4-amino-H-functional and of linear 2-amino-H-functional building blocks. Morphology of stannoxane nano-building block dispersion (TEM) and SAXS, thermo-mechanical properties (DMTA), nano-building block stability and rearrangement (^{119}Sn-NMR), as well as anti-oxidative effects are discussed (mechanical properties after oxidative ageing).

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PL.S.II.1.

CONDITIONS FOR HIGH-RESOLUTION ELECTRON MICROSCOPY OF RADIATION-SENSITIVE OBJECTS

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Radiation damage is the fundamental limitation for the attainable specimen resolution of electron micrographs of radiation-sensitive objects. To avoid atom displacement, the accelerating voltage must be lower than the knock-on threshold which is below about 60 kV for most carbonaceous and other low-*Z* materials. To achieve atomic resolution at low acceleration voltages, the correction of both chromatic and the spherical aberration is mandatory. The novel Cs/Cc-corrector of the SALVE electron microscope compensates for these aberrations. In addition, the corrector eliminates the off-axial coma providing a large field of view with more than 2000 equally-well-resolved image points per diameter. The corrector consists of two identical units, each composed of a magnetic quadrupole doublet, a mixed electric and magnetic quadrupole, and two octopoles. The mixed quadrupoles compensate for the chromatic aberration and the octopoles eliminate the spherical aberration.

PL.S.II.2.

LOW-VOLTAGE TEM TO EXPLORE PHYSICS AND CHEMISTRY OF LOW-DIMENSIONAL MATERIALS ON THE ATOMIC SCALE

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Recent technical advances in transmission electron microscopy created clear trends towards lower accelerating voltages. This enabled for the first time atomically-resolved structure analysis of materials of low-dimensions and/or low atomic numbers. At higher voltages, the low intrinsic contrast and the high susceptibility of these materials to electron-beam induced knock-on damage prevented defect analysis of materials such as graphene, carbon nanotubes, and functionalised fullerenes. For these carbon materials we answer basic questions about the exact atomic structure of defects, about their dynamical behaviour and about the atomic structure of amorphous silica in direct space. Moreover we demonstrate the usage of graphene as thin substrate for in-situ experiments.

We outline the prospects of the fully-corrected SALVE: Sub-Angstrom Low-Voltage Electron Microscope for spatial imaging, diffraction and spectroscopy using low-energy electrons optimised for the range between 20 and 80keV.

PL.S.II.3.

TOWARDS ATOMIC RESOLUTION STEM OF ENERGY-RELATED MATERIALS

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Advanced electron microscopy is making a vital contribution to the discoveries taking place in many areas of materials science. Especially, the advantages in aberration corrected TEM and STEM instrumentation now provide necessary background for solving materials science problems at the nanometer or even atomic scale. This is especially true of aberration corrected STEM which brings with it analytical techniques such as electron energy-loss spectroscopy (EELS) and the new silicon drift detector systems for x-ray spectrometry. In this paper we present how modern aberration corrected STEM systems can be used to examine the local chemistry and also the physical properties of energy-related materials, e.g. nanocomposite solar cells, solid oxide fuel cell cathodes and the optical properties of nanoparticles.

PL.S.II.4.

TRANSMISSION ELECTRON MICROSCOPY FOR HIGH-EFFICIENCY SOLAR CELLS

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Advanced high-resolution imaging and spectroscopic techniques of electron microscopy play a crucial role in characterizing the structure-property relationships of inorganic functional materials and interfaces. The microstructure, the elemental composition, and physical properties of nanomaterials can be characterized quantitatively and with spatial resolutions in the nanometer regime or even on the atomic level. The presentation will briefly introduce imaging and spectroscopic methods of transmission electron microscopy (TEM) and describe recent applications to investigations of nanostructured semiconductor layer materials for multi-junction solar cells.

Multi-junction solar cells that are based on III-V semiconductor multilayers grown by metal-organic vapour deposition on Ge and on Si substrates reach conversion efficiencies above 40% and are applied in high-concentration photovoltaics. Excellent material quality and low dislocation density of solar cells which consist of up to 40 individual layers of different layer thickness and materials composition are prerequisites for the high conversion efficiency of sunlight into electricity. Modern cell concepts involve lattice mismatched layer growth, wafer bonding, nano-materials, or novel compounds. Microstructure analyses applying imaging and spectroscopic methods based on TEM and scanning TEM (STEM) are successful in monitoring defects, layer strains, and elemental compositions and can be used to contribute to new concepts of defect engineering for multijunction solar cells with improved efficiencies. For instance, appropriately graded buffer systems consisting of GaAs-based alloy layers, result in active cell regions with reduced defect densities. Lattice distortions for control of strains in ultrathin tunnel diode layers can be measured quantitatively by HRTEM, combined with a geometrical phase analysis. Improvements are obtained as well by applying nitride layers. The success of one of such concepts has been demonstrated by a multi-junction solar cell with a world record efficiency of 41.1% for a GaInP/GaAs/Ge device. More recent microstructure research focuses on new concepts for compound semiconductor multi-junction cells grown on Si substrates.

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PL.S.II.5.

IN SITU CHARCTERISATION OF DYNAMICS OF CHARGES AND MATTER AT INTERFACES BY ELECTRON MICROSCOPY

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As material synthesis and nanofabrication methods are refined and the control of material structure reaches beyond the nanoscale the role of individual interfaces, defects and atoms is pronounced and can dominate the properties. The strong influence of local atomic structure offers the possibility of designing new components with tailored and unique properties. Electron microscopes provide the possibility of correlating the structure to transport properties with a spatial resolution that reaches the atomic scale. A knowledge platform of how to design new materials by combining experiments and theory can thus be established. In addition, inserting a scanning tunnelling or an atomic force microscope in the electron microscope enables studies of dynamic events. In this talk, observations of, for example, $Al/AlO_x/Al$ tunnel junctions, perovskite oxide interfaces and contact points of soft matter and water will be discussed.

PL.S.II.6.

APPLICATIONS OF ABERRATION CORRECTED TEMs IN ENERGY SCIENCE

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The introduction of aberration correctors has revolutionized the development of TEM and STEM instrumentation. In order to provide a platform for these novel developments and based on the experience with the first aberration corrected TEM [1-3], Research Centre Juelich and RWTH Aachen University have jointly founded the Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C) [4]. Recently, the PICO instrument has been installed at the ER-C, which is the second high resolution TEM in the world with a corrector for the chromatic aberration. A short report on the activities with PICO will be given in the presentation.

Research at the Ernst Ruska-Centre focuses on the development of new quantitative methods in TEM and on their application in materials science and solid state physics. In the present contribution, two different examples for recent applications in energy science will be discussed:

1. The investigation of Si/SiO_2 multiple quantum wells for all silicon solar cells. Current concepts promising a substantial increase in PV efficiency are the generation of multiple excitons by a single photon, the extraction of hot carriers from the absorber before thermalization (hot carrier cell), and the use of manifold absorbers consisting of Si/SiO_2 multiple quantum wells (QWs). In the Si/SiO_2 QW material the charge carrier confinement leads to an increase of the energy gap well above the bandgap value of bulk Si (1.1 eV), tunable by the Si quantum well thickness. A double-junction solar cell consisting of a Si wafer and an ideal QW absorber with a band gap of 1.8 eV is predicted to have a theoretical efficiency limit of over 40 %. We will report on our studies of such QW structures with layer thicknesses in the range of 1 - 3 nm.
2. The development of membrane materials for zero emission power plants. One of the most promising concepts for carbon dioxide capture and sequestration (CCS) relies on the application of mixed ion and electron conducting (MIEC) ceramic membranes. We will report on our studies of oxygen conducting membranes which can be applied for air separation in the highly efficient Oxyfuel process. The investigated defects and interfaces play an important role in the oxygen transport properties.

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O.S.A.1.

COMBUSTION SYNTHESIS OF COMPLEX OXIDES FOR GAS-SENSING APPLICATIONS

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The gas-sensing properties of spinel and orthorhombic ferrites (NiFe2O4, CoFe2O4 and LaFeO3 respectively) as well as cubic nickel–zinc stannates Zn2−xNixSnO4 (with x=0, 0.8) prepared by self-propagating high-temperature synthesis (SHS) are reported. The gas response of the materials was investigated against a range of gases (ethanol, ammonia, propane, CO, ethane, ethene) at a variety of operating temperatures. Good gas response behavior was found in the case of the cubic nickel–zinc stannates with excellent selectivity toward ethanol. A novel self-propagating high-temperature synthesis of these materials has been performed and their application as gas sensors for environmental monitoring has been demonstrated. SHS gives good control over phenomena such as particle size and morphology that allows gas sensor performance and gas selectivity to be greatly improved. This route shows great promise for the production of complex oxide materials for gas sensing applications that show improved selectivity and sensitivity.

O.S.A.2.

EFFICIENT BULK PRODUCTION OF JANUS PARTICLES BY BIPOLAR ELECTROCHEMISTRY

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In reference to the roman god depicted with two heads, Janus particles are micro or nano objects owning two sides of different chemistry. This makes them a unique class of materials showing useful properties for many applications, from electronic and sensing to catalysis. The great majority of the methods used to generate such objects needs to break the symmetry by introducing an interface. This makes the preparation of large quantities rather difficult because those techniques usually lead to monolayer equivalents of material as the modification occurs in a two-dimensional reaction space. Here, we report a new method to synthesize those objects based on bipolar electrochemistry, using a true bulk procedure. Any conductive material can be modified, making the process very versatile in terms of size, shape and material combination of the obtained Janus objects.

O.S.A.3.

FORMATION OF CAST METAL-MATRIX COMPOSITES BASED ON TERNARY BORIDES OBTAINED BY SHS

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For industrial application, wear resistant materials should have a wide range of properties such as high strength, high toughness, corrosion and oxidation resistance, electrical and thermal conductivity, etc. Boride composites based on ternary borides in the system Mo-Ni-B and Mo-Fe-B are promising candidates for wear resistant applications. The ternary phase diagrams are show possibility of coexisting with a metal matrix based on Ni or Fe and some ternary borides Mo2NiB2, Mo2FeB2. The work focuses on develop new technique for obtaining cast metal-matrix composites (MMC) based on ternary borides in the system Mo-Ni-B and Mo-Fe-B by means SHS metallurgy and study effect of additional elements on phase and structure formation. In overall view the chemical scheme for obtaining of the MMC can be represented as: $(Ox_1 + Ox_2 + Ox_3 + Ox_n) + R \rightarrow$ [MMC] + R_kO_l + Q, where Ox_i – oxides of Mo, Ni, Fe and alloy additives, R – metal reducer (Al), MMC– Ni-[Mo2NiB2] and Fe-[Mo2FeB2], Q – thermal effect of the process. The exothermic reactions of metal oxides reducing and SHS reactions leads to formation cast products consisting of MMC (bottom layer) and metal reduce oxide (upper layer). A short time synthesis and protection of the metal melt from oxidation by Al_2O_3 melt permit to obtain the composites in air atmosphere. Realization of high temperatures without using any additional power sources is the basic difference of the SHS from the conventional vacuum electrometallurgy and SPS. The composition/structure of SHS-produced MMC in centrifuges was found to depend on the extent of centrifugal overload a/g. created in the centrifugal SHS installations. Effect of alloy additives (Cr, V, Ta, Hf, Zr) on phase and structure formation was investigated. The obtained MMC cast alloys have fine-grained structure and hardness more than 1200 *HV*.

The work was carried out under the partial financial support of RFBR, grant № 12-03-00637 and 10-03-00316.

O.S.A.4.

COLOR STABILITY OF MODEL POLYURETHANES WITH COVALENTLY BOUND STABILIZERS

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A hindered amine light stabilizer (HALS) was modified so as to introduce SH group into its molecule. The thiol thus formed was added by a free-radical mechanism onto the pending vinyl groups of a linear polyurethane (PU) prepared beforehand from toluene-2,4-diisocyanate and a low-molar-mass α,ω-dihydroxypolybutadiene (the so called OH-telechelic liquid rubber). The resulting product represents a modified, self-stabilized PU, in which the stabilizing structures are joined to the polymer chain by covalent bonds. Using accelerated weathering experiments (QUV panel), the protective efficiency of the centers thus attached to the chain was found to be comparable with that of a physical mixture of a pure, unstabilized PU and an analogous low-molar-mass HALS. The advantage of the former relies in that the stabilizing moieties cannot evaporate from the matrix.

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O.S.A.5.

CORROSION RESISTANCE OF OXIDE COATINGS ON ALUMINUM OBTAINED BY PLASMA ELECTROLYTIC OXIDATION IN SODIUM TUNGSTATE SOLUTION

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Plasma electrolytic oxidation (PEO) is a fast and efficient process in which dense oxide coatings are obtained on light metals in appropriate electrolytes. Tungsten containing oxide layers on aluminium are widely investigated due to their catalytic, electro-optic and corrosion protection properties. Oxide coatings obtained by PEO in sodium tungstate solution are characterized during the growth using optical emission spectroscopy and potential-time measurements. Atomic force microscopy, x-ray diffraction, and scanning electron microscopy are employed to investigate the morphology, chemical and phase composition of obtained oxide coatings. The corrosion protection of obtained oxide coatings on aluminum during exposure to 3% NaCl was investigated using electrochemical impedance spectroscopy (EIS) and linear voltammetrey. Morphology, chemical and phase composition of obtained coatings are strongly associated to PEO time. Corrosion stability properties of obtained films reach peak values at about 5 minutes from the beginning of PEO process and then slowly decrease with extended PEO time. Analysis of obtained results suggests that corrosion stability is strongly related to surface roughness and chemical composition.

O.S.A.6.

BONDING ADDITIVES – A THERMOANALYTICAL APPROACH

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Possibilities of a chemical modification of the so-called liquid rubbers (LBH) have been studied with the aim to extend their application range for the stabilization of polymers. Radical additions of phenolic or HALS derivatives, individually or in combination, to the pending C=C bonds of LBH resulted in the formation of polymer-bound stabilizers bearing a variable content of phenolic or HALS moieties or both of them bound to the same polymer chain. Besides an increase in glass transition temperature T_g proportionally with the amount of grafting also a synergic effect was observed in case of the hybrid polymer-bound stabilizers on the thermo-oxidative stability of LBH, evaluated by means of DSC and TGA measurements in air. Also the performance of these new stabilizers in other commercial polymers has been revealed.

Financial support of the MPO project FR-TI2/338 is gratefully acknowledged.

O.S.A.7.

COERCIVITY ENHANCEMENT *VIA* GRAIN-BOUNDARY DIFFUSION PROCESS

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The increased use of Nd-Fe-B magnets in the motors of electric vehicles is hampered by their relatively poor high-temperature performance. To improve that, we need to develop sufficient coercivity at room temperature so that enough coercivity remains when the magnet is exposed to high temperatures. In a novel process to enhance the coercivity we have electrophoretically deposited DyF_3 powder onto the surface of an as-sintered Nd-Fe-B magnet as the initial step in the grain-boundary diffusion process. After a conventional heat treatment at 850 and 500 °C the coercivities were 30% higher. The electrophoretic deposition (EPD) process is quick, reliable, easily controllable in terms thickness and can be used to deposit the rare-earth fluoride powder on the surface of complex and irregularly shaped magnets.

O.S.A.8.

PROGRESS IN THE CHARACTERISATION OF THE MATERIALS' BEHAVIOUR BY THE DISK PRESSURE TESTING

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The disk pressure testing has been used for many years to characterise the materials sensitivity to hydrogen. Due to the improvements made, this technique allows now to investigate the behaviour of materials in a wider context including, besides the atmosphere composition, the biaxial loading with strain rates from 10−6 to 100 s−1, the heating up to 900º C, and the cyclic loading. In this work are presented the latest developments of the disk pressure testing and the results obtained on thin sheets (metallic membranes) used for pressure vessels and other equipment subjected to different environments and loading conditions. The influence of these conditions is related to that of the materials' composition and microstructure. On this basis, and by developing analytical models, the true mechanical properties and the strain hardening parameters, as well as those of the creep and fatigue behaviour, are defined.

O.S.A.9.

NEW PRECURSORS FOR DEPOSITION OF NANOSIZED NICKEL FILMS

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Five new compounds with general formula *Ni(pda)(β-diketonate)$_2$* (*pda* – 1,3-diaminopropane) were synthesized and identified by elemental analysis and IR spectroscopy. The complexes have molecular structures which were determined by single-crystal X-ray diffraction. These nickel complexes are volatility and stable in the gas phase at the temperature lower 150 ºC. The temperature dependences of saturated vapour pressure and thermodynamic parameters of the melting and sublimation process were determined by differential scanning calorimetry and static method with a membrane zero-manometer. Some of these complexes were successfully tested in MOCVD process. Deposition conditions resulting to one phase Ni films were established. Films compositions and structures were studied by XRD, EXAFS, XPS, SEM.
This work is supported by the Grant No. 11.G34.31.0033 of the Russian Federation Government.

O.S.A.10.

THE PREPARATION AND CHARACTERISATION OF NICKEL FERRITE THIN FILM

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By using of IBSD technology thin film of $NiFe_2O_4$ was sputtered on the Si (100) substrate. All sputtered films were X-ray transparent. The structure of ferrite films was consisted from agglomerate less than 35 nm. The thickness of the sputtered film was about 600 nm. Additional heat treatment at 770 K during 90 min resulted to homogeneity of the film microstructure. The temperature range 400-750 K is corresponds to working temperature range of gas-sensing devices. The ferrite compounds were studied by TOF-SIMS for all depth of film. The resistivity R of synthesized film was 39 kΩ. Measurement of gas-sensing sensitivity R_{CH4}/R_{air} for gas (2%$_{v.}$ CH_4) – air mixture showed increase of R up to 12% at the present of methane at 403 K. For further research we plan to replace iron to manganese ions in chemical compounds of ferrite.

The work was supported by the Program "Combustion and Explosion" of the Presidium of the RAS and the Grant of RF President MK-3195.2012.8.

O.S.A.11.

SOME ASPECTS IN PZT FILMS PREPARATION

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In recent years, various methods of fabrication of PZT thick films have been proposed. However, these methods have low compatibility with conventional IC/MEMS processes or cannot obtain enough large actuator forces. The present paper proposes a simple fabrication technique of high quality PZT thick films by electrophoretic deposition method, using commercial powder PZT precursor and metal alkoxide components for the same composition. The PZT films were crack-free and have good morphology. The PZT films with perfect perovskite structure have excellent piezoelectric property. Ferroelectric hysteresis loops are measured, and the remnant polarization (P_r) of the PZT films was about 30mC/cm^2 and the coercive field (EC) is about 20kV/cm. In the radio-frequency (RF) region, the dielectric constant is about 400 and the dielectric loss is less than 0.01.

O.S.A.12.

NEW METHODS OF TRIS-ACETYLACETONATES OF RUTHENIUM(III), RHODIUM(III) AND BIS-KETOIMINATE PALLADIUM(II) SYNTHESIS USING MICROWAVE HEATING

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The investigation of processes for ruthenium(III), rhodium(III) tris-acetylacetonates and palladium(II) bis-ketoiminate preparation under microwave action with precision control of parameters as well as using different (solid- and liquid-phase) synthetic variants was carried out. The effectiveness of microwave synthesis under liquid conditions was higher in comparison with solvent-free reactions as it was shown. The maximum yield for palladium(II) bis-ketoiminate (about 80 %) was achieved by increasing the process temperature. The reaction time was reduced to a 2 - 5 minutes. A procedure of microwave synthesis of ruthenium(III), rhodium(III) tris-acetylacetonates compounds in aqueous solutions allows us to get compounds with yields (85 and 55 % respectively) for a relatively short time (about 40 minutes). This work is supported by the Grant No.11.G34.31.0033 of the Russian Federation Government.

O.S.A.13.

THE INFLUENCE OF THE ADMIXTURE OF THE FULLERENE C_{60} ON STRENGTH PROPERTIES OF ALUMINUM AND CUPPER UNDER SHOCK-WAVE LOADING

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It is well known, that the mechanical properties of commercial and constructional materials depend on their internal structure, which, in turn, depends on the technologies or methods of them production and processing. In this work, the Hugoniot elastic limit and dynamic (spall) strength measurements of pressed aluminum and copper samples with admixture of the fullerene C_{60} under shock-wave loading were carried out.

The undoped aluminum and copper samples and samples, pressed from the mixture of Al or Cu powder and fullerene C_{60}, were investigated. The undoped samples were pressed under peak pressure 5 GPa, the samples with fullerene C_{60} were pressed under pressure 10 kbar and 5 kbar for aluminum and copper samples, respectively, under the temperature of 280°C. For all samples, the density, sound speeds and hardness were measured. The density for Al-C_{60} and Cu-C_{60} samples was equal 2.6 g/cm^3 и 7.8 g/cm^3, the sound velocity was equal of 5.4 km/c и 3.5 km/c, correspondingly. The measurements of the microhardness of aluminum samples with fullerene C_{60} have shown its increasing with a factor 3-4 [1]. The admixture of the fullerene to the samples also leaded to increase their Vickers's hardness three times in aluminum samples and 1.3 times in cupper samples.

Shock-wave loading of sample of 2 mm in thickness was created with a plane aluminum impactor of 0.4 mm in thickness accelerated by explosive facilities up to velocity of 0.66 km/s. The measurements of strength properties were based on the recording and following analysis of the free surface velocity history, obtained with VISAR laser-Doppler velocimeter. In the experiments, it was found, that the admixture of 5 wt% and 2 wt% fullerene in the samples leads to the increase Hugoniot elastic limit 10 times for aluminum samples. This agrees with high growth their microhardness [1]. The measured values of Hugoniot elastic limit from the free surface velocity profiles were equal of 1.3 GPa for aluminum samples and 1.5 GPa for cupper samples.

As it was expected, the spall strength of the samples with fullerene decreased about tree times in comparison with undoped samples. Probably, the decrease of the strength related with influence of solid fullerene particles on the process of dynamic fracture under high strain rates: fullerene conglomerates are as a concentrators of tension stresses in material, where the damages of material are generated and lead to its macro fracture.

PL.S.III.1.

NANOMATERIALS FOR ONBOARD HYDROGEN STORAGE APPLICATIONS

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As natural carbon dioxide generation increases and energy reserves dwindle, a global concern about environmental quality and energy shortages has intensified. In the U.S. alone, the daily consumption of oil and coal are 20 million barrels and 300 million tons, respectively. Addressing the problem of environmental sustainability and energy independence will require breakthroughs in energy storage and conversion technologies. In this presentation, I will present our efforts in making transformative advances in chemical energy storage via hydrogen storage materials of $LiBH_4$ and MgH_2.

$LiBH_4$ is one of the materials that have the highest gravimetric hydrogen density at room temperature known today. However, $LiBH_4$ has been dehydrogenated and re-hydrogenated at high temperatures (e.g., > 400°C) because of its high chemical stability. Using a novel nano-engineering approach, we demonstrate that nanoscale $LiBH_4$ can release H_2 at temperatures as low as 32°C and complete releasing all of the stored hydrogen below 400°C. These H_2 release temperatures are the lowest ever reported in the open literature. Furthermore, nanoscale $LiBH_4$ can alter the reaction pathway of the $LiBH_4$+MgH_2 mixture, leading to hydrogen release from MgH_2 below 150°C accompanied by the largest quantity of H_2 released ever reported for the $LiBH_4$+MgH_2 system. The unprecedented enhancement in the dehydriding behavior of $LiBH_4$ and its mixture with MgH_2 is due to the substantially increased thermodynamic driving force and reaction kinetics derived from the nanoscale of $LiBH_4$.

PL.S.III.2.

NANOGLASSES AND AMORPHOUS/NANOCRYSTALLINE MATERIALS: SOME NEW APPROACHES

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The main idea in Gleiter's conception of nanomaterials (1981-1985) is that interface surface is considered as a considerable factor to change the material properties. This review is devoted to new nanomaterials such as nanoglasses with tunable atomic structure obtained by the consolidation of amorphous nanoparticles and other methods. The structure and properties of these materials are analyzed. The possibilities of ductility in metallic nanoglasses are emphasized. The properties and fields of application of film composites -based nanoinclusions/nanolayers in amorphous matrices are described. The problems requiring further studies are stressed.

PL.S.III.3.

THE INFLUENCE OF STACKING FAULT ENERGY ON THE DEFORMATION MECHANISMS OF Fe-Mn AUSTENITIC STEELS

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Recently developed high-manganese transformation- and twinning-induced plasticity (TRIP/TWIP) steels are candidates for automotive structural components owing to their excellent formability and energy absorption. The TRIP/TWIP steels possess superior strain hardening in part due to low stacking-fault energy (SFE). With a decreasing value of the SFE, plasticity is achieved by: (i) partial- and perfect-dislocation glide, (ii) glide and mechanical twinning, and (iii) glide and ε- or α-martensitic transformations. These strain-induced features reduce the mean-free-path of dislocation glide, delay local necking, and give the steels exceptional ductility and toughness. Weak-beam dark-field (WBDF) imaging was used to experimentally determine the SFE of Fe-Mn-Al-Si steel for a range of Mn content and relate this parameter to the observed deformation mechanisms in order to understand the critical relationship between the SFE and deformation modes.

PL.S.III.4.

STRUCTURAL AND DIELECTRIC INVESTIGATIONS OF ADVANCED RELAXOR POLYMER SYSTEMS

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Electroactive relaxor polymers based on poly(vinylidene fluoride-trifluoroethylene) copolymer, P(VDF-TrFE), are of great interest for a broad range of applications as they exhibit fast response speeds, high dielectric constant and high electric energy density, giant electrostriction, and large electrocaloric effect. After presentation of basic structural and electrically-induced properties of ferroelectric and relaxor polymers (in the latter the long-range ordering of polymer chains is broken by introduction of additional monomers that contain large chlorine atoms), our focus will shift on characteristics of recently developed relaxor polymer systems: (i) A new class of relaxor polymer, synthesized via reductive dechlorination from the P(VDF-TrFE-CTFE) system. Here, in the so-called reduced P(VDF-TrFE) copolymer, relaxor and glassy dynamic processes, taking place in the crystallites and amorphous phase, respectively, can be studied separately. This system furthermore possesses the highest melting point among known relaxor polymers, and it has also been found that even low dc bias voltage effectively blocks its ac electrical conductivity; (ii) Blend films of relaxor P(VDF-TrFE-CFE) terpolymer and P(VDF-CTFE) copolymer, developed on the aluminum substrate. Structural, caloric, and dielectric properties will be presented and compared to those of the pure terpolymer system. The results will demonstrate that polymer blends exploit merits of both, base and additive polymer, and that due to the interference effect properties of base polymer can be tailored and improved; (iii) Finally, we will briefly present the influence of uniaxial stretching on dielectric, electromechanical, and electrocaloric properties of relaxor polymer systems, and provide some microscopic and mesoscopic explanations for observed substantial differences in the detected response of the stretched and non-stretched samples.

PL.S.IV.1.

PHYSICAL INSIGHTS INTO NATURE'S WAY OF MAKING MATERIALS

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Biomineralization is a process through which living organisms produce inorganic materials to fulfill their functional requirements. This process occurs in the oceans on such a large scale that it influences seawater chemistry and results in large-scale sequestration of CO_2 in the form of carbonates that chronicle the interplay between biota and the environment. Biomineral formation also impacts human health through both development of functional mineralized tissues including bones and teeth and pathological mineralization events such as vascular calcification. Because biomineral structures exhibit complex topologies, hierarchical designs and remarkable mechanical properties, developing an understanding of how biomolecules direct crystallization is inspiring new strategies for materials synthesis.

Self-assembly of organic matrices and subsequent directed nucleation of the mineral constituents is a widespread paradigm in biomineral formation. The architecture of the underlying matrix imposes order on the nucleating mineral species. For example, in bone collagen monomers form intro triple helices, which then self assemble into well-organized fibrils. Within these fibrils highly-oriented hydroxyapatite crystals nucleate and grow with a specific crystal face in contact with the collagen fibril. In order to understand the underlying physical controls governing both matrix self-assembly and biomolecule-directed crystallization, we are using *in situ* AFM and TEM combined with computational tools to investigate the dynamics of these processes.

Results on extended protein structures such as collagen and microbial membranes reveal the key role that is played by conformational transformations associated with assembly in controlling the pathways and kinetics of this process. Studies of mineral nucleation on organic matrices show that these surfaces promote nucleation through reduction of interfacial energy. However, the existence of pre-nucleation clusters opens up a low-barrier pathway to formation of amorphous precursor phases. Analysis of the collagen-collagen and collagen-mineral interactions through a combination of dynamic force spectroscopy and molecular modeling provides a rationale for the observed assembly behavior and a mechanism of orientation control over the mineral phase. Finally, *in situ* TEM shows that cluster- and particle-mediated growth is driven by a highly orientation-specific interaction that acts over 1 nm distances and results in attachment accompanied by crystallographic alignment. Taken together, these results provide new insights into the mechanisms controlling biological crystallization, from formation of the initial matrix to the maturation of final crystalline structures.

PL.S.IV.2.

TRICOPOLYMER/FIBRINGLUE COMPOSITE AS SCAFFOLD FOR ARTICULAR CARTILAGE TISSUE ENGINEERING

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Autologous fibrin glue has been demonstrated as a potential scaffold with very good biocompatibility for neocartilage formation. However, fibrin glue has been reported not to provide enough mechanical strength, but with many growth factors to interfere the tissue growth. Gelatin/hyaluronic acid/chondroitin-6-sulfate (GHC6S) tricopolymer sponge has been prepared as scaffold for cartilage tissue engineering and showed very good results, but problems of cell seeding and cell distribution troubled the researchers. In this study, GHC6S particles would be added into the fibrin glue to provide better mechanical strength, better cell distribution, and easier cell seeding, which would be expected to improve cartilage regeneration in vitro. Porcine cryo-precipitated fibrinogen and thrombin prepared from prothrombin activated by 10% CaCl2 solution were used in two groups. One is the fibrin glue group in which porcine chondrocytes were mixed with thrombin–fibrinogen solution, which was then converted into fibrin glue. The other is GHC6S-fibrin glue in which GHC6S particles were added into the thrombin–fibrinogen solution with porcine chondrocytes. After culturing for 1–2 weeks, the chondrocytes cultured in GHC6S-fibrin glue showed a round shape with distinct lacuna structure and showed positive in S-100 protein immunohistochemical stain. The related gene expressions of tissue inhibitor of metalloproteinases-1, matrix metalloproteinase-2, MT1-MMP, aggrecan, decorin, type I, II, X collagen, interleukin-1 b, transforming growth factor-b 1 (TGF-b1), and Fas-associating death domain were checked by real-time PCR. The results indicated that the chondrocytes cultured in GHC6S-fibrin glue would effectively promote extracellular matrix (ECM) secretion and inhibit ECM degradation. The evidence could support that GHC6S-fibrin glue would be a promising scaffold for articular cartilage tissue engineering.

PL.S.IV.3.

NANOMATERIALS: ARE THEY SAFE?

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Rapidly evolving nanotechnologies enable development, production and use of nanomaterials in all segments of our life. However, with the increased use and novel applications of nanomaterials also human and environmental exposure increases, and concerns have been raised whether certain application may represent hazard for human health and environment. Interactions between nanomaterials and cells, animals, humans and the environment have been shown to be are remarkably complex. The major challenge is, to understand how physical and chemical properties of nanomaterials govern their interactions and responses with biosystems, and to inform the regulators and public on the benefits and potential risks associated with the use of nanomaterials. This goal can be achieved only by interdisciplinary collaboration between nanotechnologies and nanotoxicology.

O.S.E.1.

MULTIFUNCTIONAL NANO SCALE DRUG DELIVERY PARTICLES BASED ON VITAMIN D3-LOADED HYDROXYAPATITE IN BONE TISSUE ENGINEERING

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Specific group of controlled drug delivery systems in bone tissue engineering are multifunctional nanoparticle systems (MNPs) based on hydroxyapatite coated with drug loaded-bioresorbable polymer. This study illustrates the possibility for controlled synthesis of multifunctional nanoparticulate forms based on hydroxyapatite as a system for local delivery of vitamin D3 and secondary delivery of defect filler hydroxyapatite. The results were two type of nanoparticle powder of controlled shapes, sizes and properties: hydroxyapatite nano particles as vitamin D3 carriers (HAp/D3) and vitamin D3-loaded hydroxyapatite coated with poly-D,L-lactide-co-glycolide (HAp/D3/PLGA) with particle sizes of d50=68 nm and d50=71 nm, respectively.

Simultaneously, biocompatibility of the materials was tested *in vitro*, on osteoblastic MC3T3-E1 and epithelial Caco-2 cells in culture. Biocompatibility tests carried out on cell cultures have shown intact monolayers of epithelial cells in contact with both materials and no negative effects on the cell viability.

The aim of this work was application in living/human systems, and it has been tested *in vivo*; artificially made bone defects of a mandible damaged by osteoporosis have been reconstructed with both types of materials. The best results were achieved 24 weeks after implantation of vitamin D3-loaded hydroxyapatite coated with poly-D,L-lactide-co-glycolide. Accelerated angiogenesis, vascularization, osteogenesis and bone structure differentiation has been achieved in the presence of specific islet-like forms of ossification centers.

O.S.E.2.

THE DYNAMICS OF THE DISSOLUTION OF THE ULTRAFINE IBUPROFEN IN COMPARISON WITH INITIAL SUBSTANCE

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Ibuprofen, a well-known anesthetic and anti-inflammatory drug, is an example of an active pharmaceutical ingredient poorly soluble in water. However, a rapid drug release is preferable, especially for analgesic drugs. One of the methods allowing improvement of bioavailability of poorly soluble drug is the micronization of the drug. In this work, we report the method of preparation of the ultrafine ibuprofen powder, consisting of planar micron-sized particles, by ultra-rapid freezing of solutions followed by removal of the solvent by sublimation under conditions excluding the formation of liquid phases. The properties of the samples were studied by scanning electron microscopy, X-ray powder diffraction, dissolution dynamics experiments. The samples of the ultrafine ibuprofen show an increase in the dissolution rate in comparison with the initial substance.

O.S.E.3.

NITROSYL [2FE-2S] PROTEINS ACTIVE SITES BIOMIMETICS AS A NEW NO DONATING AGENTS FOR THE TUMOR DISEASES THERAPY

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The report summarizes the results of studies aimed at developing the fundamentals for the design of new class of chematherapeutic agents, *viz.,* biomimetics of the nitrosyl ferredoxines active sites. The structure, reactivities and antitumor effect *in vitro* and *in vivo* of these complexes are considered. The stable crystalline mono- and dinuclear iron nitrosyl complexes with ligands, which are analogous to the natural thiols, have been prepared. We propose to consider nitrosyl [2Fe-2S] complexes, which are synthetic models of natural NO reservoirs in cells, as hybrid medicines, provided that functional azaheterocyclic thiolyls will be used as sulfur-containing ligands. Mercaptothiols has been known as reversible inhibitors for synthesis of cellular DNA and RNA and they are widely used in biochemical and medical experiments for inhibiting the growth of malignant tumors of different genesis and for the protection of cell genome. On the other hand, NO groups act as the second pharmacological component of such hybrid, as a key signal molecule controlling the neoplasms formation. The cytotoxic efficacy of nitrosyl [2Fe-2S] complexes against the human tumor cell lines (ovarian carcinoma, erythroblastic myeloleukemia, carcinoma of large intestine, carcinoma of mammary gland, prostate carcinoma, immortalized kidney cells and breast carcinoma) have been studied. Differential sensitivity of human tumor cells of different genesis to nitrosyl [2Fe-2S] complexes of various structural types has been founded. The induction of apoptosis and expression of alkyl-guanintransferase of selected compounds on human tumor cells in culture have been studied. High antitumor activity of nitrosyl [2Fe-2S] complexes *in vivo* has been shown on the experimental models of animals (melanoma B16, adenocarcinoma Ca755 and LL carcinoma (LLC)). It is expected that this work will lead to the development of innovative medicines for chemotherapy based on the nontoxic natural biocompatible products.

O.S.E.4.

BIODEGRADABLE MICROCARRIERS BASED ON CHITOSAN AND POLYESTERS FOR TISSUE ENGINEERING

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Biodegradable microcarriers are attractive materials to promote wound healing due to large surface that they develop. The facilities to transfer cells as well as the ability to combine different cell types provide their attractiveness as potential biomaterials for tissue engineering. The aim of this research was to prepare and optimize new microbeads as microcarriers for animal cells cultivation. The surface properties of the polyester microbeads have been modified with polycationic sequences (chitosan, proteins) in order to promote cell adhesion. For this purpose we use adopted chitosan-based materials produced by solid-state reactive blending under conditions of shear deformation which were realized in a twin-screw extruder. The ability of the prepared microcarriers to support attachment and growth of animal cells was tested using mouse fibroblasts (L929).

O.S.B.1.

PERITECTIC MELTING OF ß-BORON IN THE B-C BINARY – A LONG STANDING PUZZLE SOLVED

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The melting behavior of ß-boron at the boron-rich side of the B-C binary phase diagram has long been an unsolved problem, giving rise to speculations on either depleted, eutectic or peritectic reactions. Analyses of the chemical composition of the quenched molten zone and that of the zone-end part crystal obtained from floating zone crystal growth experiments on ßB(C) with varying amounts of carbon yielded data points on the liquidus and the solidus curve. A clearly peritectic melting behavior of ß-boron $L+B_4C \leftrightarrow (ßB)$ was derived. A corresponding thermodynamic modelling of the B-C system was performed via CALPHAD techniques incorporating the new data. The influence of either a eutectic ($L \leftrightarrow (ßB)+B_4C$) or a peritectic reaction ($L+B_4C \leftrightarrow (ßB)$) on the liquidus surface in the systems M-B-C will be outlined for M=Ti, Zr, Hf, W.

O.S.B.2.

RUDDLESDEN-POPPER TYPE PHASES AS SEEN BY HIGH-TEMPERATURE ^{57}FE MÖSSBAUER SPECTROSCOPY

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In the last years, the layered rare earth nickel oxides which are known as Ruddlesden-Popper (R-P) type phases, $Ln_{n+1}Ni_nO_{3n+1}$, have attracted attention mostly as potential alternate cathode materials for solid-oxide fuel cells (SOFC) as well as for oxygen separation membranes or nature gas separation. The lanthanum nickelate R-P structure is stacking up n perovskite-type layers ($LaNiO_3$) separated by rock salt layers (LaO) along the *c*-axis. The n = 1 member of this series adopts the K_2NiF_4 structure and consists of alternating perovskite and rock salt layers whereas the n = ∞ member corresponds to the three dimensional perovskite $LaNiO_3$. It is well established that the R-P compounds can tolerate a wide range of oxygen nonstoichiometry, which affects their transport properties. All R-P nickelates except $La_2NiO_{4+\square}$ are oxygen-deficient at elevated temperatures.

Herein we present a Mössbauer investigation of the $La_{n+1}Ni_{n-y}{}^{57}Fe_yO_{3n+1}$ series for n = 1, 2, and 3 with y = 0.02, 0.05, 0.1, and 0.9 in the temperature range from RT up to 1000°C and in atmospheres of different oxygen content.

O.S.B.3.

THERMOELECTRIC PROPERTIES OF PPV-BASED BLOCK COPOLYMERS AND THEIR COMPOSITES

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A range of alternating block co-polymers have been synthesized consisting of *p*-phenylene vinylene (PPV) based oligomers interspersed with flexible aliphatic blocks using a modified Wittig polymerization. The synthesized polymers were characterized by NMR, UV-Vis, GPC, and DSC. Films of the polymers blended with single-walled carbon nano-tubes (SWCNT) were prepared, p-doped using I_2 and their electrical conductivities determined using a four-point probe measurement. Seebeck coefficients (S) were determined by measuring the resultant potential as a temperature gradient was applied across the macroscopic sample. The dimensionless thermoelectric figure of merit ZT was calculated from the expression $ZT = S\sigma^2/\kappa$. The ZT's of the composite films were found to be of the order of 10^{-3}, indicating that polymer composites were relatively good thermoelectric materials.

O.S.B.4.

POLYMERIC MATERIALS FROM ALGAE OIL

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Algae are a potential source of future renewable energy because they can generate many times more oil per acre than other plants used for biofuels, such as corn or soybean. Algae are biological factories that use photosynthesis to transform carbon dioxide and sunlight into energy so efficiently that they can double their weight several times a day. To date, little attention has been paid to the chemical transformation of algal oil to polymeric materials. Algal oil composition depends on the type and species of algae. The oils from single-cell or microalgae are rich in saturates, have relative low iodine value and have high free fatty acid content, which makes them less desirable for many chemical transformations. We have converted oil from the single-cell algae to polyols and polyurethanes by different techniques and proved the feasibility of their conversion to useful polymeric materials.

O.S.B.5.

THE EFFECT OF ELECTRIC POTENTIAL ON MATERIAL MICROHARDNESS AND DISLOCATION DENSITY IN ZINC MONOCRYSTALS

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The effect of weak electric potential on material microhardness was investigated for single zinc crystals. The experimental evidence suggests that with increasing electric potential, the microhardness of single zinc crystals would change exponentially. Thus the microhardness of studied material decreased by 8 % in the interval 0 … 0.1 V and thereafter remained unchanged. The statistical significance of data obtained is considered. Assumedly, the application of electric potential causes a change in surface energy density; hence the conditions which favor the origination and motion of elementary plastic deformation carriers, i.e. dislocations, would also change. Using selective etching method, the dislocation density was determined for fresh cleaved facet (0001) of zinc monocrystal before and after the application of electric potential. For outer electric potential of 0.02 V, a three-fold increase is found to occur in the density of dislocations. It can thus be concluded that weak electric potential is liable to affect the microhardness of zinc monocrystals and the dislocation subsystem thereof.

O.S.B.6.

POLYURETHANE – Fe POWDER FILMS: PREPARATION AND CHARACTERIZATION

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Novel organic-inorganic composites in the form of free-standing films were prepared. Organic polymeric matrix was based on polyurethane elastomer made from KRASOL LBH P (linear liquid polybutadiene terminated with primary hydroxyl groups), aliphatic diisocyanate (1,6-hexamethylenediisocyanate), and 1,4-butanediol. Powder iron (ASC 100.29**)** of micrometre size formed the inorganic part of the composites (5 to 80 wt. %). Fe content considerably influenced functional properties: (a) The composites with low contents of Fe (< 30 wt. %) are typical elastomeric. 'PU-matrix composite' is further distinguished by high toughness, high specific resistivity, high elasticity and relative low hardness and low tensile strength. Iron particles are homogeneously distributed in the polyurethane matrix. (b) The highest Fe content (70 to 80 %) leads to the agglomeration of Fe particles ('Fe-matrix composite'). If compared properties of 'Fe-matrix composites' with 'PU- matrix' ones, their hardness, strength and specific resistivity increased but elasticity and toughness rapidly decreased. (c) Mixed microstructure with Fe particles and Fe agglomerates was observed in the range between 30 and 60 wt. % of Fe, showing anomalous changes in properties of PU-Fe composites in this concentration region.

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O.S.B.7.

FORMATION OF HYPEREUTECTIC ALUMINIUM-BASED ALLOYS OR NICKEL ALUMINIDES USING SACRIFICIAL NICKEL COATINGS

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The contribution is focused on hypereutectic alloys or nickel aluminides formation, where was utilized the unconventional method consisted of (i) sacrificial coating deposition onto the substrate and (ii) subsequent heat treatment. The 99.7 wt.% Ni powder was used to produce the nickel coating, by means of high velocity oxyfuel spraying, onto the 99.999 wt.% Al sheet surfaces. Then the as-sprayed samples were heat treated up to the temperatures of 700, 900 and 1200 °C. The heating/cooling rate of the samples of 5 °C / min was set up. The hypereutectic alloys or nickel aluminides formation was investigated by using differential thermal analysis, metallography and scanning electron microscopy. To estimate the chemical composition of phases the energy dispersive microanalysis was used. The resulting microstructure of Al-Ni hypereutectic alloys originated up to the temperature of 900°C is of aluminium matrix and Al_3Ni eutectic. Instead of that, the nickel aluminides were produced at the temperature of 1200 °C and consist of Al_3Ni_2 and Al_3Ni intermetallics. The image analysis was also applied to quantify the undissolved nickel coating thickness and parameters of eutectic.

O.S.B.8.

FLY ASH GEOPOLYMER BASED IMMOBILIZATION OF ELECTRIC ARC FURNACE DUST

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Fly ash geopolymers are relatively new materials that can be successfully used in a civil engineering. In addition, geopolymerization technology is promising method for immobilization of toxic materials. In this work we have investigated influence of alkaline dosage on properties of fly ash based geopolymers containing 10 % of electric arc furnace dust (EAFD). Fly ash based geopolymers are mainly amorphous materials. However, some undissolved phases such as quartz, calcite, anothrite and melilite remained from unreacted fly ash were found in the investigated geopolymers. There is no new crystalline phase formed as a result of geopolymerisation reaction. Investigations of mechanical properties have shown that addition of EAFD decrease of compressive strength of fly ash based geopolymers. Compressive strength, geopolymers increase with increase of alkaline dosage from 7 to 10 M NaOH. Further increase of NaOH concentration leads to reduction of compressive strength. Change of compressive strength is consistent with change of porosity of geopolymers. Obtained geopolymers are generally characterized as mesoporous materials. But, presence of micropores cannot be neglected, because they existing within the gel and determine the properties of amorphous phase. The pore size distribution, indicate that mesopores width shift to the smaller size with increase of NaOH concentration. At the same time increase of NaOH concentration leads to the micropores volume decrease, which is accompanied with increase of geopolymers strength. Increase in NaOH concentration to 13 M leads to the further decrease of mesopore size but also to the development of microporosity in a gel phase. This leads to weakening of gel phase and slight decrease of geopolymer strength.

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O.S.B.9.

NOVEL HYBRID INORGANIC-ORGANIC ONE-DIMENSIONAL CHAIN SYSTEMS TAILORED WITH MONOCARBOXYLIC ACIDS

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Two novel nanosized hybrid inorganic–organic frameworks, $VO(C_{14}H_9COO)_2$, and $VO(C_{10}H_7COO)_2$ have been solvothermally synthesized and their structures elucidated using a combination of powder XRD and DFT geometry optimization. They contain one-dimensional chain of corner-sharing tetrahedra in the case of $VO(C_{10}H_7COO)_2$, and corner-sharing octahedra for $VO(C_{14}H_9COO)_2$ oriented along orthorhombic/monoclinic *c*-axis, respectively. While $VO(C_{14}H_9COO)_2$ exhibits bidentate bridging binding of organic moiety to the metal center, $VO(C_{10}H_7COO)_2$ shows monodentate mode as evidenced from DFT and infrared spectroscopy. Both hybrids exhibit fiber-like morphology, consisting of smaller individual single crystals aligned in parallel to the growth direction along the *c*-axis. They are thermally stable up to 350 °C having even more stable impurities containing vanadium in its highest oxidation state. The magnetic properties have been also investigated and indicate antiferromagnetic ordering along the chains characterized by rather low spin exchange parameters.

O.S.B.10.

EFFECT OF CLAY ON REACTION-INDUCED PHASE SEPARATION IN MULTIPHASE EPOXY

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It is now well accepted that nanofillers have also structure-directing effect in systems with reaction-induced phase separation. Results presented show that structural transitions in epoxy systems containing both liquid rubbers and thermoplastics are dependent on dynamic asymmetry, determined by diference in T_g and molecular weight of components. In epoxy/rubber systems with low asymmetry, clay causes both increase or decrease of particles in dependence on curing temperature and synergistic affecting of mechanical behaviour is caused predominantly by favourable ratio of component parameters achieved. With epoxy/polycaprolactome, the clay-affecting of strong asymmetry leads to phase inversion and marked change of mechanical behaviour. Combination of clay and polymeric modifier represents a tool to tailor structure and parameters of epoxy nanocomposites. This work was supported by Grant Agency of the ASCR (Grant No IAA200500904).

O.S.B.11.

SYNTHESIS AND CHARACTERIZATION OF POLYANILINE-SILOXANE COMPOSITES

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Polyaniline is one of the most popular conducting polymers. It displays high electrical conductivity, environmental stability, ease of preparation from common chemicals, reasonable processibility, in combination with a relatively low cost [1]. In this contribution we present the synthesis and characterization of polyaniline-siloxane composites, in which the siloxane resin acts as matrix, while colloid polyaniline particles are dispersed as filler. The composite was designed in order to combine the mechanical properties of siloxane resins with the electrical properties of polyaniline. The mechanical proprieties (characterized via DMTA) were varied by changing the ratio of branching and linear siloxane monomers. The nanofiller dispersion was characterized via TEM. The electrical conductivity of the composites was measured as well. The effect of the synthesis technique, especially of polyaniline formation and dispersion, on mechanical and electrical properties is discussed.

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O.S.B.12.

ANALYSIS OF CUTOUT FIBER AS SOURCE OF DELAMINATION IN COMPOSITES SYSTEM USING FEM

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Delamination in composite structures can be a serious threat to the safety of the structure. Delamination leads to loss of stiffness and strength of laminates under some conditions. This is particularly so in the case of compressively loaded structures as the loss of stiffness may lead to separation of layers, the consequences of which can be catastrophic. Causes of delamination are many. In aerospace applications, this includes manufacturing defects, as well as operationally induced defects such as bird strikes, hits due to runway debris and tool drops. In this work one of the main causes of delamination that is dealt with, is the redistribution of the stress state due to some defects that resembles for example a broken single fiber (*cutout fiber*) in composite system which is initiated by one of the above causes. When a laminate is subjected to in-plane tension, the effects of delamination on the stiffness and strength may be characterized by analytical results concerning the onset of delamination growth and its subsequent development. Many of the analytical treatments deal with just free-edge delamination. While the redistribution and the gradient of the stress state in composite system is playing important role for causing delamination. The main task of this work is to analyze a single fiber with and without cutout embedded in matrix. Different FE models were generated, from the results, the redistribution of the stress state around the defected fiber were presented and discussed. Finally concluded remarks were presented.

O.S.B.13.

STUDY OF MICROSTRUCTURES AND PHASE TRANSFORMATIONS IN THE CeO_2-Er_2O_3 SYSTEM

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Systems with ceria and erbia are perspective for the development of alternative ceramics for the thermal barrier coatings (TBCs) and intermediate temperature solid oxide fuel cells (SOFCs). Doped ceria is a promising material for applications as a solid electrolyte for its use in oxygen concentration cells and in solid oxide fuel cells. It is also a candidate material for application in controlling air-to-fuel ratio in automobile exhaust. The high ionic conductivity coupled with the low activation energy for ionic conduction makes the doped CeO_2, a superior material in comparison yttria-stabilized zirconia (YSZ), for use at temperatures below 800 °C, which would allow greater flexibility in design of the electrode and interconnectors. Moreover, this system can be widely used in atomic power engineering for creation of the safe disposal techniques for the nuclear waste and development of advanced and new generation of reactors. Phase diagram based on CeO_2 and Er_2O_3 and microstructural design in this system are interesting from both fundamental and practical viewpoints.

In present work, first the microstructures and phase relations in the binary CeO_2-Er_2O_3 system at 1100-1500 °C in air in the whole concentration range were studied. Powders of $CeO(NO_3)_2$ and Er_2O_3 (99.99 %) were used as raw materials. The samples were prepared in steps of 1 and 5 mol % from nitrate solutions with their subsequent evaporation and decomposition at 1000 °C for 2 h. Thermal treatment was carried out in the furnaces with heating elements based on H23U5T at 1100 °C for 16800 h and Superkanthal ($MoSi_2$) at 1500 °C for 170 h in air. The phase compositions were investigated by X-ray diffraction, microstructural phase and electron microprobe X-ray analyses.

The study of solid state reaction of CeO_2 (fluorite-type, F) and Er_2O_3 (cubic modification of rare-earth oxides, type C) at 1100-1500 °C showed that two types of solid solutions based on cubic modifications of F-CeO_2 and C-Er_2O_3 in the CeO_2-Er_2O_3 system. These solid solution regimes were separated from end to end with the two-phase field: (F+C).

The boundaries of the homogeneity fields for the solid solutions based on F-CeO_2 and C-Er_2O_3, as well as lattice parameters of the unit cells for solid solutions F-CeO_2 and C-Er_2O_3 were determined. The solubility of Er_2O_3 in F- modification of CeO_2 is about 20 mol % at 1100 °C (16800 h) and ~30 mol % at 1500 °C (170 h).The lattice parameter of the unit cell decreased from a = 0.5409 nm in pure CeO_2 to a = 0.5376 nm for the solid solution of boundary composition (1100 °C) and . a = 0.5369 nm in the sample containing 30 mol % Er_2O_3 (1500 °C). The solubility of CeO_2 in cubic C- erbium oxide attain ~15 mol % at 1100 °C and 40 mol % at 1500 °C. The lattice parameters of the unit cell C phase varies from a = 1.0531 nm in pure Er_2O_3 to a = 1.0537 nm in the sample containing 85 mol % Er_2O_3 (1100 °C) and a = 1.0622 nm for the solid solution of boundary composition (1500 °C).

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Keywords: ceria, erbia, microstructures, phase equilibria, solid solutions, lattice parameters, fluorite, pyrochlore, ceramic functional materials.

Poster Presentation

P.S.A.1.

THE SORPTION SEQUENCE OF IONS FROM AQUEOUS SOLUTIONS ON OXIDES

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The use of various materials, especially inorganic oxides, for the sorption of ions from solutions has increased in last decades. New synthesis methods to obtain these materials with improved and desirable properties contribute to this. The study of sorption sequences of ions from different mixtures has been of special interest. The obtained experimental data enable selective sorption of specific ions. In this paper the experimental results, obtained by the author of this paper as well as by other authors, are given. The Sorption sequence of ions from aqueous solutions on various oxides (silica, zirconia, alumina, titania, iron oxides, etc.) is especially analyzed. It depends on experimental conditions (ion concentrations in a solution, pH of the solution, temperature, presence and concentration of other ions in the solution, etc.) Deviation from liotropic sorption sequences of ions on oxides is explained on the basis of the activities of ions in the solution.

P.S.A.2.

SYNTHESIS AND CHARACTERIZATION OF SILICA CORE/NANO-FERRITE SHELL PARTICLES

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Major challenges for the preparation of nanoparticle systems include the development of new compositions and the fabrication of multifunctional systems with specific architectures. In such systems, silica has been very often utilized as a template for the assembly of different functional nanoparticles. Thus, numerous particulate systems have been developed and fabricated by assembling diverse nanoparticles on the surface of silica particles, encapsulated within, or integrated on both sides using a variety of synthesis methods.

In this work silica core/ferrite shell particles were synthesized by assembling of ferrite (Fe_3O_4 and $NiFe_2O_4$) nanoparticles on the surface of monodispersed silica core particles (having size ~400 nm) prepared by hydrolysis and condensation of tetraethylortosilicate. Deposition of Fe_3O_4 nanoparticles on the surface of silica core particles by attractive electrostatic forces was performed at pH~5.4 and obtained core-shell particles were monodispersed with homogenous shell structure which has superparamagnetic nature. However, nickel ferrite particles can be formed at higher pH values ($pH \geq 7$). Thus, functionalization of silica core particles was necessary to allow electrostatic deposition of nickel ferrite nanoparticles onto silica surfaces. Functionalization was performed with two functionalization agents, 3-aminopropyltriethoxysilane (APTES) or poly(diallyldimethylammonium chloride) (PDDA). However, the formation rate of separate nickel ferrite particles was faster than the rate of deposition of nickel ferrite nanoparticles on the surface of silica core particles. To prevent self-aggregation process, nickel ferrite nanoparticles were functionalize with citric acid before their deposition on functionalized silica core particles. The particles synthesized in this way have continuous and uniform shell with average shell thickness of 50 nm.

P.S.A.3.

HYDROTHERMAL SYNTHESIS OF ZnO POWDERS WITH A TAILORED PARTICLE MORPHOLOGY AND IMPROUVED OPTICAL CHARACTERISTICS

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ZnO represent one of the most important multifunctional materials. Its properties are well known and confirmed in different application areas such as: gas sensors, UV lasers, solar cells, electroluminescent and optoelectronic devices, piezoelectric transducers, hydrogen-storages, rubber industry and plastic processing, cosmetics and pharmacy, and it is also used as an antibacterial agent. In this work, we propose a low-temperature hydrothermal method for the synthesis of phase-pure ZnO powders with a controlled morphology and narrow particle size distribution. This simple and low-cost method allows tailoring of the shape and size of ZnO particles, from micro-rods *via* hexagonal prism-like to nano-spheres, by choosing the appropriate pH of the reaction solution, tuned by the varying of $[Na^{+}]$:$[Zn^{2+}]$ molar ratio. The agglomeration of the powders was prevented with the assistance of PVP as a capping agent.

The synthesized powders were characterized by XRD, TEM, SEAD and HRTEM methods to examine the phase purity and crystallinity. FE-SEM measurements were used for the morphology characterization, while the results of Raman and UV-Vis DRS measurements were used for the study of optical properties. The relationship between the particle size and morphology and the optical properties is discussed. Diffuse reflectance spectra of ZnO powders with different size and morphology revealed characteristic R curves with the absorption edge near 380 nm, but with obvious difference in the absorption in the visible region. The micro-sized powder ZnO8 revealed the lowest reflectance (~70%), compared to submicro- (~80%) and nano-sized (ZnO12 and ZnO13, ~90%) powders. Thus, the reflectance of the ZnO powders decreases with the increase in the average particle size.

P.S.A.4.

NANOSIZED OXIDE PARTICLE SYNTHESIS BY ULTRASONIC SPRAY PYROLYSIS FOR ENHANCED GOLD PLATING

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Using precious metals such as gold is an effective way to avoid failures of electrical contacts by fretting. One of limitation of lifetime of gold represents the wear resistance. In order to improve the wear resistance of gold plates, it is additionally alloyed with nanosized TiO_2 produced by ultrasonic spray pyrolysis. This paper pointed out the first results regarding to using nanosized particles for electroplating.The influences of different reaction on process parameters (gas flow rate, decomposition temperature, retention time, etc.) on particle morphology were determined. The model one droplet to one nanoparticle was discussed. The droplet size distribution was measured with a laser diffraction system without dilution of the aerosol and for the same atomization and carrier gas parameters as those during the synthesizing process. The nanopowder obtained by ultrasonic spray pyrolysis was characterized using various methods (SEM, EDS, and SMPS) with respect to structure and constitution. A reaction mechanism of synthesis is proposed, as well as optimal experimental conditions for obtaining nanopowder with a specific particle size distribution and morphology. Thesespherical oxidicnanosized particles were suitable to be applied in combination with gold layers for electrical contacts, what is confirmed with improved mechanical properties and life time of these coatings, without decreasing the electric conductivity.

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P.S.A.5.

FLEXIBILITY OF ULTRASONIC SPRAY PYROLYSIS PROCESS FOR THE SYNTHESIS OF CORE-SHELL NANOPARTICLES

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Core-shell nanoparticles have attracted much attention because their enhanced catalytic and optical properties. Several synthesis techniques have been developed to obtain the bimetallic particles with core-shell morphology. Ultrasonic spray pyrolysis represents a simple method enabling the generation of fine aerosol droplets and its subsequent thermal decomposition in order to produce nanoparticles of metals, oxides and mixed powders with a controlled composition and morphologies. The synthesis of core-shell nanoparticles of Au/TiO_2 in a single and multistep process will be considered in this study.Because of the improved properties the formation of core-shell nanoparticlesin one single step was firstly investigated from one common solution in difference to multistep synthesis from two separated solutions using two atomizers at the same time. Molar ratio of precursors and reaction temperature play crucial role in the formation of core-shell structures. The comparative analysis of two USP syntheses will be performed.

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P.S.A.6.

MICROSCOPY IN THE DESIGN OF NEW DRUG FORMS

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We designed a new method for obtaining highly dispersed forms of drugs, based on freeze-drying of rapidly frozen solutions in the systems of "low-boiling liquid - water" with clathrate formation. This method allows one to obtain micro-and nanoparticles of drugs with given sizes and characteristics. Selection of optimal conditions for creating highly efficient new-generation drugs requires the control over size, shape and morphology. To do this, we actively used methods of optical and scanning electron microscopy. Using paracetamol as a model object, we have shown that after freeze-drying the size of the original paracetamol particles is greatly reduced, the structure is changed and the surface area is significantly increased.

P.S.A.7.

DESIGN OF NEW DRUG FORMS BY CRYO-NANOTECHNOLOGY

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Currently, about 40% of industrially produced pharmaceuticals are poorly water soluble, what restricts their usage as orally administered drugs because of poor wetting properties and solubility in liquors of the digestive tract. Development, preparation and introduction of novel drug forms are time- and money-consuming, therefore the search for various approaches to optimizing already known and widely used medicines is highly topical. Besides, the interest of pharmaceutical companies in developing the technologies of producing micro- and nanoparticles of desirable size is related, among other reasons, to the growing popularity of inhalation therapy. A detailed study of processes occurring on annealing of frozen solutions of selected APIs in mixed organic-aqueous solvents allowed us to optimize the ratio of components and the experimental conditions for preparing novel forms of the APIs with improved properties.

P.S.A.8.

SYNTHESIS AND MAGNETIC PROPERTIES OF THE SOLID SOLUTIONS $Zn_{0,9}Cd_{0,1}GeAs_2$

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$ZnGeAs_2$ and $CdGeAs_2$ are advanced material for spintronics. These chalcopyrites doped with Mn have Curie points 367 and 355 K respectively. The phase diagram $ZnGeAs_2$-$CdGeAs_2$ was investigated. The solid solutions can be observed from the sides of both compounds till 10 mol.%. The crystal structure of the compound $Zn_{0,9}Cd_{0,1}GeAs_2$ is closest to GaAs crystal cell parameters. The samples of $Zn_{0,9}Cd_{0,1}GeAs_2$ doped with Mn (0.00, 1.13, 1.89, 2.65 wt.% of Mn) were synthesized. The samples with Mn were ferromagnetic, the Curie point (for sample with 2.65 wt.% of Mn) increased from 323 to 349 K with the increasing of magnetic field from 500G to50 kG. The magnetic properties of the compounds are attributed to the presence of the nanoclusters of MnAs. The size of the clusters increased with increasing of the manganese concentration.

P.S.A.9.

TOPOLOGICAL-NETWORK NANOCLUSTERING IN OVER-STOICHIOMETRIC ARSENIC SULPHIDES

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Topological self-organization concept was examined at the level of molecular and network-forming nanoclusters possible in binary arsenic-sulphur system beyond stoichiometric composition. Computational approach based on ab inito quantum chemical calculations was performed to determine characteristic energies for different topological configurations possible in these glasses. It was shown that under full saturation in covalent bonding, the real optimally-constrained phase was formed by corner-sharing pyramids corresponding to stoichiometric arsenic trisulphide. This result is in full agreement with solitary percolation transition from elastically floppy to stressed-rigid topological networks. With further arsenic addition, a strong molecular nanoclustering towards uzonite, realgar and dimorphite-type building blocks significantly destroys glass-forming ability.

P.S.A.10.

PREPARATION OF LITHIUM-SELECTIVE NANOCOMPOSITE SORBENT

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Preparation of grained lithium-selective nanocomposite absorbent is presented. Working substance was created at the base of dispersed phase of $LiCl{*}2Al(OH)_3{*}mH_2O$ with defect structure. Absorbent was created for lithium compounds production from multicomponent lithium-containing raw materials. The absorbent works successfully in brines, containing wide spectra of elements – chlorides of sodium, calcium, magnesium. The discussed hydromineral raw materials are highly concentrated solutions. The classification of treated brines is constructed and used. It is based at the brine property to be concentrated by lithium element.

P.S.A.11.

NANODISPERSED $Li_4Ti_5O_{12}$/C COMPOSITE AS AN ULTRA-FAST ANODE MATERIAL FOR LI-ION BATTERIES

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$Li_4Ti_5O_{12}$/C composites with different carbon black content were prepared in two steps: hydrothermal reaction at 130°C (tetra-n-butyl orthotitanate + LiOH + different amounts of carbon black) and postcalcination at 400°C. The X-ray diffraction experiments confirmed the spinel structure of both $Li_4Ti_5O_{12}$ composites. The composites $Li_4Ti_5O_{12}$/C were investigated by cycling voltammetry and galvanostatic cycling in the solution 1M $LiClO_4$ in propylene carbonate. The carbon content altered significantly the morphology of obtained micro/nanoparticles. The $Li_4Ti_5O_{12}$/C composite with the highest carbon content displayed the best electrochemical performance: the cyclovoltammograms consisted of well defined reversible redox peaks at a scan rate as high as 10 mV s^{-1}, while, by galvanostatic cycling, the coulombic capacity of 150 mAh g^{-1} was evidenced at a discharging rate of 10 C.

P.S.A.12.

NANOCRYSTALLIZATION OF ION CONDUCTING GLASS-CERAMICS IN THE SYSTEM Li_2O-Al_2O_3 -GeO_2-P_2O_5

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By crystallization of some glasses from the system Li_2O-Al_2O_3-GeO_2-P_2O_5, the $LiGe_2(PO_4)_3$ phase which belongs to the solid solutions with general formula of $Li_{1+x}M_xGe_{2-x}(PO_4)_3$ (M=Al or Cr) is formed. This family of the crystalline phosphates is often referred to as ′NASICONs′ materials which are potential candidates as solid electrolytes for utilization in high energy density batteries, supercapacitors, sensors, displays, nuclear waste disposals, low expansion ceramics, thermal-shock-resistant materials and electrochemical devices. $LiGe_2(PO_4)_3$ can be synthesized by conventional ceramic method, glass-ceramics method, solution-sol-gel method or hydrothermal method. In comparison with the sintered materials, glass-ceramics have much advantage because they can be easily manufactured into desired size or shape and have dense microstructure. Therefore, it is significant to understand the processes in the crystallization of these glass-ceramics materials.

The crystallization of glass $6.4Li_2O{\cdot}8.6Al_2O_3{\cdot}42GeO_2{\cdot}43P_2O_5$ (wt%) under non-isothermal conditions was investigated using DTA method. The powder glass samples particle sizes of < 0.048 mm were heated at different rates of 5, 10, 12, 15 and 20 °C/min up to T = 800 °C. The DTA exothermic peaks in temperature range T= 629-649 °C were recorded. With increasing the heating rates the peaks shift toward higher temperatures was determined. Since the crystal growth in these DTA experiments occurred on a constant number of nuclei and the dominant surface crystallization of glass ($n = m = 1$), the Kissinger equation was used for analysis of the kinetics of crystallization. Using the temperatures T_p, the activation energy of crystal growth of $E_a = 462 \pm 11$ kJ/mol was calculated. The XRD patterns of the glass samples crystallized at temperatures T_p showed that the $LiGe_2(PO_4)_3$ phase was formed. SEM analysis revealed the nanostructured glass-ceramic with the crystal size in the range of 20-80 nm.

P.S.A.13.

TAILORING OF MULTIFUNCTIONAL $KAlSiO_4$ - $KAlSi_2O_6$ BASED CERAMIC MATERIALS

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An optimization of a material properties i.e. material tailoring for industrial applications is an imperative for successful applications. In order to tailor potassium based ceramic materials with good physical properties we have synthesized them by: a) homogenization and annealing of K_2O-SiO_2-Al_2O_3 mixtures, b) sol-gel procedure, c) mechanochemical method and d) flux method. In addition, small amounts of REE (Sm, Eu, Gd, Er, Yb) were incorporated. In all cases (synthesis procedures) obtained crystalline phases were: kalsilite $KAlSiO_4$, $KAlSiO_4$-O_1 and leucite $KAlSi_2O_6$. Only in combination of all four synthesis procedure it was possible to characterize obtained materials and make clear conclusions about future direction of synthesis procedures. Results of powder and single crystal X-ray diffraction, SEM and TEM, magnetic and PL measurements will be reported and discussed.

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P.S.A.14.

SYNTESIS AND CHARACTERIZATION OF IRON-CONTAINING ZEOLITES: ZSM-5, BEA AND CLINOPTIOLITES

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Iron-containing zeolites, where Fe is octahedrally coordinated (extra-framework species), are materials with remarkable catalytic and adsorption properties. Their properties are highly influenced by preparation methods, in particular by ion-exchange procedures. A difficulty in aqueous ion-exchange process is that Fe^{3+} ions tend to agglomerate and precipitate. Fe-exchange carried out in Fe-citrate aqueous solution has been identified as an attractive way for preparation of these materials since it prevents the hydrolysis and precipitation of iron species into zeolite channels.

This work presents systematic investigation of following Fe-zeolites obtained by ion-exchange procedure using Fe(III)citrate aqueous solution: FeHZSM-5 and FeBEA (SiO_2/Al_2O_3=23 and SiO_2/Al_2O_3=25, respectively) containing 1, 5, 10 and 20 wt% of Fe-cations, as well as clinoptiolite and its Fe-containing forms. Synthesized samples were investigated by X-ray powder diffraction (XRPD), diffuse–reflectance UV-Vis spectroscopy (DRUV-Vis) and temperature-programmed desorption coupled with mass spectrometer as detector (TPD/MS).

Diffraction patters have shown that structures of all investigated zeolites have not been affected by ion-exchange and presence of iron-oxides or iron-hydroxides has not been detected. Collected TPD profiles of the characteristic mass fragments corresponding to water and CO_2 (m/e = 18(H_2O^+), 17(OH^+), 44 (CO_2^+)) have shown that the strength and strength distributions of sites active for H_2O adsorption have not been influenced by presence of iron cations in majority of investigated samples, while significant changes occurred in the case of CO_2. The most prominent changes have been detected for samples FeHZSM-5 with 5 % of Fe and FeBEA with 1 % of Fe where formation of stronger active sites has been identified. The existence of strong active sites for water and CO_2 adsorption/desorption can be most probably related to the presence of well dispersed isolated mononuclear iron species. Detailed characterization of these materials is of outmost importance for their application as adsorbents of phenol and phenols' derivates from wastewaters.

P.S.A.15.

SYNTHESIS AND CHARACTERIZATION OF Pt NANOCATALYST ON TIN OXIDE BASED SUPPORT FOR OXYGEN REDUCTION

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Platinum nanocatalyst on Sb doped tin oxide support has been synthesized and characterized as a catalyst for oxygen reduction reaction in 0.5 mol dm^{-3} $HClO_4$ solution, at 25°C. Sb doped tin oxide support has been synthesized by sol-gel procedure. Synthesized support was characterized by BET (Brunauer, Emmett, Teller), X-ray diffraction and cyclic voltammetry techniques. Specific surface area of the support determined from nitrogen adsorption/desorption isothermal curves was 42 m^2 g^{-1}.

Platinum nanocatalyst at modified tin oxide support has been synthesized by borohydride reduction method and characterized by XRD and TEM techniques. Quite homogenous Pt nanoparticles distribution over the support, without pronounced particle agglomeration was observed. Electrochemically active surface area of the catalyst was determined from adsorption/desorption charge of hydrogen atoms, after double layer charge substraction, taking into account the reference value of 210 μC cm^{-2} for full coverage with adsorbed hydrogen species.

The oxygen reduction reaction at $Pt/SbSnO_2$ catalyst has been studied by cyclic voltammetry and linear sweep voltammetry at rotating disc electrode. Two different Tafel slope were observed: one close to 60 mV dec^{-1} in low current density region, and other close to 120 mV dec^{-1} at high current densities region, as it was already reported in literature for oxygen reduction at pure polycrystalline Pt, as well as at Pt nanoparticles in acid solutions. The specific activities, expressed in terms of kinetic current densities per electrochemically active surface area at the constant potential, of this new catalyst and Vulcan supported Pt were compared. $Pt/SbSnO_2$ catalyst exhibited similar catalytic activity for oxygen reduction reaction compared to carbon supported one. Better durability of $Pt/SbSnO_2$ catalyst under repetitive cycling up to 1.4 V vs RHE was confirmed, comparing with Pt on carbon support.

P.S.A.16.

FABRICATION TECHNOLOGY OF $Bi_{1-x}Nd_xFeO_3$ CERAMICS

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In the present paper the synthesis conditions for fabrication of $Bi_{1-x}Nd_xFeO_3$ ceramics are reported. The mixed oxide method was employed for the ceramics fabrication. $Bi_{1-x}Nd_xFeO_3$ ceramics with were prepared from simple oxide powders Bi_2O_3, Nd_2O_3 and Fe_2O_3. The mixtures of powders were subjected to thermal analysis. The results of thermal analysis allowed to determine the optimal temperature of synthesis. Morphology of the ceramic material was observed by scanning electron microscopy. $Bi_{1-x}Nd_xFeO_3$ ceramics was studied in terms of its chemical composition. The structural analysis was performed by X-ray diffraction. Microstructure and crystalline structure studies of ceramics were carried out at room temperature.

Keywords: $BiFeO_3$ ceramics, perovskites, Nd^{3+} doping.

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P.S.A.17.

SPECTROSCOPY INVESTIGATION OF NANOSTRUCTURED ZINK FERRITE OBTAINED BY MECHANOCHEMICAL SYNTHESIS

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$ZnFe_2O_4$ has been obtained by soft mechanochemical synthesis in a planetary ball mill. $Zn(OH)_2$ and α-Fe_2O_3 are used as initial compounds. This mixture was mechanically activated for 18h, uniaxial pressed and sintered at 1100°C/2h. The phase composition of the sintered samples was analyzed by XRD, Raman and IR spectroscopy. Morphologies were examined by SEM. The electrical DC/resistivity/conductivity in the temperature range 298-473K was measured on a Source Meter Keithley 2410. Impedance measurements were carried out in the frequency range 100Hz to 1MHz on a HP-4194A impedance/gain-phase analyzer using a HP-16048C test fixture in the temperature range 298-423K. For analysis of the relaxation mechanism the sintered $ZnFe_2O_4$, we can use the complex impedance spectrum of which explains what kind of dielectric relaxation exists in the frequency-dependent response of the samples.

P.S.A.18.

PREPARATION OF TUNGSTEN BRONZES ON TITANIUM BY PLASMA ELECTROLYTIC OXIDATION PROCESS

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The growth of tungsten bronzes on titanium by PEO in heteropolytungstate acids (12-tungstosilicic acid and 12-tungstophosphoric acid) is experimentally investigated and discussed. Oxide coatings formed by PEO process were characterized by AFM, SEM-EDX and XRD. The elemental components of PEO coatings are Ti, W and O. The oxide coatings are partly crystallized and mainly composed of WO_3 and anatase. Raman spectroscopy' results have shown that outer layer of oxide coatings formed during the PEO process are tungsten bronzes. Composition of oxide coatings formed by PEO is identical with tungsten bronzes obtained during thermal treatment of solid heteropolytungstate acids. Therefore, PEO of titanium in heteropolytungstate acids can be used as a viable method for obtaining tungsten bronzes.

P.S.A.19.

STRUCTURE MODIFICATIONS OF MULTILAYERED Al/Ti SYSTEMS INDUCED BY LASER IRRADIATIONS

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Multilayered nanometric thin films and their intermetallic compounds are very interesting for wear protection in mechanical applications. Five and ten (Al/Ti) bilayers, using a d.c. sputtering method, were deposited on silicon substrates to total thicknesses of 130 and 260 nm respectively. The samples were irradiated in air by a defocused Nd:YAG laser beam with different number of pulses. We have used two different duration of laser pulses, 150 ps and 6 ns, wavelength was 1064 nm, and fluence was ~ 0,5 J/cm^2 for all irradiations. Compositional and structure analysis were performed by X-ray diffraction (XRD), Auger electron spectroscopy (AES), atomic force microscopy (AFM) and transmission electron microscopy (TEM). Obtained results show that laser irradiation with 150 ps lead to intermixing of Al and Ti films, and to the formation of AlTi and $AlTi_3$ intermetallic compounds. Irradiations with nanoseconds laser pulses induced intermixing of thin films and their mixing with silicon substrate and formation of metal-silicide compounds.

P.S.A.20.

SYNTHESIS, MICROSTRUCTURE AND THE CRYSTALLINE STRUCTURE OF BARIUM TITANATE CERAMICS DOPED WITH LANTHANUM

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The results of fabrication process and characterization of $Ba_{1-x}La_xTi_{1-x/4}O_3$ (BLT) ceramics for x within the range $0.001 \leq x \leq 0.004$ (0.1-0.4mol.% La) are reported in the paper. BLT is known as adopting the ABO_3 perovskite-type structure with properties depending on the chemical composition. The samples have been synthesized from powders of La_2O_3, TiO_2 and $BaCO_3$ (all 99.9+% purity, Aldrich Chemical Co.). Powders were thoroughly milled and the pellets of d=10mm in diameter were formed (p=300MPa). The synthesis was performed at T=950°C for t=2h. The final step was a pressureless sintering (free sintering method) at T=1350°C for t=2h.
The characterization of the ceramic powders was carried out using a simultaneous thermal analysis (STA), with a combined DTA/TG/DTG system (Q-1500D-type Paulik-Paulik-Erdey system).

Microstructure was investigated by scanning electron microscopy (SEM), crystalline structure was studied by X-ray diffraction method (XRD). The EDS investigations showed that samples exhibited conservation of stoichiometry according to the chemical composition formula. The microstructures are different what leads to differences in electric properties of ceramics under investigation.

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P.S.A.21.

ELECTRICAL AND THERMOMAGNETIC PROPERTIES OF NiFeWCu AMORPHOUS POWDER

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In this study, the temperature changes of magnetization and electrical resistivity of NiFeWCu amorphous powder have been investigated. The NiFeWCu alloy powder was electrodeposited on a titanium cathode from an ammonium citrate bath. Thermomagnetic measurements of magnetization were performed using a Faraday balance in the temperature range from room temperature to 750 ^oC.

In the temperature range from 170 ^oC to 420 ^oC it is observed decrease of resistivity and increase of magnetization. After the annealing up to 420 ^oC magnetization increase about 16 % but electrical resistivity decreases about 43 % as a result of structural relaxation of powder. In the temperature range from 420 ^oC to 600 ^oC it is observed both decrease of resistivity and permeability. Upon the heating to 750 ^oC the annealed powder has about 43 % lower magnetic permeability and 60 % lower electrical resistivity. These changes are resulted by processes of crystallization and crystal grain growth.

P.S.A.22.

MAGNETIC PROPERTIES OF BULK NANOSTRUCTURED $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$ ALLOYS PRODUCED BY DYNAMIC COMPACTION AND PLASMA SPRAY DEPOSITION

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The industrial applications of nanostructured materials rely on their successful consolidation into bulk body without deteriorating the nanoscale microstructure. The interest in amorphous and nanocrystalline alloys $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$ is due to technical characteristics of this material (zero magnetostriction, high initial and maximum magnetic permeability, etc.). In present work the bulk nanostructured $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$ alloys were prepared by two methods. The first method is dynamic compaction of the powders after milling (samples size is 7×12×1.5mm), the second one is plasma spray deposition (thickness of coating is 1 mm). The investigations of structure and magnetic properties of bulk samples prepared by both methods were carried out by X-ray diffraction, electron microscopy and correlation magnetometry.

P.S.A.23.

STRUCTURE AND MAGNETIC PROPERTIES OF ELECTRODEPOSITED COMPOSITE $Ni_{79,1}Co_{18,6}Cu_{2,3}$ ALLOY

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Nanostructured powder of composite $Ni_{79,1}Co_{18,6}Cu_{2,3}$ alloy was electrodeposited from an ammonia solution of nickel, cobalt and copper sulphates at a current density of 100 $mAcm^{-2}$. The alloy contains an amorphous phase with embedded FCC-structured nanocrystals of the solid solution of cobalt and copper in nickel. Nanocrystals exhibit a high mean microstrain level and a high density of chaotically distributed dislocations. The size of the powder ranges from 5 μm to 200 μm, with the largest particles being cauliflower-shaped and smaller ones dendritic. Dendrites give rise to a large number of secondary branches and higher-order branches. During successive heating of the alloy to different temperatures under a magnetic field of 13 kAm^{-1}, the effect of heating on magnetic permeability was observed. Heating the alloy up to 300^0C resulted in an increase in magnetic permeability due to structural relaxation occurring within this temperature range. Upon annealing at temperatures above 600^0C, the powder cooled to room temperature was found to have a considerably lower magnetic permeability. The decrease in permeability was induced by amorphous phase crystallization and FCC-phase crystal grain growth. The crystallization of the alloy caused an abrupt drop in electrical resistivity within the 600 to 680^0C temperature range.

P.S.A.24.

MICROSTRUCTURE AND MAGNETIC PROPERTIES OF A NOVEL COMPOSITE POWDER

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Nanostructured powders containing 60-85wt.% nickel, 23-35wt.% iron, up to 3wt.% tungsten and up to 3wt.% copper were electrodeposited from an ammonia citrate bath at a current density of 50 $mAcm^{-2}$ to 600 $mAcm^{-2}$. The codeposition of copper and the other three metals led to powder formation within the wide current density range with a relatively high current efficiency achieved. The composite alloy contains an amorphous phase and FCC-structured nanocrystals exhibiting a high mean microstrain level and a high density of chaotically distributed dislocations. The effect of heating on magnetic permeability was observed during successive heating of the powders under an external magnetic field of 13 kAm^{-1} to different temperatures: up to 280^0C, 520^0C, 400^0C, 460^0C, 520^0C, 700^0C and 700^0C during the first, second, third, fourth, fifth, sixth and seventh heating runs, respectively. At room temperature, magnetic permeability was found to be highest in the powder previously annealed at 400^0C. The increase in permeability relative to the as-prepared powder was 16.2%. The increase was due to structural relaxation occurring within the temperature range of 160^0C to 400^0C. Heating the alloy at temperatures above 450^0C caused a decrease in magnetic permeability due to amorphous phase crystallization and FCC-phase crystal grain growth. Additional heating of the powder at 460^0C resulted in the formation of a powder containing 2% lower magnetic permeability as compared to that annealed at 400^0C, whereas annealing at 700^0C induced a 36.3% decline in permeability due to crystallization. The changes in specific electrical resistivity during heating of the composite alloy show that structural relaxation and crystallization take place within the temperature range of 160^0C to 380^0C, and 460^0C to 520^0C, respectively.

P.S.A.25.

EFFECT OF MECHANICAL ACTIVATION ON MAGNETIC AND ELECTRICAL PROPERTIES OF ELECTRODEPOSITED Ni-28Fe-4W POWDER

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Nanostructured Ni-28Fe-4W powder was electrodeposited from an ammonia citrate bath. The powder contains an amorphous matrix with embedded nanocrystals (average size 8.8 nm) of the solid solution of iron and tungsten in nickel. The effect of milling in a planetary mill on the microstructural, electrical and magnetic properties of the powder was investigated. Multiple cycles of heating and cooling of both the as-prepared and milled powders were used to evaluate the effect of heating on their microstructure and the ensuing effect of changing microstructure on their electrical and magnetic properties. A maximum increase in magnetization was obtained in powders milled for 12 hours. Annealing the as-prepared and milled powders at 420^0C caused complete structural relaxation and maximum increase in magnetic permeability. The powder milled for 12 hours and subsequently annealed at 420^0C shows the highest increase in magnetic permeability of 176.6%. Annealing at 600^0C in all powders leads to crystallization, resulting in a decline in magnetic permeability. The highest decline in magnetic permeability of 47.36% was observed in the powder previously milled for 12 hours and annealed at 420^0C. A correlation was observed between microstructural, electrical and magnetic properties of the Ni-28Fe-4W alloy.

P.S.A.26.

INFLUENCE OF THERMAL EFFECTS ON STRUCTURAL CHANGES IN NANOCRYSTALLINE AlSi10Mg ALLOY

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This paper presents the analysis of thermal dependence of electrical resistivity of rapidly quenched AlSi10Mg alloy under isothermal and non-isothermal conditions. The study revealed that the temperature coefficient of resistivity, depending on temperature interval, can have positive, zero or negative values.

The method of isothermal measuring of electrical resistivity at 473 K, 498 K and 528 K showed that the process of stabilization occurs in two levels, with determined kinetic parameters. Rapid decrease in resistivity at these temperatures confirmed the existence of structural disorder in the alloy obtained by rapid cooling (cooling rate of about 10^5 K/s).

Relative changes in the electron density of the cooled sample after multiple heating processes were determined by the method of measuring thermoelectromotive force of a thermocouple obtained by mechanical connection of the analyzed alloy and a copper conductor. The same sample was heated up to 200, 300, 350, 400, 450 ^{o}C. Changes in temperature coefficient of thermoelectromotive force showed that the density of free electrons in the alloy increased after every heating process. The analysis revealed that the decrease in electrical resistivity is induced by the increase in mean free path of electrons and the increase in the density of free electrons during the thermal stabilization of the structure.

P.S.A.27.

INFLUENCE OF STRUCTURAL STATE OF A DOPING ALLOY ON THE PROPERTIES OF HEAT-RESISTANT ALUMINUM CAST IRON

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The high-temperature strength of aluminum cast irons depends on metallic matrix and characteristics of graphite particles (morphology, shape and size). In the present research one can propose to investigate of so-called the phenomenon of structural heredity, i.e. transfer of structural features of doping alloy (in the given case it was ferroalloy on the base of Fe-Al system) through a liquid state for ingot or cast iron forming. The comparative analysis of influence for two different types of additives (technical aluminum and Fe-(25-33)%Al alloy) on the properties of aluminum cast irons was performed at variation of cooling rate of ferroalloy. In the paper the mechanisms controlling the heat-resistant properties of cast irons are discussed. Finally, it was established that the optimal properties of heat-resistant aluminum cast irons can be obtained after use of fast-cooling doping alloy.

P.S.A.28.

EFFECT OF ALLOYING ELEMENTS ON THE DISSOLUTION OF $CuAl_2$ PHASE IN Al-Cu-Si ALLOYS

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The hypoeutectic aluminum alloy Al-3.5%Cu-6%Si was used in the present study to investigate the effect of diverse alloying elements on the dissolution of the copper phase ($CuAl_2$) during solution heat treatment. Elements such as Sr and P were added to the base alloy individually and in various combinations. The cooling curves of these alloys were obtained by solidifying the alloy melts in a preheated graphite mold (600°C, cooling rate ~0.6°C/s). From these the first derivate curves were plotted and used to determine the effect of the additives on the precipitation temperature of the Al-$CuAl_2$ eutectic reaction. Microstructural examination was carried out using optical microscopy, image analysis and electron probe microanalysis, with energy dispersive X-ray (EDX) analysis facilities. Samples from different alloys were solution heat treated at 505°C for various times up to 100 hours. The results explicitly reveal that solution heat treatment plays a critical role on the dissolution of the $CuAl_2$ phase. It is found that Sr leads to segregation of the $CuAl_2$ phase away from the Al-Si eutectic regions, which slows down its dissolution during solution heat treatment. However, phosphorus addition has a negative effect on $CuAl_2$ dissolution due to its solubility in the $CuAl_2$ phase particles, and the formation of oxide particles which act as nucleation sites for the precipitation of the block-like $CuAl_2$ phase. It retards the complete dissolution of this copper phase even after 100 hr solution treatment.

Keywords: Al-Cu-Si alloy, segregation, dissolution.

P.S.A.29.

THE APPLICATIONS OF CONTROL WITH NDT TECHNIQUES IN PASHALIMAN SHIPYARD

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To highlight and assess defects (micro cracks, pores, cavities, etc) on surfaces and depth of steel welded structures used in shipbuilding, without destroying the structure and component. A detailed inspection of the damages in welded connections through without destruction techniques NDT, like the use of ultrasound rays give us the opportunity to see and check the surfaces of pipes welded under pressure, tiles combined with each other by welding, component consumption in thickness, within the component control for the presence or not of internal of flow of micro cracks.

P.S.A.30.

PROBLEMS IN THE THEORY OF ELECTROCAPILLARITY FOR SOLID-LIQUID INTERFACE

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Electrochemical processing methods use electrocapillary effects. However, today the main problem in electrocapillarity of solid electrodes is the lack of clarity in determining the surface stress and formulating basic equations. Within the framework of the Gibbs concept of geometrical dividing surface, the 'surface stress' cannot be defined because methods of continuum mechanics can be applied to a physical surface layer (of finite thickness), but not to a mathematical surface positioned to a certain extent arbitrarily. Gibbs never used the concept of 'surface stress' introducing 'surface tension' for a liquid electrode and "closely related quantity" for a solid electrode. A critical review suggested in this presentation shows that the attempts to create a thermodynamic definition of the surface stress and theoretical background for electrocapillarity of solid electrodes need corrections because they are based on a formulation of the fundamental thermodynamic equations and Maxwell relations with common mathematical defects. To overcome these difficulties, we recommend a greater involvement of Guggenheim' concepts of a surface layer and electrochemical potential into the thermodynamics of electrocapillarity.

P.S.A.31.

TRANSPORT COEFFICIENTS IN MIXTURES Ar/H_2

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In this work we present electron transport coefficients for electrons in Ar/H_2 mixtures for the conditions used in plasma assisted technologies for semiconductor production i.e. in moderate to very high *E/N*. We used a Two term numerical solution of Boltzman equation at the lowest *E/N* and mean energies and also Monte Carlo simulation technique at moderate and high *E/N*. We show that a good agreement with experimental data exists for low and moderate *E/N* and that based on the tests for pure H_2 and Ar we can model properly the high *E/N* development. Results were obtained for abundances of H_2 from 1% to 30%. Such data are required to test the sets of cross section data which are necessary in kinetic models for this mixture and also to produce transport coefficients for fluid models. Hydrogen is used for etching of organic compounds, most importantly low k dielectrics, at the same time argon as a buffer gas is added to control the mean energy and distribution function. At the same time operation at high *E/N* allows generation of fast neutrals for charging free etching on nanometer scales.

P.S.A.32.

QUANTIFICATION OF POLY(VINYLPYRROLIDONE) BY "ON-LINE" PYROLYSIS COUPLED TO GAS CHROMATOGRAPHY

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"On-line" pyrolysis coupled to gas chromatography (Py-GC) was performed in this work for quantitative determination of poly(vinylpyrrolidone) (PVP) in wastewater sample. Py-GC is an instrumental method that enables an effective and reproducible identification and determination of non-volatile samples like synthetic polymers, which can be detected in the natural environment as a result of pollution. PVP is a widely used water soluble polymer whose occurrence in wastewaters is likely. The PVP is presumed to be detected in the polluted water samples as a result of its very frequent usage and suggested environmental stability. Pyrolysis of commercial PVP, spiked water samples and wastewater sample was performed in on-line conditions (5 s at 750 °C) in order to cause rapid polymer fragmentation into volatile products – compounds capable of being analyzed using GC. Gas chromatography-mass spectrometry (GC-MS) showed that the main product of pyrolysis of PVP, at high temperatures, is *N*-vinylpyrrolidone (NVP). Different amounts of commercial PVP were pyrolyzed in order to establish correlation between the amount of generated NVP (its GC peak area) and the initial mass of pyrolyzed PVP. GC-FID analysis was used for construction of calibration curve and for quantitative determination of PVP. Very good linear correlation was obtained between the area of NVP peak, generated during pyrolysis, and the initial mass of PVP (r^2=0.998). Further, solutions of known concentration of PVP were prepared in distilled water ("spiked samples"). Spiked samples were preextracted with diethyl ether and *n*-hexane, and after that, the water-layer was evaporated and dissolved again in methanol. Analysis of pyrolysates of preextracted spiked samples showed that the "recovery" of PVP was above 96 mas.%. This finding suggested that pre-extraction could be applied to reduce the concentration of organic substances that could also be pyrolyzed, and thus hinder identification and quantitative determination of PVP, without significant loss of polymer. The sample of an industrial wastewater from Pančevo was investigated in the last part of this work. The sample was preextracted in the same way as the spiked samples and than pyrolyzed. NVP was identified by GC-MS in obtained pyrolysate, which was the evidence that PVP was present in the wastewater sample. NVP was quantified on the basis of the peak area in GC-FID chromatogram, and than the concentration of PVP in wastewater sample was calculated based on calibration curve. Concentration of PVP in industrial wastewater amounted 2.5 mg/L.

P.S.A.33.

INFLUENCE OF ELECTRODE MATERIAL ON GAS FILLED SURGE ARRESTERS PREBREAKDOWN CURRENT IN γ AND X RADIATION FIELD

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The aim of this paper is to find the possibility for improvement of the gas filled surge arresters (GFSA) model characteristics in gamma and X radiation field by appropriate choice of construction parameters. Examination of the influence of electrode material to pre-breakdown current of GFSA model in d.c. regime was performed, and the results were presented in this paper. The obtained results show that the optimal solution for GFSA model was with brass electrodes.

P.S.A.34.

INCREASE OF COLD-RESISTANCE OF STEEL BY TITANIUM MODIFICATION

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The properties increase of constructive cold-resistant steels is presenting a basic and applied interest. The impact strength is a critical parameter defining the properties of such steels at low temperature. There are various ways to increase the impact strength including an optimization of melting technology, decreasing of the general content of non-metallic phases and others. In the lesser extent an influence of titanium modification on above mentioned property was investigated. In the given research one can proposed to increase the level of impact strength by titanium additive in the range of 0, 008 up to 0, 01%. It was shown that at titanium addition in the widely used steel ((0.15-0.25)%C, (0.2-0.4)%Si, (1.2-1.6)%Mn, 0.04% S and P) a ferrite grain size is markedly decreased. It leads to growth of impact strength at -60°C up to 70% in average as compared to non-doping steel.

P.S.A.35.

INFLUENCE MONTMORILLONITE NANOCOMPOSITES ON DEFORMATION PROPERTIES OF POLYSTYRENE KRASTEN 171

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The paper is focused on experimental investigation of the effect of montmorillonite nanocomposites on deformation properties of polystyrene KRASTEN 171. In some cases, combination of a low amount of clay with dispersed polymeric phase may cause synergistic effects leading to very fair balance of mechanical behaviour. This seems to be a consequence of complex influencing the multiphase system by clay such as modification of components (reinforcement) and parameters of the interface is accompanied by influencing the dynamic phase behaviour, i.e., the compactibilizing effect. KRASTEN 171 is general purpose polystyrene with excellent optical quality, gloss, very good heat resistance, heat deflection temperature and other mechanical properties. The paper analyses the effect of nanocomposites and type of the material on the individual measured parameters, relations between them, strength and deformation behaviour. Deformation was evaluated by non contact – videoextensometry method.

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P.S.A.36.

INFLUENCE OF NANO-STRUCTURED FILLERS ON PHASE RELATIONS IN ELASTOMER BLENDS

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It is well recognized that phase heterogeneity almost always prevails in elastomer blends. Elastomer blends are used today in a wide variety of rubber products and represent important class of materials for both, industrial and special applications. Thus attention is focused on number of issues of the particular phase contribution to the material properties as subdivision of separate polymers, the relations of so generated phases and their contribution to the total response of the material.

Addition of active fillers can dramatically change mechanical properties of elastomer materials. For example a pure gum vulcanizates of some general-purpose synthetic rubbers have as low tensile strength as in the order of 2 MPa, but mixing with different amount and different types of active fillers, this value rises more than ten times. Obviously addition of fillers to polymer blends can significantly change properties of particular phases and their contribution to total properties of the blend. But, despite great sophistication in compound development, very little is known about the properties of the individual phases, once the elastomer have been mixed and vulcanized. In parallel with different distribution of fillers between the phases, additional factors as cure compatibility, curative migration and interactions with fillers have the influence.

In this contribution we analyze experimentally and theoretically the influence of active carbon black fillers on blends of natural rubber with different synthetic rubbers. The influence of structure of carbon black particles at nano level is investigated in parallel with macro mechanical testing of the material to obtain Mooney- Rivlin curves and development of mathematical interpolation procedure to separate contribution of phases.

P.S.A.37.

PROPERTIES OF THE BITUMEN AFTER WINTER STORAGE

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The bitumen samples of winter storage, normally treated and overheated were investigated using methods of thermal analysis, chemical group analysis, IR-spectrometry, viscosimetry, dielectric constant and dielectric loss measurements. Samples with asphaltene imitators and mineral add were studied too. Thermal analysis allows calculation of energetic barriers. As it was shown in IR and viscosimetry, appreciable changing of bitumen composition and structure took place. From dielectrometry experiment it was found, there are inner ordering in samples and existence of two types of relaxation particles. From relaxation time the height of potential barrier was found for each sample.

P.S.A.38.

KINETIC INVESTIGATIONS OF DECONVOLUTEDPROCESSES OF THERMAL DEGRADATION OFCo(II), Cd(II) AND Zn(II) COMPLEXES WITH *N*-BENZYLOXYCARBONYLGLYCINATO LIGAND

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The aim of our investigation was deconvolusion of multi step thermal degradation of Co(II), Cd(II) and Zn(II) complexes with *N*-benzyloxycarbonylglycinato (*N*-Boc-gly) ligand. It was shown that thermal degradation of complexes of general formula $[M(N\text{-Boc-gly})_2(H_2O)n]\cdot mH_2O$,where M is transition metal Co, Cd, Zn and n = 6, 2, 0; m = 2, 0, 0, respectivelyoccurs in three (in the case of Co(II) and Cd(II)) or four (in the case of Zn(II))well separated steps.All three complexes follow the same mechanism of thermal degradation which implies dehydration followed by three steps of ligand fragmentation. Changes of the apparent activation energies with conversion degree indicated that all degradation processes, except Cd(II) complex dehydration, are multi-step. Complex degradation processes of dehydration and first steps of ligand fragmentation were deconvoluted to single-step processes. In order to obtain reaction models of eachstepsMalek's and Šesták-Berrgren's methods were applied. Reaction models were confirmed by using Master plot method. Malek's, Šesták-Berrgren's, as well as Master plot method indicated that reaction models for all single-steps are Šesták-Berrgren's model, $\alpha^M(1-\alpha)^N$, with different *M* and *N* kinetic parameters.

P.S.A.39.

INDENTATION AND SCRATCH TESTING AT NANOSCALE OF NEAT AND GRAFTED POLYETHYLENE NANOCOMPOSITES AS A FUNCTION OF CRYSTALLINITY

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The use of supercritical coating methods for functionalization of nano-SiO_2 particles and preparation of silica/polyethylene nanocomposites via melt compounding method has demonstrated the advantages of nanosilica dispersion in nanocomposites: thermal stability, crystallinity and mechanical properties. The mechanical and tribological performances of neat and grafted polyethylene nanocomposites are studied with nanoscale indentation and scratch tests using Hysitron TriboIndenter. Nanoindentation tests also showed an increase in hardness and reduced modulus with an increase in sample crystallinity. A higher degree of crystallinity in the grafted polyethylene resulted in lower friction coefficient and an increase in scratch resistance at the nanoscale, indicating the significant effect of covalent bonding between polymer matrix and modified silica nanoparticles.

P.S.A.40.

THE CORRELATION BETWEEN THE MECHANICAL STRAIN DEGREE AND ELECTRON STATE DENSITY CHANGE AT FERMI LEVEL IN Č-4580 STEEL WIRES SAMPLES

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The structural relaxation process of mechanical strain was experimentally investigated in Č-4580 steel wires samples. Steel wires samples (Φ = 2,8 mm) have undergone plastic deformation under the strain degrees: 330 MPa, 350 MPa, 400 MPa, 450 MPa, 500 MPa, 550 MPa and 600 MPa. The correlation has been determined between the thermopower of thermoelectromotive force (TEMF) and strain degree by means of measuring TEMF of the thermocouple which was obtained by mechanical coupling of the deformed sample and copper wire. It has been shown that thermopower of TEMF decreases upon each subsequent annealing. The relative changes of electron state density caused by structural relaxation process were determined by thermopower slopes during each annealing. The kinetics and mechanism of the structural relaxation process were defined by thermopower measurements at the temperatures of 300^0C, 350^0C, 400^0C and 450^0C in isothermal conditions and their analysis thereof. It has been shown that the structural relaxation process of deformed structure occurs in two stages during isothermal annealings.

P.S.A.41.

DESIGN OF CHARACTERISTIC BRAIN SIGNALS IN MATLAB

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By using characteristic EEG signals simulation, selection of parameters which are influenced to the isolated neurodynamical model are obtained. Designed model of generator simulates EEG signals of small neural area in the form of signal's shape in all typical real frequent domains. The source program code of discrete model of the brain neural function produces shapes of the signals which are similar of the real EEG signals. During the computer simulation optimal sampling period of continual model is calculated in process creation of discrete model which is prepared for digital simulation of the part of brain function in one neural area. The shapes of quick and slow simulated signals are generated with selection of differential values of neurophysiologic parameters. In this paper, the influence and mathematical modeling possibility of the time delay which appears during the real transmission of the neural impulse across the brain structure is considered. The modeling of the part of brain functions is realized with application of corresponding mathematical tools. The digital neurodynamical model is realized in Matlab 7.1 program code.

P.S.A.42.

ADVANTAGES AND APPLICATIONS OF USING ATOMIC FORCE MICROSCOPY

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Since its creation, the atomic force microscope (AFM) has been used to study a wide variety of materials, including those in the nanoscale. It is an invaluable technique capable of providing atomic scale resolution of surfaces, as well as depth resolution. AFM is not limited to conducting and semiconducting samples like its close counterpart: scanning tunneling microscopy (STM). This versatility has allowed AFM to be used on just about any kind of substrate, including biological samples. The AFM is relatively simple to set up, and provided the right conditions and environment, can resolve individual atoms. To understand how the AFM turns measured forces into a topographical map, it is essential to look at the atomic interactions that take place. It is important to mention that AFM is not only useful for "reading" a sample, but it can also be used to "write" on the sample. AFM is an excellent characterization tool for studying surface topography.

Key word: atomic force microscopy, microscopy, nanoscale.

P.SA.43.

INFLUENCE OF STRETCHING ON DIELECTRIC, ELECTROMECHANICAL AND ELECTROCALORIC RESPONSE OF P(VDF-TrFE-CFE) TERPOLYMER

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Electrically-induced behavior was compared in the non-stretched and uniaxially stretched poly(vinylidene fluoride-trifluoroethylene-chlorofluoroethylene) terpolymer - a member of the relaxor polymer family that exhibits fast response speeds, giant electrostriction, high electric energy density and large electrocaloric effect. Although the temperature dependence of the low-field dielectric constant is almost identical, dc bias electric field via higher nonlinear contribution more heavily alters dielectric response of the less-oriented non-stretched samples. We will present and explain substantial differences in the polarization, electrocaloric response and induced electrostrictive strain of the non-stretched and stretched terpolymer, which suggest that electrically-induced properties of relaxor polymer films can be tailored by controlling the preparation conditions.

P.S.B.1.

TEMPERATURE DEPENDENCE OF GRAPHENE ELECTRICAL CONDUCTIVITY

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The exceptional transport characteristics, coupled with high thermal, mechanical and chemical stability, provide wide opportunities of practical application of graphene. Temperature dependence of graphene electrical conductivity is hereby analyzed in the wide temperature range of 15–400 K, by solving Boltzmann equation in the approximation of relaxation time. Basic relaxation mechanisms in graphene – electron scattering on impurities and electron-phonon interaction – will be accounted with corresponding relaxation times introduced phenomenologically. The theoretical results will be compared with the experimentally observed.

P.S.B.2.

IMPACT OF SHAPE OF EXTENDED OBJECTS ON JAMMING AND PERCOLATION ON A LATTICE

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Percolation concerns the formation of long–range connectivity in disordered systems and has applications in many physical, chemical and even sociological systems. Numerous practical problems include conductivity in composite materials, flow through porous media, polymerization, behavior of the scale–free random networks such as the Internet, etc. For most real percolating systems, some important physical properties depend on the detailed geometry of the substrate and on the shape and size of the adsorbed particles. Percolation aspect of random sequential adsorption (RSA) of extended objects on a triangular lattice is studied by means of Monte Carlo simulations. The depositing objects are formed by selfavoiding lattice steps on the lattice. Jamming coverage θ_{jam}, percolation threshold θ_p^* and their ratio $\theta_p^* / \theta_{jam}$ are determined for objects of various shapes and sizes. We find that the percolation threshold θ_p^* may decrease or increase with the object size, depending on the local geometry of the objects. We demonstrate that for various objects of the same length the threshold θ_p^* of more compact and rounded shapes exceeds the θ_p^* of elongated ones. In addition, we study the polydisperse mixtures in which the size of line segments making the mixture gradually increases with the number of components. It is found that the percolation threshold decreases, while the jamming coverage increases with the number of components in the mixture.

P.S.B.3.

SINTERING OF OXIDE POWDER SYSTEMS PRODUCED BY CHEMICAL PRECIPITATION AND PLASMA SPRAY SYNTHESIS

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In this work the sintering of ZrO_2 powders was investigated. Powders were synthesized by chemical precipitation and plasma spray synthesis methods. Chemically precipitated ZrO_2 consisted of dense polycrystalline aggregates with an average size 12 μm. Dioxide of zirconium powder produced by plasma spray synthesis consisted of spherical particles, particles with irregular shape and their agglomerates. During the sintering of green bodies intensive shrinkage occurred regardless of the powder synthesis method. The rate of shrinkage was calculated from the kinetics equation of isothermal shrinkage. It was revealed that the lowest rate of shrinkage was observed for ceramic fabricated from chemically precipitated powder.

P.S.B.4.

SINTERING EFFECTS ON MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF CCTO CERAMICS

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A perovskite-type compound, calcium copper titanate ($CaCu_3Ti_4O_{12}$, CCTO) attracted ever-increasing attention for its practical applications in microelectronics, especially for preparation of capacitors and memory devices. CCTO ceramics are very attractive because of their giant dielectric constant (~10^4–10^5) in the kilohertz region at room temperature, and their good stability over a wide temperature range from 100 to 600 K.

Here, CCTO powder was prepared by solid state reaction between $CaCO_3$, CuO and TiO_2 at 1000 ^oC for 12 hours. Synthesized powder was characterized by XRD, FT–IR and FE–SEM techniques. The sinterability of CCTO powders was investigated by heating microscopy. Powder was uni-axially pressed into pallets (Ø 6 mm) and sintered up to 1100 ^oC, with 2, 5, 10 and 20 ^{o}/min. The recorded shrinkage curves were used for calculation of activation energy for sintering process, and furthermore, for choosing two step sintering (TSS) conditions. By TSS the samples were heated up to 1050 (1070) ^oC and after retention for 10 min the cooled down to 1000 (1020) ^oC and kept for 20 h. The microstructure of CCTO ceramics sintered by conventional and TSS techniques was examined by FE–SEM method; the electrical properties were investigated by *ac* impedance spectroscopy over the ranges 1000 - 25 ^oC and 40 Hz - 5 MHz. Electrical properties of the sintered CCTO ceramics were correlated to the samples microstructure. Finally, we have shown that appropriate choice of sintering conditions is important for preparation of high-quality CCTO ceramics with giant dielectric permittivity.

P.S.B.5.

SYNERGISTIC EFFECT OF HYDROXYAPATITE NANOPOWDERS' HIGH CRYSTALLINITY AND NON-ORDERED PARTICLES' BOUNDARY REGIONS ON LOW-TEMPERATURE SINTERING

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One of the goals in the field of biomaterials for bone and dental tissue reconstruction is preparation of highly sinterable hydroxyapatite nanopowder; low-temperature sintering behavior could provide microstructural refinement yielding to dense nanostructured ceramics as well as preservation of surface functional groups important for bioactivity. Today, there is plenty of hydroxyapatite nanopowders prepared by different methods but with very distinct sintering behavior. Generally, powder properties like average particle size and size distribution, morphology, crystallinity and specific surface area are important.

However, since sintering process could be governed by different mechanisms, particles' interior and boundary regions microstructure can play a significant role.

This study is about sintering behavior of hydroxyapatite nanopowders with different crystallinity and microstructure of nanoparticles' boundary regions. Three hydroxyapatite nanopowders were synthesized and their detailed analyses (XRD, FTIR, SSA, FESEM, TEM) were performed. TEM results imply three types of systems: type I - low crystallinity/non-ordered boundaries, type II – middle crystallinity/ordered boundaries and type III - high crystallinity/non-ordered boundaries. Sintering curves showed that type III exhibits the lowest sintering temperature, around 900 °C. The obtained results stressed the importance of the synergistic effects of particles' microstructural characteristics and properties of nanopowder, directing towards the most valuable consumption of supplied energy during sintering process.

P.S.B.6.

SYNTHESIS AND CHARACTERIZATION OF $LiFePO_4$/C COMPOSITE OBTAINED BY CELLULOSE TEMPLATE

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In the on-going search for alternative cathode materials for Li-ion batteries olivine-type lithium iron phosphate ($LiFePO_4$) is one of the most promising candidates due to its high energy density (with theoretical capacity of 170 mAh/g and plateau voltage of 3.5 V vs. Li^+/Li), high safety, both electrochemical and thermal stability, environmental friendliness and low raw materials cost. Here is presented the synthesis of nanocrystalline $LiFePO_4$/C composite powder through templating method. A quantitative filter paper serves as both template and carbon source that on rapid heating degrades pyrolytically through fragmentation reactions and formation of volatiles that further impact powder morphology. By taking extreme measures of rapid heating, short high-temperature delay, and subsequent quenching well-ordered 40 nm crystallites are obtained within 5 minutes. Preliminary electrochemical measurements in terms of galvanostatic cycling convince that adopted approach of rapid crystallization is suitable for achieving almost theoretical capacity. The results of Rietveld crystal structure refinement, scanning electron microscopy, and galvanostatic charge/discharge tests are presented in detail.

P.S.B.7.

SYNTHESIS AND CHARACTERIZATION OF Li_2FeSiO_4/C COMPOSITE

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Polyoxyanion compounds, particularly the olivine phosphate $LiFePO_4$, are receiving considerable attention as cathodes for rechargeable lithium batteries. Despite its numerous advantages, olivine phosphate severely suffers from poor rate performance due to its inherent conducting properties and limited capacity. More recently, an entirely new class of polyoxyanion cathodes based on the orthosilicates (Li_2MSiO_4, M = Fe, Mn, and Co), has been attracting growing interest. Li_2MSiO_4 has two lithium ions per formula unit, suggesting a higher theoretical capacity than phosphate. Lithium iron orthosilicate, Li_2FeSiO_4, is very important member of orthosilicates family due to its electrochemical stability, cell safety, eco-friendliness, and cost effectiveness. It is proposed as another promising alternative cathode material for the same lattice stabilization effect as in $LiFePO_4$ through the presence of strong Si–O bond. The lower electronegativity of Si vs. P would result in a lowering of the $Fe^{2+}\leftrightarrow Fe^{3+}$ couple and therefore Li_2FeSiO_4 often possesses a lower electronic band gap and higher electronic conductivity in comparison with $LiFePO_4$. Although Li_2FeSiO_4 is known for several years, it is still a challenge obtaining a phase pure material with desired particle size and good electrochemical characteristics. Here we report citric acid assisted sol-gel method for Li_2FeSiO_4/C composite synthesis. Starting compounds were $LiNO_3$, $Fe(NO_3)_3$ and $Si(OC_2H_5)_4$ (tetraethyl orthosilicate, abbrev. TEOS). Citric acid was used as a chelating agent. Sol-gel preparation of Li_2FeSiO_4/C powder was conducted via two routes: (i) one starting from water solutions of above mentioned compounds and (ii) other starting from ethanol solutions of the same compounds. Synthesis in alcohol solution proved to be much faster due to fast hydrolysis of TEOS in presence of alcohol and rapid gel formation. Final product obtained from alcohol solution contains a higher percentage of carbon.

P.S.B.8.

SYNTHESIS OF ZIRCONIUM TUNGSTATE BY COPRECIPTATION ROUTE

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The structure and properties of zirconium tungstate powders synthesized by co-precipitation method was studied. Zirconium tungstate ZrW_2O_8 has a negative coefficient of thermal expansion, $\alpha = -9.6*10^{-6}$ C^{-1}, over a wide temperature range up to 770 ^oC. It was established that the powder annealed at 500 and 1100 ^oC consists of irregular shape agglomerates and a higher temperature annealing leads to appearances a needle-shaped particles. The length of these particles is increased and its thickness varies slightly with increasing temperature. X-ray analysis had shown that the beginning of the zirconium tungstate formation was at temperatures more than 1100 ^oC. The lattice parameter ZrW_2O_8 was equal to a = 9.1482 Å with a good agree with literature data. It was shown that the synthesized material has a negative thermal expansion in the temperature range from 580 to 620 ^oC and it was equal to $-12.1 * 10^{-6}$ C^{-1}.

P.S.B.9.

CATHODIC REDUCTION OF NITRO-1,4-DIHYDRO-4-OXOQUINOLINES STUDIED BY EPR AND UV-VIS-NIR SPECTROELECTROCHEMISTRY

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4-Oxoquinolines (quinolones) themselves are well known biologically active chemicals and are used as broad-spectrum antibiotics and chemotherapeutics and their reaction routes are subjects of an intensive interest. To initiate their reductive conversions, cathodic reduction was used. Cathodic reduction of nitrocompounds represents a relatively straightforward reduction process. Our aim is, by means of EPR and UV-vis-NIR spectroscopies to identify both the paramagnetic and diamagnetic intermediates formed upon 4-oxoquinolines reduction, which are frequently assumed but hardly observable by the other techniques. Acknowledgement**:** This study was financially supported by the Scientific Grant Agency (Project VEGA 1/0289/12) and the Research and Development Agency of the Slovak Republic (contract No. APVV-0339-10). Maroš Bella and Viktor Milata are gratefully acknowledged for selenadiazoloquinolones synthesis.

P.S.B.10.

ELECTRON STRUCTURE, VALENCE STATE AND MAGNETIC PROPERTIES OF THE NEW TERNARY INTERMETALLIC COMPOUNDS: EXPERIMENTAL AND THEORY

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High-energy spectroscopy has been used to study the electron structure and valence state of new ternary intermetallic compounds, which crystallize in the $CeNiSi_2$, $ThMn_{12}$, $ThCr_2Si_2$ and $HfFe_2Si_2$ types. The calculations of electron energy bands E(k) and partial DOS for compounds were performed by the semi relativistic linear muffin-tin orbital method (LMTO) without considerations of spin-orbit interactions. Effective filling numbers of electrons in different bands of components in $R.E.M_2X_2$ (R.E = Sc, Y, Ce, Yb; M= Fe, Co, Ni, Cu, Pd, Rh; X= P, Si) compounds have been calculated. The electron occupation of the d-states of the M atoms has a dominant influence on the degree of their hybridization. Between the experimental and calculated X-ray emission spectra $R.E.M_2X_2$ good agreement has been obtained. L_{III} - absorption spectra Ce and Yb in ternary $YbNi_4In$ and $Ce(Yb)M_4X_8$ compounds were obtained at 78K and 300K using a tube spectrometer equipped with an RKD-01 co-ordinate detector. The mixed valence state of Ce and Yb was obtained in the $YbNiIn_4$ and $Ce(Yb)M_4Al_8$ compounds.

P.S.B.11.

STRUCTURAL CHARACTERIZATION AND ELECTRICAL PROPERTIES OF SINTERED MAGNESIUM-TITANATE CERAMICS

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In this article the influence of ball miling process on structure of $MgO\text{-}TiO_2$ system, along with its influence on electrical properties of post-sintering samples, were investigated. Mixtures of $MgO\text{-}TiO_2$ powders were mechanically activated in a planetary ball mill for time interval from 0 to 120 minutes. On thus obtained powders, structural investigations have been performed. N_2 adsorption method was used to determine the BET specific surface area and pore size distribution. Unusual results were obtained: specific surface area continuosly decreases up to 40 minutes of activation and after that increases, reaching its minimun value of 5.5 m^2/g. The influence of mechanical activation on lattice vibration spectra was examined by Raman spectroscopy at room temperature. For sintered samples characterization, Raman scattering spectroscopy has been used. Very similar spectra for all samples were observed. Raman spectroscopy of sintered samples indicates a presence of two phases, while varieties in spectra were explained with different ratio of present phases. Effect of activation and sintering process on microstructure was investigated by scanning electron microscopy (SEM). Electrical measurements showed difference in dielectric constant (ε_r), loss tangent ($tg\delta$) and specific resistance (ρ) as a function of time of mechanical treatment.

P.S.B.12.

KINETICS OF CRYSTALLIZATION PROCESS OF BULK METALLIC GLASS FeCrMoGaPCB PREPARED BY COOPER MOLD CASTING

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

The rods of Fe-based bulk metallic glasses with the nominal composition $Fe_{65.5}Cr_4Mo_4Ga_4P_{12}C_5B_{5.5}$ were cast by melt injection into a 1.5 and 1.8 mm diameter copper molds. DTA thermogram shows wide supercooled liquid region between crystallization temperature (T_x) and glass transition temperature (T_g) in the as-cast state $\Delta T_x = T_x - T_g = 57$ K.

The thermal stability and crystallization processes were investigated by non-isothermal differential thermal analysis (DTA) and X-ray diffraction (XRD). Thermal stability was discussed in terms of the width of supercooled liquid region ΔT_x. Calculation of kinetic parameters of crystallization process was preformed by nonisothermal measurements results using Kissinger method.

P.S.B.13.

MAGNETIC AND STRUCTURAL PROPERTIES OF IRON-COBALT BASED ALLOYS

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PIM technology is very suitable for soft and hard magnetic of generally small components with highly complex geometry. Iron-cobalt based alloys exhibit high saturation magnetic induction as well as high Curie temperature. We have characterized Fe49Co49V2 alloys samples produced by PIM. The feedstock for powder injection molding was prepared by mixing starting FeCoV powder with a low viscosity binder. Green samples were subjected to solvent debinding and subsequent thermal debinding followed by sintering. Sintering was performed during 3.5 hours: from 1370 ^{O}C to 1460 ^{O}C in hydrogen atmosphere or from 1330 ^{O}C to 1400 ^{O}C in vacuum.

Structure of sintered samples was characterized using X–ray diffractometry and scanning electron microscopy. XRD analysis shows that the samples contain Co/α-Fe crystals.

Mechanical and magnetic properties were investigated as a function of sintering atmosphere and sintering temperature. Magnetic properties were measured by B-H hysteresis graph at different frequencies up to 100 Hz. Relative magnetic permeability as well as magnetic power losses was analyzed as frequency dependent. The results obtained were compared with the data for other technologies of preparing Fe-Co-V from available literature. It is shown that the PIM samples reach magnetic properties values comparable to those obtained by conventional methods.

P.S.B.14.

THE ROLE OF TECHNOLOGICAL INPUT PARAMETERS ON A QUALITY OF PLASMA SPRAYED THERMAL BARRIER COATINGS

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The thermal barrier coatings uses the approach of functional gradient coatings, where combination of ceramic and metallic coatings are applied to reduce the temperature height and also to increase oxidation and corrosion resistance of the substrate alloys on which are deposited. Thermal barrier coatings are most frequently produced from the top ceramic coating based on YSZ (ZrO2+Y2O3) and metallic bond coating based on M-CrAlY, where M means Ni, Co, Fe or their appropriate combination. Their formation is usually provided by means of electron beam physical vapour deposition (EB-PVD) or vacuum, low pressure or atmospheric plasma spraying techniques. Despite the requirements on the product shape simplicity, the air plasma spraying offers high productivity, sufficient quality and disproportionate lower production costs in comparison with the other mentioned technologies. The contribution deals with the influence

P.S.B.15.

MICROMECHANICAL INCLINOMETER FOR TRANSPORT SYSTEMS

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Development of micro-mechanical sensors and systems based on them is one of the development branches in microelectronic technology and labeled as one of the technologies of the 21-st century. In recent years, this industry is one of the fastest growing. Applications include micro computing and telecommunications, biology, medicine, chemistry, environmental monitoring, automotive, space exploration, aviation and other technologies. The relevance and significance of the paper related to the methodology creation for the development and manufacture of silicon sensors with capacitive signal pickup system. Methodology was based on an integrated approach to solving such problems as the processes of surface preparation, etching of the complex profile surfaces, matching the silicon structures, etc. which allows to create MEMS elements.

P.S.B.16.

IDENTIFICATION WIND TURBINE BLADE STRUCTURAL DAMAGES BY MAGNETIC FORCE MICROSCOPY

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In this paper investigation of broken wind turbine blade parts, which are made from fiber reinforced composites, is presented. The composite material is micro-glass fibers reinforced epoxide resin. The impellers were exposed to critical load till failure and parts from critically and sub-critically loaded regions of wind turbine blade are investigated by Magnetic Force Microscopy (MFM). Magnetic force microscopy is able to provide characterization of surface and internal structure near surface of the sample, which is used in this paper to give analysis of structural change of material with different loads. Results and comparison of microstructure of two parts of wind turbine blade are analyzed and presented.

P.S.B.17.

INFLUENCE OF SHAFT-TO-BEARING CONTACT PROPERTIES ON CUP ANEMOMETER PERFOMANCE

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According to the study of the expert group on wind recommended practice there is no other branch of meteorology, science or technology where the importance of low uncertainty in wind speed measurement is as great as in wind energy. Cup anemometer is one of the most widely used instrument in meteorology and the most advanced wind speed measuring techniques such as LIDAR and SODAR use the cup anemometer data as the reference. Since its invention 165 years ago, the models of cup anemometer were developed considering the friction torque negligible, which is questionable for long term operation description. A new model of cup anemometer operation is presented which provides the calculation of continuous shaft-to-bearing material pair friction contribution to the long term overall resistant torque.

P.S.B.18.

THE STRUCTURE OF HOT DIP GALVANIZED COATINGS OBTAINED ON THE 23MnNiCrMo52 STEEL

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The 23MnNiCrMo52 steel is used to produce coil chains for the mining industry. The chemical composition of that steel is responsible for the high strength of chains but their corrosion resistance is not sufficient. The chains are delivered as naturally black, treated with anti-corrosion oil or painted. They are not generally protected against corrosion by hot dip zinc coatings due to their specific shape and complex chemical composition of steel. In the paper the authors present the results of tests on obtaining zinc coatings on the 23MnNiCrMo52 steel. The growth kinetics of the coatings has been defined, their structure has been developed and the chemical composition of particular structural components of the coating has been established. It has been determined that the obtained coatings are continuous and uniform and their morphology depends on the chemical composition of the galvanized steel.

P.S.B.19.

THE INFLUENCE OF Si CONTENT IN STEEL ON THE GROWTH KINETICS AND STRUCTURE OF HOT DIP Zn-31Al-3Mg COATINGS

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An effective method of increasing corrosion resistance of zinc coatings is to introduce aluminium and magnesium into the bath. In the paper the author presents the results of tests on obtaining Zn-Al-Mg by use of the batch hot dip method. The growth kinetics of coatings obtained in the Zn-31Al-3Mg bath on steel with low silicon content (0.01%Si), Sandelin steel (0.035%Si) and high-silicon steel (0.027%Si) have been defined. The structure has been developed and the chemical composition of structural components of the coating has be established. It has been determined that the obtained coatings do not exhibit any discontinuity. The reaction between the bath and steel with 0.01%Si and 0.035%Si contents is very abrupt, which leads to the formation of coatings with excess thickness. Increasing the content of Si in steel to 0.27%, results in a considerable limitation in the coating thickness.

P.S.B.20.

RELAXATION PROPERTIES IN LATTICE GAS MODEL WITH EXTENDED PARTICLES

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We study the relaxation process in two-dimensional lattice gas model, where the interactions originate from the excluded volume. In this model particles are formed by self-avoiding lattice steps. The particles can both randomly translate and rotate on the planar triangular lattice. We focus on the dynamics investigated by means of the time autocorrelation function of the density fluctuations and the particle mean-square displacement. We observe a considerable slowing of diffusion (subdiffusion) on a long-time scale when suppressing the rotational motion of particles. Furthermore, percolation aspect of random deposition of extended objects on a triangular lattice is also studied by means of Monte Carlo simulations. At low densities the system completely relaxes within the simulation time. The relaxation process becomes slower as the density increased and above the percolation threshold, the system is kinetically arrested below jamming density for some objects. We analyze more quantitatively the long-time decay of self-intermediate scattering function (SISF). The SISF displaying slower than exponential relaxation suggests the existence of heterogeneous dynamics. As the density approaches the percolation threshold, SISF displays a long-time decay well fitted by a stretched exponential law. At the percolation threshold the onset of a power law decay is observed. The results suggest a novel connection linking classical gelation to recent results on colloidal systems.

P.S.B.21.

REDUCTIVE DEGRADATION OF THE NEW EXPLOSIVE MATERIAL FOX-7

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A new energetic material 2,2-dinitroethene-1,1-diamine (FOX-7) has significant potential for application due to its high performance and low sensitivity. This molecule can be presented in several different forms depending on conditions and properties of the solution. Due to the reducibility of FOX-7, its electrochemical degradation can proceed in various pathways. In aqueous solvents the reduced form is the imine tautomer protonated according to pH. The initial reduction step is then followed by a chain of intra- and intermolecular redox reactions leading to the total degradation of the starting material under formation of gaseous products. The eventual analogy with the reaction mechanism during explosion is now under study. In aprotic solvents FOX-7 is reduced only by two one-electron steps up to –2.9 V via at least two radical intermediates characterized spectroscopically. The reaction is accompanied by the colour changes. The interpretation of the mechanism is discussed.
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P.S.B.22.

CHARACTERIZATION OF SLURRY ALUMINIDE DIFFUSION COATINGS ON INCONEL 713LC

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Commercially pure aluminium powder and a mixture of aluminium and silicon powders, both in a liquid amyl acetate-based organic binder were sprayed onto the surface of Inconel 713LC nickel base superalloy. A two-stage heat treatment process in argon atmosphere flow was designed and applied to produce nickel aluminide diffusion coatings after the air spraying. Two coating systems composed from different layers with gradual changes in chemical composition and phase quantities were formed. Scanning electron microscope, scanning electron microscope/focused ion beam, both equipped with energy dispersive microanalyzers, and X-ray diffractometer techniques were utilized to characterize the structure and phases of the coatings.

P.S.B.23.

INTERNAL FRICTION AND ACTUATION IN SHAPE MEMORY ALLOYS

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The work details the results on measuring the internal friction and the observation of the correlation with the phase transformation in shape memory alloys explored using an Acoustic Elastometer. The simoultaneous exploration of the internal friction and actuation during heating and cooling of several alloy families are discussed based on the specific phase transformations that occur in each alloy. The influence of the thermomechanical history of the investigated alloys is also accounted in the interpretation of theresults. The measurement of the free end of cantilever-type samples as a function of temperature, based on capacitive measurement during the thermal cycling is taken as a base for the discussion of the effects of the phase transformations on the resulting actuation.

P.S.B.24.

LIFETIME ANALYSIS OF RHODAMINE B/PMMA FLUORESCENCE EMISSION

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In this work we study the fluorescence lifetime characteristics of Rhodamine B using polymethylmethacrylate (PMMA) as a host medium and compare it to the characteristics of Rhodamine B dissolved in ethanol and tetrahydrofuran (THF). The excitation part of our time resolved laser induced fluorescence (TR-LIF) spectroscopy system is based on Nd:YAG laser and Optical Parametric Oscillator (OPO). The pulse length of tunable OPO output (320-475 nm) could be reduced to about 1 nanosecond, so by means of a correct deconvolution procedure it is possible to measure the fluorescence lifetimes in the range of interest in this study. The published data for lifetime of Rhodamine B are up to a few nanoseconds. The fluorescence detection part of the system is based on the picosecond streak camera. We show that optical characteristics of Rhodamine B are not impaired when using PMMA as host medium.

P.S.B.25.

DISPERSION OF REFRACTIVE INDEX AND OPTICAL BANDGAP OF THE NON-CRYSTALLINE CHALCOGENIDES IN CdS-As_2S_3 SYSTEM

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In this paper we present the results concerning the dispersion of refractive index and optical bandgap of bulk samples from the amorphous CdS-As_2S_3 system. The refractive index behaviour of investigated glasses was determined by the prism method and analyzed. Measurements were performed in the wavelength range between the absorption edge and 1800 nm at room temperature, with an error of ± 0.01. To calculate and discuss the parameters of dispersion in the bandgap region two different approaches were used (Sellmeier and Wemple-DiDomenico single-oscillator model). It was found that the glasses have a relatively high index of refraction (about 2.55 at the wavelength of He-Ne laser), and exhibit normal dispersion dependence. Also, it was determined that the optical bandgap changes for about 0.1 eV with a change of CdS content in the material.

P.S.B.26.

SYNTHESIS AND STRUCTURE OF THE FIRST VANADIUM(V) COMPLEX WITH THE SCHIFF BASE OF PYRIDOXAL AND AMINOGUANIDINE

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It has been proven that the synthesis of new complexes with the Schiff base of pyridoxal and aminoguanidine (PLAG) is of a high interest not only for the examination in the field of chemistry but also for the biological investigation. In this paper we present the synthesis, physico–chemical and structural characterization of the first V(V) complex with this ligand. In this complex, PLAG is coordinated in a usual tridentate ONN mode, *via* oxygen atom of phenolic OH–group and nitrogen atoms of azomethine and imino groups of the aminoguanidine fragment. The V(V) is situated in a slightly deformed square-pyramidal environment of the chelate ligand and two *cis*–oxido ligands. In all previously characterized complex PLAG was coordinated in its zwitter-ionic form. However, here we have proven that this ligand can be coordinated in a double deprotonated form as well.

P.S.B.27.

THE REACTIVITY OF EPOXY RESIN MODIFIED WITH LOW MOLECULAR WEIGHT SILOXANE COMPOUNDS

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Amine-cured epoxies are one of the most commonly reported objects of polymer science due to wide possibilities in engineering applications such as coatings, adhesives, matrices for composites, etc. Depending on the chemical structure of curing agents, kind of modifiers, it is possible to vary the mechanical properties of the synthesized polymers. Other important parameters are curing conditions that are temperature and time of reaction. In particular, a wide range of temperatures in which one can cure epoxies enables controlling the degree of crosslinking and determine the properties of final products. The kinetics of curing, including isothermal cure of thermosetting resins and the models of this process have been the object of many scientific and technical studies for the last decades.[1-2]

In this investigation, we have characterized the curing process of epoxy compositions with and without reactive fillers: 1,3-bis(glycidyloxypropyl)-1,1,3,3-tetramethyldisiloxane and 1,3-bis(aminopropyl)tetramethyldisiloxane. The epoxy system consisting of a commercial diglycidyl ether of bisphenol A (Epidian 6) was cured with aliphatic amine: triethylenetetramine. For each composition we used stoichiometric amounts of monomers, so that the ratio of epoxy groups to amino protons was 1:1.

The isothermal curing kinetics was studied using differential scanning calorimeter (DSC) with stochastic temperature modulation TOPEM® operating under nitrogen atmosphere. The total, reversing and non-reversing heat flow, and specific heat capacity as a function of reaction time for our systems were conducted at six different temperatures (40, 50, 60, 70, 80 and 90°C). The experimental results obtained from DSC were used to determine TTT (time-temperature-transformation) diagram. We also calculated the conversion of our systems depending on temperature of reaction using data from dynamic measurements which were conducted at temperature range 0 to 250°C.

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P.S.B.28.

KINETIC-SPECTROPHOTOMETRIC METHOD FOR DETERMINATION OF INSECTICIDE DIFLUBENZURON

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A new sensitive and simple kinetic method is developed for determination of the insecticide diflubenzuron [1-(4-chlorophenyl)-3-(2,6-diflubenzoil)urea (DFB). The method is based on inhibited effect of DFB on the oxidation of sulfanilic acid by hydrogen peroxide in phosphate buffer in presence Co(II) ion as catalyst. The DFB was determined with linear calibration graph in the interval from 0,102 to 3,40 μg/cm^3 and from 3,40 to 23,80 μg/cm^3. The reaction rate was monitored spectrophotometrically by measuring the rate of change of absorbance at 370 nm. The Limit of Detection (LOD) and Quantification (LOQ) were evaluated to be 0,03 μg/cm^3 and 0,101 μg/cm^3. The RSD is 2,25-1,12 % for the concentration interval of DFB 0,102-3,40 μg/cm^3. The developed procedure was successfully applied to the rapid determination of DFB in baby juices and water samples.The HPLC method was used like an comparative method to verify results. The results obtained by two different methods showed good agreement.

P.S.B.29.

POLYCARBONATE-BASED POLYURETHANE ELASTOMERS: RELATION BETWEEN STRUCTURE AND PROPERTIES

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The paper focuses on novel polyurethane elastomers based on aliphatic polycarbonate macrodiol and aliphatic diisocyanate (PC-PU). Previously, these all-aliphatic PC-PUs were found to possess superior mechanical properties. In this paper, relation between structure of PC-PUs and their properties is investigated. The research is kindly supported by Grant Agency of the Czech Republic (Czech Science Foundation, project no. P108/10/0195).

P.S.B.30.

EPDM/CSM/RWP RUBBER BLEND COMPOSITES

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Rubber waste powder (RWP) as a filler was investigated in ethylene propylene diene terpolymer (EPDM)/chlorosulphonated polyethylene (CSM) rubber blends compounds. EPDM/CSM rubber blend compounds were prepared by the incorporation of Rubber waste powder (RWP) at different loadings into a EPDM/CSM rubber matrix with a laboratory size two roll mill. The effect of RWP loading as filler on curing characteristics, tensile properties, morphological properties using scanning electron microscopy (SEM) and rubber–filler interaction of RWP filled EPDM/CSM rubber blend compound were studied in the filler loading range of 0 to 50 phr. The results indicate that the scorch time (t_{s2}) and cure time (t_{c90}) shorten with increasing filler loading, whereas the maximum torque (Mh) showed an increasing trend. As the filler loading increases, the tensile strength and elongation at break decreases while tensile modulus; modulus at 100 % elongation and modulus at 300 % elongation increased. The rubber filler interactions of the rubber compound decreased with increasing filler loading. SEM studies indicate that the increasing RWP loading weakens the rubber-RWP interactions.

P.S.B.31.

PROBABILISTIC ASPECT OF THE RUPTURE OF FRAGILE POLYMERS: CASE OF THE PHENOLIC RESIN

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The character fragile specific to polymers containing phenolic resin induced an absence of plastic deformation and a great sensitivity to the defects what makes very delicate a determination precise and faithful their stresses the rupture [. the studies of characterization generally lean on an evaluation of the average characteristics and do not give any information on the statistical character of the values.Also a better knowledge of the statistics of the mechanical properties of fragile polymers proves to be such necessary for their application the more so as they are often prone for a purpose of size and volume.This one can be highlighted by an analysis based on a statistical approach of Weibull Ce work presents an application of the probabilistic model of Weibull at the analysis of the behavior in direct traction and inflection of a phenolic resin used in the manufacture of composite materials SMC.

Key words: polymer, phenolic, defects, statistical approach.

P.S.B.32.

DYNAMIC DESTRUCTION OF LAYERED MATERIALS

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The reactive multilayer composite systems based on materials such as titanium-aluminum are researched. Eigen frequencies of Rayleigh waves of the elements of structure are taken into account. A criterion for the unsteady regimes of shock compaction and chemical reactions initiation are considered. Destruction of the layers of model sample in the resonant mode when velocities of shock loading are close to the Rayleigh wave velocities is possible. Mechanical activation of the reacting components of model sample is determined by fragmentation of the layers of simulated structure that provides decrease of threshold of chemical transformations initiation.

P.S.B.33.

DIFFERENT NON DESTRUCTIVE METHODS TO DETECT AND EVALUATE DEFECTS IN COMPOSITE MATERIALS

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Composite materials have entered largely into use. Defects that appear in these materials may be, manufacturing defects as porosity, bonding defects, or defects during service life as delamination, cracks, bond failures. These defects are ranked in order of importance that impact on performance of the material behavior. To detect and evaluate the type and dimensions of defects in composite materials, we have used different methods such as ultrasound, X-ray and acoustic emission. Samples have been prepared with material the same as in CIFA Concrete Pump arm. Confronting the results of these methods gives us the conclusion as valid criteria on the relationship between defect type and most appropriate method for evaluation, the minimum the size that can be detected, knowledge of the growth performance of defects and the effects on material performance.

P.S.B.34.

MEASURE RATE OF REFUND OF CRITICAL ENERGY IN COMPOSITE MATERIAL SHOCK

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A methodology of measurement based on the principles of the breaking process and allowing a fast estimate of tenacity or critical energy of rupture GIC intrinsic parameter in shock of a series of composite materials perlon-carbon-polyester and perlon-glass-polyester used in the manufacture of the orthopedic prostheses manufactured by the ONNAPH of Annaba was adopted. The results were interpreted according to the theory of Williams. The test-tubes tested are prismatic bars de50x10x2 mm containing in their center of the notches various depths respecting the report/ratio 0,2 < a/W< 0,6 (has length of notch and W width of the test-tube) and various geometries of the type SEN (acute bottom of notch)), of type B (ray à.fond of notch = 1mm) and of type C (ray à.fond of notch = 0,1mm). The samples pre-were initially notched then notched using a surgical razor blade. The distance between supports is of 40cm.

A sheep Zwick pendulum equipped with a hammer of 7,5 joules and equipped with a software makes it possible to raise the energy lost by the hammer at the time of the impact U for each notch. Thus the layout of the curve U = F (BWø); B being the thickness of the test-tube and ø a factor of calibration tabulé by Wiliams for each length of notch gives a line whose slope measures GIC (dynamic tenacity).

The results of measurement are characterized by a strong dispersion around the linear straight regression line. This dispersion is a characteristic as well of the impact test itself as of material of share the heterogeneous nature of this last. It is also due to the presence of defects within the composite introduced during its development such as porosities of surface and interior like with the differences of épaisseur. Malgré this strong dispersion, the impact test remains average a rapid of evaluation of the parameters of tenacity of composite materials for their classification. The increase in energy total of the rupture with the increase in broken surfaces results in the fact that the rupture is a phenomenon consuming energy and thus the increase in broken surfaces require a more significant energy.

It appears as well as the composite carbon-perlon-polyester has a better resistance to cracking than the composite glass-perlon-polyester.Let us note that the value of GIC for type SEN is relatively lower than those of the types B and C which are relatively close clearly translating the effect of the acuity of the notch on the dynamic tenacity of composite materials.

The microscopic observation of the fracture topographies makes it possible to draw up an inventory of the various mechanisms at the origin of the damage and rupture of these materials and to thus locate most dominant. The test-tubes generally present a rupture which follows the axis of application of the load.The damaged zones are characterized by the washing away of fibres in the orthopedic composite glass-perlon-polyester which is more significant than in the case of the composite carbon-perlon-polyester.

Key words: perlon-carbon-polyester.perlon-glass-polyester;shock, rupture.

P.S.B.35.

MICROSTRUCTURAL CHANGES IN NICKEL AND COBALT BASE SUPERALLOYS AFTER THERMOMECHANICAL TREATMENTS APPLIED

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Nickel and cobalt-base superalloys are widely used in many military and commercial aircraft turbine engines for vanes and other high temperature structural components, owing to their good mechanical properties stress and excellent hot corrosion resistance after prolonged exposure. Cobalt-base alloys, unlike nickel base superalloys, are not strengthened by a coherant, ordered precipitate. The presence of carbide phase has long been recognized as an important strengthening mechanism in cobalt-base superalloys. In this paper, the microstructural changes in nickel base and cobal base superalloys arrisen after thermomechanical treatments are observed by light and scanning electron microscope and analysed by energo-dispersive sprectrometry.

P.S.B.36.

THE CHOICE OF CONSTRUCTION MATERIAL AND ITS IMPACT ON SOME MAIN CHARACTERISTICS OF THE SHIP

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Ship design is a complex process which based on the input data required by the customer, determines all the necessary data on the basis of which the shipyard can start building and check all the qualities required for the ship until its full completion. Among the complex problems of design and production of marine vehicles the choice of construction material is one of the first problems that ship designer must resolve. This choice influences directly in some fundamental characteristics of vessel, such as in its displacement and stability. Also this choice can indirectly affect the hydrodynamic performance of marine vehicles and production and operation costs. The combination of the architectural design of the ship with the optimal material and production method leads to the construction of optimal ship in technical and economical terms. To achieve the best project among other issues ship designers must be updated with areas related to the development of materials and technological processes work. In the article will briefly present the characteristics of materials used in naval industry making an impact analysis of construction material in the characteristics of the vessels which are affected more by the choice of materials. The analyzes will refer mainly to small and recreational vessels.

P.S.B.37.

FINITE ELEMENT ANALYSIS OF METAL TO METAL BONDED BUTT JOINT OF COMPOSITE STRUCTURAL ELEMENTS

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Analysis of stress strain distribution for metal to metal bonded butt joint of composite structural element is done using finite element method. Joint is subjected to both shear force and bending moment. The problem is considered as plane state of strain. Results are presented in the form of graphs. Change of joint geometry is also incorporated to study its effect on regulating stress concentration at the edge. It is observed that the stress concentration is regulated as a result of modifying joint geometry.

Key words: Stress, strain, finite element method, butt joint, composite structure

P.S.B.38.

SIGNATURES OF ANTIBONDING GROUND STATES IN NEUTRAL EXCITON SPECTRA OF VERTICALLY COUPLED NANORINGS IN ELECTRIC FIELD

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We perform a theoretical study of exciton energy spectra in a quantum dot molecule composed of two vertically coupled quantum rings in a perpendicular electric field. The strained axially-symmetric (In,Ga)As ring structures immersed in an infinite GaAs matrix are considered. The neutral exciton states are calculated by the exact diagonalization approach, for various inter-ring distances and for a range of the electric field values. We show that for certain ring distances the strong spin-orbit coupling might result in an antibonding orbital character of the ground valence band state, which is never being observed in natural molecules. Therefore, interesting characteristic features of lowest energy excitonic states arise, those that can not be modeled by the single-band heavy-hole approximation for the valence-band states, which is able to reveal that only the bonding character of the hole ground state. These results are in qualitative agreement with the recent experimental findings for vertically coupled dots. Therefore, a treatment of hole states as multiband Luttinger spinor is essential for proper description of excitonic spectra in an artificial molecules.

P.S.B.39.

CALCULATION OF ELEVATOR SAFETY COEFFICIENT: ADVICE ON SAFETY AND HAZARD IMPLICATIONS

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Constructing home elevator is very complicated and challenging task to perform. In this research we will focus on elevator safety construction using MathCAD software. Considerable attention we address to selection of material used in construction and its calculation based on weight, length and speed in which an elevator can work. We will calculate the safety of each part using scientific method evaluating its mechanical and electrical possible defects. Based on our scientific calculations we will give advice to users in case of mechanic and electrical defects. We aim to give additional advice on mechanical and electrical defects. As a constructer we also will give advice to users how to use the elevator in order to avoid accidents and how to act if an incident happens. As result we aim to give to our reader a complete package of safety and hazards starting from technical calculation to everyday use of it. Of course we do not pretend that the common people to be elevator experts however we will give them the idea of what machinery they are using and to teach them how to use it.

P.S.B.40.

ALTERNATING CURRENT/DIRECT CURRENT ELECTRICAL PROPERTIES OF CARBON NANOFIBER/EPOXY RESIN COMPOSITES

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A study of the electrical conductivity and permittivity of carbon nanofiber/epoxy composites and their dependence on frequency and filler volume fraction was carried out. Nested cone carbon nanofibers were used as the filler. Filler volume fraction was varied over a broad frequency range. It was attempted to generalize the experimental data based on theoretical equations proposed earlier for describing the alternating current and direct current electrical properties of "conductor-insulator" composites. The general rule of mixtures and two-exponent phenomenological percolation equations were examined for a description of the conductivity and permittivity of carbon nanofiber/epoxy composites as a function of filler volume fraction and frequency. It has been suggested that electrical properties may considerably depend on the shape of the filler.

P.S.B.41.

ESTABLISHING OF OPTIMUM FORMING TEMPERATURE ON 100CrMo7-3 AND 100CrMnSi6-4 BEARING STEELS UNDER PARTIAL HEATING CONDITIONS

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The forming process is associated with the plastic deformation capability of materials. The formability of metals and alloys is influenced by physical-metallurgical properties of material and by external forming conditions, forming temperature in particular. A kind of borderline for the division of forming is the recrystallization temperature, according to which forming is divided into cold forming, partially hot forming and hot forming. The paper is concerned with problems of optimizing the temperature of forming grade 100CrMo7-3 and 100CrMnSi6-4 bearing steels under partial heating. Experimental establishment of the optimum range of forming temperatures was based on the results of tensile testing at elevated temperatures from 100 to 800 ºC. Experimental verification of the behaviour of bearing steels under pressure was conducted via the upsetting test at elevated temperatures. The experimental part of the work is also concerned with the analysis of phase composition of grade 100CrMo7-3 and 100CrMnSi6-4 bearing steels using computer simulation, and by the verification of simulation via metallographic evaluation.

P.S.B.42.

SUPERPOROUS HYDROGELS OF CHITOSAN, ITACONIC ACID AND METHACRYLIC ACID

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Superporous, pH-sensitive hydrogels were synthesized by ionic crosslinking of chitosan and itaconic acid followed by free radical polymerization and crosslinking with different methacrylic acid and crosslinking agent concentrations. These hydrogels represent a combination od natural and synthetic polymers with tunable swelling. The hydrogel composition was found to have a great impact the hydrogel structure, mechanical and thermal properties, morphology and swelling kinetics. Incorporation of monomers in hydrogels was confirmed by FT-IR analysis; superporous structure was showed by SEM analysis, while topography of hydrogels were determined by AFM and IFM analysis.

P.S.B.43.

DISPERSED ALUMINA INFLUENCE ON PROPERTIES OF Cu-ODS ALLOY OBTAINED BY ORIGINAL METHOD

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The conditions for maximal increase of mechanical properties of oxide dispersion strengthened (ODS) material were investigated. An original method for preparing copper--alumina system what was developed. The method is based on experimental production of Cu--Al ribbons by quenching onto a rotating wheel (melt-spinning technique), which allows fine distribution of aluminum particles into the Cu matrix and also sufficient ribbon surface: thickness ratio. The ribbons were outdated, milled and reduced under specified conditions giving Cu--Al sub 2 o sub 3 powder. After compaction of Cu--Al sub 2 O sub 3 powder under standardized regimes, measurements of the hardness change were performed for Cu--Al sub 2 O sub 3 samples. The results of nana hardness measurements and elastic modulus of cold deformed and thermally treated samples at 700 and 1000 deg C showed expected level of deformation. After SEM and EDS analysis, the dominant influence of Al sub 2 O sub 3 dispersed particles on mechanical properties of Cu--Al sub 2 O sub 3 samples was confirmed.

Keywords: Copper base alloys, Powder technology, Dispersion harderening alloys, Powder metallurgy, Melt spinning and Compacting

P.S.C.1.

COMPUTATIONAL STUDY OF SUMANENES SUBSTITUTED WITH NITROGEN

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Bowl-shaped polyaromatic hydrocarbons, (buckybowls or π-bowls) are considered to be important structures which investigation could significantly improve the potential of important fields such as catalysis, pharmaceutics and electrical material science. There are two main facts that relate π-bowls, such as coranullene and sumanene, with fullerenes. The first is that these structures serve as model compounds of fullerenes and second is that these structures serve as possible synthetic intermediates for artificially-designed fullerene derivatives such as hetero-fullerenes. In this article we focused on computational investigation of sumanenes substituted with nitrogen within density functional theory. Analysis included calculations of chemical shift, aromatic properties through nuclear independent chemical shift and bowl-to-bowl inversion barrier.

P.S.C.2.

OPTICAL SPECIFICITY OF SYMMETRIC MOLECULAR NANO-FILMS

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In this paper, based on the established model of nanofilm crystal structures, we presented theoretically investigated and studied changes in optical properties due to the presence of boundaries of symmetric ultrathin film structure compared with and ideal film and bulk ones. We examined the effects of three border parameters on the occurrence of localized exciton states as well as their connection to the effects of discretization and selection of the resonant absorption of present electromagnetic radiation. Relative dynamic permittivity as well as the optical properties (absorption, refraction, reflection and transparency indices) of these ultrathin dielectric films is determined. Influence of symmetric boundary perturbation parameters on the appearance of discrete quantum size and confinement effects through layers and the entire film is analyzed.

P.S.C.3.

OPTICAL PROPERTIES OF ASYMMETRIC MOLECULAR NANO-FILMS

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In this paper, by application of the established model of nanofilm crystal structures, we presented theoretically investigated and studied changes in optical properties due to the presence of boundaries of asymmetric ultrathin film structure compared with an ideal film. Relative dynamic permittivity as well as the optical properties (absorption, refraction, reflection and transparency indices) of these ultrathin dielectric films is determined. Analyzing the influence of asymmetric boundary perturbation parameters on optical properties we found out that these parameters could change position and appearance of discrete absorption and refraction. All results are graphically represented.

P.S.C.4.

ORGANIC/INORGANIC HYBRIDS IN BIOSENSORS

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New opportunities are emerging from the combination of organic and inorganic buildingblocks at the nanoscale. The combination of organic and inorganic nanostructures intonanocomposites is called nanohybrids. Studies in colloidal materials, self-assembly, andpolymer-based nano-structuring are coming together to form these novel materials. Recentresearch initiatives are designing nanoparticle conjugates of organic/inorganic molecules whichenable the coupling of the intrinsic functionalities of these diverse molecular systems with thesize and shape dependent optical and electronic properties of nanomaterials. Specific nanomaterials show an inclination for combining with organic and biological molecules, andtheir inherent properties prove to be beneficial and unique to their nanostructure. The propertiesof hybrid nanomaterials make them exemplary options for utilization as biomedical applicationsbecause of their combined organic and inorganic properties.

Key words: nanomaterials, hybrid, biosensor

P.S.C.5.

MECHANICAL APPLICATIONS OF NANOMATERIALS

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It is commonly known in the community of materials scientists the correlation between structure, processing, performance, and properties. In the past few decades, the growth of interest in nanomaterials, materials with at least one dimension of less than 100 nanometers, has altered some of the fundamental understandings of this relationship. In regards to the mechanical properties of materials, it was found that a change in the grain size of materials during processing allows for the bulk material to exhibit enhanced properties such as strength, toughness, and crack initiation and propagation. Moreover, a relationship known as the Hall-Petch relation has indicated the increase of yield strength with a decrease in grain size. This is one of the most popular findings among many others that describe the mechanical properties of nanomaterials. The most obvious application for enhanced mechanical properties is in cutting tools. It was concluded that the Si3N4/SiC nanocomposites is a promising material for cutting tool applications. However, the preparation procedure of this material still needs to be optimized for any future production.

Key words: Nanomaterials, mechanical properties, mechanical behavior.

P.S.C.6.

MULTILAYER NANOFIBROUS CONSTRUCTS WITH INCORPORATED GENTAMICIN FOR CONTROLLED DRUG RELEASE

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Polyvinylalcohol nanofibers with incorporated wide spectrum antibiotic gentamicin were prepared by Nanospider™ needle-less technology. With multiple tracking of the fibers, polyvinylalcohol layers were covered by other pulyurethane layers of various thicknesses. Drug release was investigated in laboratory conditions, the antimicrobial efficacy was evaluated on Gram-positive Staphylococcus aureus and Gram-negative Pseudomonas aeruginosa. Both experiments revealed prolongation of gentamicin retention with increasing thickness of overlapping layers. Nanofibrous multilayer drug carriers were found to be promising materials in various medicinal applications.

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P.S.C.7.

PAL SPECTROSCOPY AS A TOOL TO CHARACTERIZE NANOSTRUCTURED VOIDS IN PHYSICALLY-AGED GLASSY CHALCOGENIDES

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Methodology of positron annihilation lifetime (PAL) spectroscopy to characterize time-dependent evolution of intrinsic free-volume namovoids is analysed at the example of As/Ge-S/Se glasses. Within developed model, the subsequent twisting-aligning-shrinkage stages of physical ageing are adequately reflected in the corresponding changes of PAL parameters. Observed decrease in average positron lifetime, caused by disappearing of overall free volume within glassy structure due to increase in the overlapping between neighbouring nanovoids, is a permanent feature attributed to physical ageing, while the final stage being identified as nanovoid fragmentation resulting in reduced defect-related lifetime with increased intensity. The enhancement of positron trapping rate is recognized as a principal signature of nanovoid fragmentation during natural physical ageing.

P.S.C.8.

THERMAL DEGRADATION OF POLYCARBONANE-BASED POLYURETHANES AND THEIR NANOCOMPOSITES

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Segmented thermoplastic polyurethane (PU) elastomers have attracted a growing interest in medical devices industry and hence, the investigation of their thermal stability and degradation is of great importance for their processing and application. A series of PUs based on aliphatic polycarbonate diols, hexamethylene diisocyanate (HDI) and 1,4-butane diol (BD) was prepared. Hard segment content (HSC) in final PUs was ranging from 9 to 35 wt. %. PU nanocomposites (1 wt. %) were prepared by the addition of organically modified bentonite (BO) into the reaction mixture before the polymerization process. Thermal stability and degradation pattern were investigated using thermogravimetric analysis coupled with differential scanning calorimetry (TG-DSC). The decomposition mechanism depends on the macrodiol chain constitution and HSC. PU thermal stability with higher HSC is significantly improved by BO addition (e.g., by about 17 °C for PUs with 26 wt. % HSC), which might be explained by the interactions between the hard segment (HDI-BD) building block domains and well dispersed nanometer-scale BO particles. A correlation between PU composition and initial decomposition onset temperature (T_o) exists. The ratio of DTG values at the corresponding inflection points if presented as HSC function gives a line. The equation of this line allows the determination of any urethane content or HSC for all PU compositions in the investigated range.

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P.S.C.9.

SYNTHESIS AND CHARACTERIZATION OF SHAPE MEMORY HYBRIDS BASED ON EPOXY RESIN

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Temperature-responsive shape memory polymer composites enables high recovery stress levels as well as novel functions. Organic-inorganic hybrids based on diglycidyl ether of bisphenol A (DGEBA) with in-situ formed silica under nonaqueous conditions were prepared. Silica phase was applied for increasing recovery stress. Lewis acid salt of boron trifluoride monoethylamine (BF_3MEA) was proved to be an effective catalyst for the formations of nanosilica in epoxy-resin under thermal heating process. Glycidyloxypropyltrimethoxysilane (GTMS) was used as a coupling agent to increase interfacial interaction with silica phase formed from tetraethoxysilane (TEOS). Hexamethylenediisocyanate (HDI) and phenyl glycidyl ether (PGE) were used for the tailoring shape memory properties for the epoxy-amine network. The structure evolution, morphology, network formation and mechanical properties as well as shape memory properties were evaluated by FTIR, NMR, TEM and DMA.

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P.S.C.10.

RAMAN SCATTERING FROM ZnO(Mn) NANOPARTICLES

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Nanocrystaline samples of ZnO(Mn) were synthesized by wet chemical method. Samples were characterized by X-ray diffraction to determine composition of the samples (ZnO, Mn_3O_4, $ZnMn_2O_4$ and $ZnMnO_3$) and the mean crystalline size (from 9 to above 100 nm). In this paper we report the experimental spectra of Raman scattering (from 200 to 1600 cm^{-1}). Main characteristic of experimental Raman spectrum in 200 to 1600 cm^{-1} spectral region are: sharp peak at 436 cm^{-1} and broad multi phonon structure at ~ 1150 cm^{-1}, typical for ZnO; sharp peak at approximately 653 cm^{-1} typical for spinel structures as it is Mn_3O_4 nanoparticles.

P.S.C.11.

ATOMIC MICROSCOPY OF ConTec LC ADHESIVE

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Adhesives are used in orthodontics (fixed technique) to fix the brackets to tooth enamel. One of the main characteristics of adhesives is the size of the force of separation of the bracket from tooth (i.e. debonding). The size of the debonding force is dependant upon the structure, i.e. the nanostructure of the adhesive. The analysis of ConTec LC adhesive which is often used in orthodontic practice will be performed by using AFM (Atomic Force Microscopy). Based on the obtained topography of adhesive nanostructure, obtained by calculating roughness, we will try to find a correlation between the obtained adhesive nanostructures and the size of the debonding force of the bracket breaking away from the tooth enamel. The conducted research will contribute to further consideration of the characteristics of ConTec LC adhesive which is frequently used in clinical practice.

Key words: adhesive, debonding force, orthodontics, AFM technology, adhesive nanostructure.

P.S.C.12.

CHARACTERIZATION OF MICROBIAL MORPHOTYPES IN DENTAL CALCULUS DEPOSITS BY NANO PROBE MICROSCOPY AND OPTO-MAGNETIC SPECTROSCOPY

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In this paper we present a possible approach for precise characterization of microbial morphotypes in dental calculus deposits (DCD). Nanoscaletopographic pictures of the surface of dental calculus deposits on recently extracted teeth and Neolithic teeth samples have been obtained through the use of atomic force microscopy (AFM). Using these pictures, identification of microbialmorphotypes has been performed. Polymerase chain reaction (PCR) technique has been used for parallel check of results acquired for DCD of recently extracted teeth. Further structural characterization of DCD has been conducted by the meansof magnetic force microscopy (MFM) and opto-magnetic spectroscopy (OMS). Based on overall results we have tried to make conclusions considering the presence of different bacterial species in modern and prehistoric DCD.Recently extracted teeth have been acquired through procedures performed at the Clinique of oral surgery, Faculty of Dental Medicine, University of Belgrade, Serbia, and Neolithic teeth samples belong to so called ″LepenskiVir″ culture, locality of Padina, Serbia.

P.S.C.13.

FRICTION CHARACTERISTICS DEGRADATION OF SELF LUBRICATED SHAFT-TO-BEARING CONTACT SURFACE

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Several material pairs for manufacturing the shaft and bearing as a tribological pair used for cup anemometer construction were selected. Special lubricants were applied to lower the friction coefficient in case of metal contact surface, but in some cases self lubricated tribological pairs were used. Long term field operation of the cup anemometer with the shaft made of fully hardened beryllium copper and self-lubricating modified teflon bearings was analyzed. The degradation of anemometer performance was detected after three years of continuous operation and recalibration was carried out in an aerodynamic tunnel. A significant change of calibration curve was found with increased offset value. The origin of calibration offset is mostly due to the aerodynamic torque, but in considered case the degradation occurred during short time interval indicating friction torque influence. A method to recognize the friction torque change during sensor field operation was suggested.

P.S.C.14.

CHARACTERIZATION COMMERCIAL AND NANOPHOTONIC RIGID GAS PERMEABLE CONTACT LENSES BY OPTO-MAGNETIC SPECTROSCOPY AND OPTICAL POWER MEASUREMENT

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This work presents a comparative study of the optical power of rigid gas permeable contact lenses (RGP) made of commercial material and nanophotonic materials with different measurement techniques used for the final contact lens controllers. With Rotleks device the following optical results were obtained: optical power, the radial profile of power, strength histogram, cross-section of the lens, a map of defects, while with the Nidek device: optical power, cylinder power and cylinder angle. Optomagnetic spectroscopy (OMS) was used to characterize molecular conformation state of RGP contact lenses. Commercial material of RGP contact lenses is based on polymethylmethacrylate (PMMA), and nanophotonic materials are combination of base material and added fullerene. All experiments were done at room temterature. The acquired results and spectrums were commented and compared with the commercial RGP contact lens material, which was analyzed by the same methods, in order to show the different properties of classical commercial and new nanophotonic materials.

P.S.C.15.

WATER – MATERIALS SURFACE INTERACTION ON MACRO, MICRO AND NANO SCALES

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Surface energy is strongly dependent on the dimension of materials. Different sizes of the same solid-state material particles have different values of surface energy. This difference is very distinguished in cases when the size of the same material differs on macro, micro and nano scale.

Liquid materials, such as pure water, also express different behavior at different dimension scales (bulk water, micro and nano quantities). The interaction of water and surface of solid state materials makes unexpected phenomena on different scales.

In this paper the three major phenomena will be presented: (1) paramagnetic/diamagnetic properties of water-material surface interaction, (2) formation of water exclusion zone (EZ) near material surface in the presence of micro and nano particles, and (3) water mirror effect on molecular level, where through water-light interaction the resultant structure of water seen as a spectral pattern – aquagram, reflects as a mirror response of water to environmental or other perturbations.

P.S.C.16.

STRUCTURAL AND DIELECTRIC PROPERTIES OF NICKEL FERRITE AND NICKEL FERRITE-STRONTIUM TITANATE CERAMICS

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Dielectric properties of multiferroic ceramics (consisting of ferroelectric and ferromagnetic separate phases) are of great importance for most of their potential applications in electronic devices. However, dielectric properties of such ceramics depend significantly on their microstructure, and therfore their optimisation is quite complex as the occurance of undesired phases and defects is usually hard to avoid. In this work, nickel ferrite ($NiFe_2O_4$) and nickel ferrite-strontium titanate ($NiFe_2O_4$-$SrTiO_3$) powders were synthesized, pressed and sintered in order to obtain dense ceramics. Structural characterization of ceramics was done by X-ray diffractometry (XRD) and scanning electron microscopy (SEM). Dielectric properties measurements were conducted on the prepared samples, as a function of both temperature (room temperature-200°C) and frequency (up to 1 MHz).

P.S.C.17.

SPRAY PYROLYSIS SYNTHESIS OF FTO-SUPPORTED ELECTROCHROMIC FILMS

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Fluorine-doped Tin Oxide (FTO) thin films have been deposited on glass substrates using a spray pyrolysis technique from tin tetrachloride solution precursors at various substrate temperatures. The electrochromic layers of different transition metal oxides were deposited onto FTO support and electrochromic properties of the layers were investigated by electrochemical cyclic voltammetry and optical transmission measurements. The structure, phase composition and crystallinity were studied using UV- and IR spectroscopy, X-ray diffraction, scanning electron microscopy (SEM). Color/bleach kinetics and reversibility were found to depend on the thickness, structure, microstructure and chemical composition Model electrochromic cells with different electrolytes and deposited electrodes were assembled and tested and their electrochromic parameters were determined.

P.S.C.18.

HYDROTHERMAL SYNTHESIS OF MAGNETIC NANOPARTICLES AND FABRICATION OF MAGNETIC COMPOSITE PARTICLES USING POLY(L – LACTIDE)

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Magnetic iron oxide nanoparticles ranging from 5 to 20 nm were synthesized using hydrothermal approach. Syntheses were carried out starting from non toxic chemicals at mild reaction temperatures. Different surfactants such as sodium oleate, oleic acid/oleyl amine and PEG are used as in situ surface modifiers for nanoparticles. Also, by varying the type and concentration of precursors and surfactants the size and habitus of the obtained nanocrystals was adjusted. Furthermore, prepared particles are used for fabrication of hydrophilic nano and micro composite particles using biodegradable poly(L-lactide). The qualitative analysis of the synthesized magnetic particles and composites were carried out by XRD. The particle morphology, size and structure were determined TEM, while size distribution was measured by laser diffraction. The phase composition of composite particles, in particular, surface modification was investigated by FT–IR spectroscopy. Morphology of composite particles was observed by SEM.

P.S.C.19.

EFFECT OF INITIAL POWDER DISPERSITY ON THE PHYSICAL AND MECHANICAL PROPERTIES OF SiC CERAMICS SINTERED AT HIGH PRESSURE

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Recently there is a growing interest in nanocrystalline ceramic materials and methods for their preparation, which is associated with the expectation of higher physical and mechanical properties and thermal stability of such materials. Therefore, nanocrystalline materials based on silicon carbide are of great interest, because this compound belongs to highly hard. Efficiency of high pressure sintering for obtaining of highly hard nanocrystalline materials based on high-melting point compounds has been shown earlier by one of the authors by the example of titanium nitride. Such possibility is not enough studied for silicon carbide.

The microstructure, density, microhardness and fracture toughness of ceramic samples sintered from powders of different dispersion: submicron α-SiC (Goodfellow, UK) with a particle size of 0.1-1 μm and silicon carbide micropowder (Boksitogorsk aluminous plant, Russia) with a particle size of 5-7 μm (F1000) are studied. Sintering was realized in high-pressure "anvil-type with hollows" apparatus at pressure of 4 GPa and temperatures of 1500-2000 ° C. Sintering time was 60 s. XRD-analysis in $Cu\text{-}K_\alpha$ radiation, as well as SEM was used for the structure investigation. Microhardness of the sintered samples was measured under a load of 2 N. Fracture toughness K_{1C} was measured by indentation method.

It is found that throughout the temperature range of sintering the samples of more coarse SiC micropowder have greater density, due to plastic deformation and fragmentation of large particles at compression under high pressure. In the sintering temperature range up to 1700 °C samples of this powder have a higher microhardness (19-22 GPa) due to the higher value of their density. However, at sintering temperatures above 1700 °C, the samples of finer submicron SiC powder have the highest microhardness (~24 GPa), due to their more disperse microstructure and a higher level of SiC crystal lattice microstrains.

The results of the studies analyzed in comparison with available literature data for similar ceramic materials obtained by other methods.

P.S.E.1.

ADVANCED BIOPOLYMERS CHARACTERIZED WITH PAL SPECTROSCOPY

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Methodological possibilities of positron annihilation lifetime (PAL) spectroscopy within conventional fast-fast coincidence *ORTEC* system using un-moderated positron beams have been analyzed comprehensively and systematically to characterize inner nanovoid structure of advanced biomaterials for dentistry application based on acrylate-type polymers. At the ground of these results it has been concluded that correct analysis of chemically-technologically modified biopolymers could be developed by using original PAL-data treatment algorithms within mixed three-state model to compensate defect-free bulk annihilation within two-state positron trapping (1) and account for an inter-balance between simultaneously co-existing positron trapping and ortho-positronium decaying channels (2).

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P.S.E.2.

BAND GAP PHOTONIC STRUCTURES IN DICHROMATE BIOPOLYMER

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One - dimensional photonic crystal (PC) was fabricated in a dichromate-sensitized biopolymer using holography method. Photonic crystals were created as volume reflection holograms. A single-frequency, diode pumped Nd-YAG laser, at 532 nm, was used for exposure. The hologram was obtained by interference of two oppositely directed beams inside the emulsion. The interference pattern consists of planes parallel to the substrate. After exposure, plates were chemically processed. Band gaps in the visible range are observed.

P.S.E.3.

MALDI-TOF MASS SPECTROMETRY CHARACTERIZATION OF COLLAGEN

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Collagen is the most frequently occuring fibrillar protein in mammals, which can be found in cartilage, tendon, bone, ligament, skin, etc. The structure of collagen is based on a complicated helix structure of single chains of amino acids (most abundant is glicine-Gly, proline-Pro and hydroxyproline-Hyp) which are connected by hydrogen bonds. We tried to establish MALDI method to get better resolution of collagen's mass spectra. Digested collagen (type II from bovine Achilles tendon which was digested with collagenase from *Clostridium histolycium*) has been analysed on MALDI-TOF MS in order to find peptide's fragments that are characteristic for collagen. In mass spetra we found peaks of peptides, which is highly indicative for collagen (Gly-Pro-Hyp, Gly-Pro-Asp, Gly-Pro-Glu ect.) We hope that it should be possible to obtain MS analysis and structure characterization of collagen by MALDI-TOF/TOF in future.

P.S.E.4.

COLLAGEN STRUCTURE AND MORPHOLOGY ANALYSIS BY TEM AND AFM

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Collagens, one of the most abundant on the Earth, are family of proteins which constitute the basis of connective tissue (extracellular matrix) in multicellular organisms. We used collagen type II from bovine Achilles tendon. In further work, collagen has been studied by transmission electron microscopy (TEM) and atomic force microscopy (AFM). Using TEM we successfully obtained images of collagen and whole collagen fibrils. Using AFM we captured images of whole collagen as well as images of fragments from collagenase-treated collagen (it was digested with collagenase from *Clostridium histolycium*). AFM images of collagenase-treated collagen showed many fibrils grouping into large bundles – collagen fiber. Based on obtained images we studied surface morphology, shape and length of fragments from collagenase-treated collagen.

P.S.E.5.

A NEW KINETIC SPECTROPHOTOMETRIC METHOD FOR TOTAL POLYPHENOLS DETERMINATION IN WHITE WINES

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Phenolics are a wide grown of compounds constitued by phenolic aldehydes, hydroxybenzoic and hydroxycinnamic acids, catechins, flavonols, and stilnenes, in their monometic form or conjugated to some species, such as tartaric acid in the case of cinnamic acids (Bravo et al., 2006), among others. These compounds are present in wines, because they are secondary metabolites of plants. The composition of phenolics and their concentration depend on grape variety, geographical origin, soil type, collection system, and grape processing. These compounds are responsible of the sensory properties of the wine, and, also, they are anticarcinogenic and have an anti-inflammatory action when they are regulary ingested. Folin-Ciocalteau method has been used for the determination of total poliphenols in various samples. The Folin-Ciocalteau assay for total phenolics content is a fast and simple method and can be useful in characterizing and standardizing botanical samples. Method is based on oxidation of phenolics by molybdotungstate in Folin-Ciocalteau reagent to yield a colored product with λ_{max} 745-750 nm. Kinetic spectrophotometric method having excellent sensitivity, sufficient accuracy, simple procedures and the necessity of less expensive apparatus are more attractive for trace metals, anions and organic compunds in food, water and biological samples. Their sensitivity is at least 2-3 order of multitude higher than that of the ordinary spectrophotometric methods. This work describes a new, simple and sensitive catalytic kinetic spectrophotometric method for total polyphenolics determination in white wines. The method was based upon the catalytic effect of Cu(II) on the oxidation of phenolic compounds by H_2O_2 in acidic acid media. The reaction was followed spectrophotometricaly by measuring the increase in absorbance of oxidation products at 420 nm. Under optimum experimental conditions, the differential variation of the tangent method was used to obtain a calibration curve over the range of 23.0 – 194.0 μg/mL of phenolics. The calculated detection limit ($3.3S_b/m$) was 6.77 μg/mL for ten replicate measurements of blank signal. The relative standard deviations for five replicate determinations of 70.0, and 170.0 μg/mL of galic acid were 2.49 and 1.79 %, respectively. The proposed method was successufully applied for the determination of total polyphenols in white wine samples and the results were in excellent agreement with Folin-Ciocalteau method.

P.S.E.6.

OPTO-MAGNETIC SPECTROSCOPY STUDY OF COLORECTAL, CERVICAL AND SKIN CANCER SPECIMENS

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Since colorectal carcinoma, cervical cancer and melanoma all belong to the group of cancer originating in epithelium and based on the results in previous studies where opto-magnetic spectroscopy (OMS) was used for characterization of PAP smears, this study was designed to introduce opto-magnetic method for colorectal, cervical and skin cancer by investigating cytology slides and histopathology sections.. Investigation have included 50 samples: 20 prepared according to standard staining procedure used for PAP smear test, 15 histological sections taken from colorectal tissue and 10 histopathology skin samples. Depending on cancer type, different sample preparation was applied. In the case of colorectal cancer and melanoma, stained and non-stained sections were considered while in the case of cervical cancer, stained and non-stained PAP smears were considered. Results obtained with OMS were compared with results obtained with standard medical tests and indicated significant correlation. In this study, it is shown that OMS method can detect difference between normal and pathological tissue in non-stained specimens. Early detection of cancer based on non-stained slides testing could help in reducing time and resources.

P.S.E.7.

EYE POSITIONING SYSTEM LENS INVESTIGATION BY SCANNING PROBE MIRCROSCOPY

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Standard methods for mapping location of fovea can be difficult due to eye movement and puppilary reflex of the patient. Particular ophtamlic embodiments are created to provide methods and systems for aligning, tracking and monitoring motion of a human eye. This medical device can also serve as eye-contact guide device for ocular treatment of macular lesions by X-ray beam.

In this paper we present results of scanning probe microscopy investigation of inner surface of the contact lens which is used for eye fixation. Adhesion forces are important factor in fixation process. In order to provide better understanding of eye fixation by contact lens, surface topography and roughness of contact lens are analysed.

P.S.E.8.

SYNTHESIS OF GOLD NANOPARTICLES BY ULTRASONIC SPRAY PYROLYSIS AND HYDROGEN REDUCTION

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Different sizes and shapes of nanoparticles (spherical, cylindrical, triangularand round) were prepared during the synthesis of gold by ultrasonic spray pyrolysis USP. The experimental investigations were performed by an ultrasonic source of 0.8 and 2.5 MHz, acting on the water solution of the $HAuCl_4$ forming aerosols with microndroplet sizes, which depend on the characteristics of the solution and the frequency of the ultrasound. Subsequent thermal decomposition of the aerosol droplets was performed in ahydrogen atmosphere between 260°C and 500°C.

P.S.E.9.

EFFECT OF SILVER(I) AND COPPER(II) IONS ON CONTROLLED RELEASE AND ANTIMICROBIAL ACTIVITY OF SILVER AND COPPER/POLY(2-HYDROXYETHYL ACRYLATE/ITACONIC ACID) HYBRID HYDROGELS

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Due to hydrogel three-dimensional porous structure, it is easy to embed therapeutic metal ions in order to design a hybrid biomaterial. These materials have attracted great attention due to various applications in medicine and pharmacy. Notably, comparing to all other available antimicrobial agents, silver(I) ion is probably the most powerful antimicrobial agent that exhibits a strong toxicity toward a broad range of microorganisms, and simultaneously a remarkably low human toxicity. Copper(II) ion also possess antimicrobial and angiogenic properties and also has low human toxicity. The aim of this work was the synthesis of the novel silver/poly(2-hydroxyethyl acrylate/itaconic acid) (Ag/P(HEA/IA)) and copper/poly(2-hydroxyethyl acrylate/itaconic acid) (Cu/P(HEA/IA)) hybrid hydrogels. Controlled release of silver and copper ions from hybrid hydrogels was investigated *in vitro*, for a time period of seven days, as well as their antimicrobial activity during the release period, in order to anticipate their therapeutic efficacy. The release results for Ag(I) and Cu(II) ions from Ag/P(HEA/IA) and Cu/P(HEA/IA) hybrid hydrogels show two-phase exponential profiles, with a fast release in the initial period, followed by a much slower release rate. Experimental data fitted well Peppas model equation, revealing Fickian diffusion as a dominant transport mechanism. Very high values for antimicrobial activities were obtained for Ag/P(HEA/IA) hydrogels against *E. coli,* which varied slightly with IA content and the release time. The antimicrobial activity of Cu/P(HEA/IA) samples was lower but also showed a dependence on IA content and the release time. The beneficial antimicrobial efficacy makes Ag/P(HEA/IA) and Cu/P(HEA/IA) hybrid hydrogels attractive candidates for the use in wound healing and controlled drug delivery.

P.S.E.10.

IN VITRO ANTITUMORAL ACTIVITY OF PLATINUM(IV) COMPLEXES WITH *O,O'*-DIALKYL-(*S,S*)-ETHYLENEDIAMINE-*N,N'*-DI-2-(4-METHYL)PENTANOATE LIGANDS ON HUMAN BREST CANCER

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Many platinum complexes have been synthesized not only in order to investigate their chemistry but also to identify novel complexes with improved antitumoral properties in comparison to the drug cisplatin. There has been a special interest in platinum(IV) complexes, as their greater inertness in comparison with platinum(II) complexes may allow for the oral administration of the drugs, reduce the toxicities associated with platinum-based chemotherapy. The selection of satraplatin for clinical studies was based on its potent *in vitro* growth-inhibitory properties against several tumor cell types, and its *in vivo* oral anticancer activity that was largely comparable to that of administered cisplatin or carboplatin in a variety of murine tumor models.

Herein the antiproliferative activity against human breast cancer (MDA-MB-361 and MDA-MB-453) of four platinum(IV) complexes: tetrachlorido[*O,O'*-dialkyl-(*S,S*)-ethylenediamine-*N,N'*-di-2-(4-methyl)pentaneate]platinum(IV) (alkyl = ethyl, *n*-propyl, *n*-butyl, and *n*-pentyl) are described.

P.S.E.11.

PHYTOCHEMICAL SCREENING, ANTIMICROBIAL AND ANTIOXIDANT ACTIVITIES OF PLANT SPECIES *SESELI RIGIDUM WALDST. & KIT.*

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This study was aimed at evaluating the antioxidant activity and efficacy of the ethanolic extract of the plant species *Seseli rigidum* in inhibiting the development of selected fungi and bacteria. The highest susceptibility to the ethanolic extract of *Seseli rigidum* among the bacteria was exhibited by *B. subtilis* and *S. aureus* (MIC = 15.62 *μg/ml*). Among the fungi, *A. niger* (MIC = 15.62 *μg/ml*) showed the highest susceptibility. Total phenolic, flavonoid, condensed tannin and gallotannin contents were 94.34 mg GA/g, 34.42 mg RU/g, 76.35 mg GA/g and 33.64 mg GA/g, respectively. Total antioxidant capacity was 98.45 μg AA/g. IC_{50} values were determined for each measurement: 20.15 μg/ml for DPPH free radical scavenging activity, 34.36 μg/ml for inhibitory activity against lipid peroxidation, 97,21 μg/ml for hydroxyl radical scavenging activity and 43.21 μg/ml for chelating ability. Rosmarinic acid was found to be the dominant phenolic compound of the extract. This is the first report of chemical constituents and antioxidant and antimicrobial activities of this plant species.

P.S.E.12.

ZnO BIOCOMPATIBILITY ASPECTS

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ZnO nanoparticles are believed to be nontoxic, bio safe, and possibly biocompatible and have been used in many applications in our daily life, such as drug carriers and cosmetics. However, data on this subject is rather scant sometimes controversially reported and requires further investigation.

Studying the solubility of ZnO nanomaterials in biofluids has important implications for their applications in biomedical science. Firstly, ZnO has the potential to be used for biosensors, where, in order to function in biological systems a reasonable time is required. A device "survival lifetime" of a few hours would be necessary. Secondly, if the ZnO is lost in the body or in a blood vessel, it can be dissolved by the bio fluid into ions that can be absorbed by the body becoming part of one's nutrition without forming blockages. Zn ions are needed by each one of us every day. Finally, the slow solubility and high compatibility of ZnO in bio fluid is required for its applications in biology.

We have investigated the interaction of ZnO bulk material and nanoparticles with physiological solution. The following samples were used: ZnO single crystals, as prepared ZnO nanoparticles and ZnO nanoparticles, rinsed in 0.9 % of NaCl solution (in order to remove the Br contaminating impurity introduced during their preparation). The bulk ZnO sample was purchased from ZnOrdic AB. ZnO nanoparticles were electrochemically produced under oxidizing conditions by electrical deposition under oxidizing conditions. The as prepared particles had uniform size distribution and a high degree of crystallinity. The samples were immersed into a physiological solution (0.9 % of NaCl) for 7 days. The pH and elementary composition of the solution was controlled throughout. The solubility of the samples after 7 days (T = 36.6 °C) was determined. The most prominent effect on the pH change was observed for the as-grown ZnO nanoparticles, which, however, may be explained due to the Br solubility (0.026 mass.%), as can be established from the elementary composition. We found the single crystalline material to be practically insoluble toward the solution, while the as-grown nanoparticles, containing Br as a preparation impurity, had a higher solubility. The rinsed ZnO nanoparticles (where the Br content was significantly lower - 0.001 mass. %) showed twice as high a solubility as the previous sample, thus demonstrating the interaction of the material with the solution. Presence of other elements – Ca, Fe, Si, Ag, S, is explained by their presence in the initial solution.

In conclusion, we have observed that the ZnO nanoparticle solubility in physiological solution after 7 days is as low as 0.001 – 0.002 mass %, while the ZnO single crystalline material does not appear to be soluble. The solubility of the nano sized ZnO material should be taken into account during design of bio related applications.

P.S.E.13.

MICROSTRUCTURAL CHARACTERISATION OF ORTHODONTIC Ni-Ti WIRE

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Shape Memory Alloys (SMA) has been at the forefront of research for the last several decades. In this field especially, Nickel-Titanium (Ni-Ti) alloys have been found to be the most useful of all SMA. The most important applications of SMA Ni-Ti alloys are namely in medicine and dentistry, where they are used as orthodontic wires. In this paper we describe the procedure of preparing metallographic samples of typical orthodontic Ni-Ti wires which are nowadays used in dentistry praxis. We prepared the samples for microstructure observation using a light microscope. Special attention is given to the metallographic preparation, which could result in damages and deformations of the sample surfaces if the procedure is incorrect. Finally, we illustrated the typical metallographic recipe for Ni-Ti SMA alloys for optical and electron microscopy observation.

Key words: shape memory alloys, Ni-Ti wire, metallographic preparation, microstructure

P.S.E.14.

OPTIMIZATION OF POLYMERIZATION SHRINKAGE ANALYSIS OF DENTAL COMPOSITES USING A 3D OPTICAL METHOD IN EXTRACTED TEETH

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Volume shrinkage is an important mechanical property of dental composites that affects the tooth-adhesive - polymer integrity. The aim of this study was to develop a test procedure to analyze local deformation fields of dental composites upon polymerization using a 3D optical method. A conventional resin-based composite was placed in modified Class II cavities in extracted molars and polymerized with a conventional halogen light. Local deformation fields were determined using the two-camera system, Aramis 2M, by correlating sample dimensions before and after polymerization. Polymerization of dental composites resulted in heterogeneous local deformation fields with variations in shrinkage values. Development of this experimental concept could help in understanding the behavioral patterns of dental composites in extracted teeth.

P.S.E.15.

DENTAL IN VITRO EXPERIMENTS USING 3D DIGITAL IMAGE CORRELATION METHOD

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Mechanical behavior is very important aspect for implementation and development of biomaterials, so modern technologies are becoming an important aspect in biomedical research. Numerous methods for material testing are developed around the world, but most of them refer to standardized specimen testing. The need for better understanding of mechanical behavior of biomaterials and soft and hard tissues, with constant development of new experimental technologies, shifted researchers focus from 2D specimen testing to 3D real object testing. The aim of the experiment was to measure 3D strain and displacement fields of denture-bone complex during the loading that simulates the human bite. This paper presents development of "in vitro" models for studying the distribution of forces and measuring deformation and displacement that simulate real conditions of Orofacial-System functioning of edentulous patients. An experimental model of acrylic lower total denture placed on the residual alveolar ridge of edentulous mandible was designed. The results of this experiment showed that the main effect appears with the moving of lower denture onto the mandible bone. Load increasing resulted in linearly growth of value of denture base resilience. This experimental concept could help in understanding the resorptions changes of the lower jaw bone fundament that occur under acrylic lower total denture base.

P.S.E.16.

THE APPLICATON OF THE DEVICE "LIFE SYSTEM" IN THE TREATMENT OF MULTIPLE SCLEROSIS

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Diagnosis in this branch of medicine is non-invasive (and therefore painless) and is performed with the help of a special apparatus that is associated with the patient. Emitting electromagnetic waves, this apparatus is able to receive feedback signals from the cells of our body, and of various biochemical substances, micro-organisms, thoughts or feelings, and thus build a complete picture of the health of the patient.

Special software gives the possibility to conduct therapy in multiple sclerosis.

Multiple sclerosis (MS) (lat. multiple sclerosis) is a neurodegenerative and autoimmune disease that first "attacks" the white mass of the central nervous system. The complex pathogenesis of multiple sclerosis involves inflammation and potential focal lesions that are associated with heterogeneous, often destructive pathologic changes disseminated in the white matter of the central nervous system. Multiple sclerosis attacks axons, long extensions of nerve cells, with inflammation and decay of some parts of the myelin. Therefore, multiple sclerosis is considered as an inflammatory, demyelization disease induced by immunological changes of unknown etiology. Multiple sclerosis can occur at any age, but usually occurs between the 20^{th} and 40 years. Currently the world's 2.5 million people suffer from this disease.

Multiple sclerosis usually occurs in adults in their thirties, it is more common in women, but its occurrence is possible in children younger than 15 years. Symptoms of multiple sclerosis vary individually. However there are a number of symptoms that are very typical for most patients, such as weakness, fatigue, stiffness, tremors, slurred speech, depression, muscle spasms, problems with balance, vision, kidneys and bladder, sexual function, memory and thinking. Complete paralysis is also possible. Very often, just one weak individual symptom of MS occurs, such as blurred vision or shaky legs. For many people with MS, symptoms come and go in an unpredictable manner. In some patients, the development of the disease does not significantly affect their way of life, there are cases in which various symptoms occur that can affect the physical and mental abilities and capability for independent life of the patients.

P.S.E.17.

REGENERATION BONE TISSUE BY NEW NANOPARTICULES SYSTEM BASED ON HYDROXIAPATITE AS SYSTEMS FOR LOCAL DELIVERY OF VITAMIN D3

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Increased life expectancy in developed countries leads to an increase in the number of musculoskeletal disordes, such as osteoporosis, oasteoratritis thus compromising good dental treatment. There are many drug delivery systems based on hydroxiapatite used in bone tissue regeneration. Vitamin D3 is osteodiferentiation factor which regulates bone formation by increasing osteoblast differentiation and bone mineralization. The aim of this study is to examine new multifunctional nanoparticulate system for local delivery of active form of vitamin D3 by biochemical blood marker and histochemical analysis. The research was carried out on female Westar rats, aged 6-8 weeks, which have been implanted biomaterials in the artificial bone defect. Biochemical markers of osteogenesis were statistically significant after only 6 weeks of implantation. ALP activity in bone tissue was showed by histochemical analysis as well as high level reparatory skills. Local realized Vitamin D3 contribute to bone formation by increasing osteoblast differentiation and bone mineralization

Key words: nanoparticles drug delivery system, vitamin D3, alveolar bone, regeneration.

P.S.E.18.

HYDROXYAPATITE AND HYDROXYAPATITE SUBSTITUENTS IN STRENGTHENING OF THE JAW BONE TEGMENTA

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In recent years, calcium hydroxyapatite (HAp) and its substituents are increasingly used in dentistry and medicine. The influence of nanoparticles Ca / Co-HAp in strengthening weak osteoporotic bone jaw tegmenta was tested in an experimental model. The study was conducted on Wistar soy rats, aged 6-8 weeks. The biomaterial was implanted in the osteoporoticly weakend mandible of these animals. The best results in the strengthening of the lower jaw bone tegmenta were achieved 24 weeks after implantation of hydroxyapatite nanoparticles in which the calcium ion was substituted with 12% of cobalt ions. Histochemical parameters of bone syntesis were in a statistically significant increase. SEM analysis showed a high degree of osteogenetic ability of nano particulate material implanted in the bone defect.

Keywords: hydroxyapatite, Ca / Co-HAp, osteoporosis, jaw bone, osteogenesis.

P.S.E.19.

MECHANICAL PROPERTY IN INFLECTION 3 POINTS OF A COMPOSITE MATERIAL OF ORTHOPEDIC USE

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Our studies passes by the development of the test-tubes or level of company ONNAPH of Annaba, Algérie containing acrylic resin reinforced by perlon and glass fiber obtained by vacuum moulding.

The curves obtained starting from the deflection tests 3 points show 3 phases. One can notice that to leave the values stresses the rupture as those of the Young modulus obtained in the direction perpendicular to the moulding are higher than those obtained in the direction of the moulding and the oblique direction. The cracking and damage mechanisms were analyzed using a microscopic observation of the morphology of the product what made it possible to make a correlation with macroscopic measurements.

The application of the probabilistic model of Weibull made it possible to identify the parameter of heterogeneity or module of Weibull for all the directions of moulding as well as the constraint of standardization.

Key words: inflection 3 points, fabric, cracking, models probabilistic of Weibull.

P.S.E.20.

OPTICAL ABSORPTION PROPERTIES AND APPLICATIONS OF FULLERENES

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The optical absorption properties of the basic C_{60}, C_{70} and the higher fullerenes C_{76} and C_{84}, isolated from the obtained carbon soot extracts by the new improved chromatographic methods, were investigated. Spectroscopic characterizations were performed using the IR and UV/VIS techniques that have not been presented previously for the higher fullerenes. The unique and the main, dominant optical absorption maxima of these molecules were registered in this research, in the regions where they intensively absorb. All the experimentally observed features were in excellent agreement with theoretical calculations, which has not been reported previously, as a significant advancement. Characteristic changes of locations and relative intensities of absorption bands were also observed, indicating separation of fullerenes in the similar, regular way in several different processes. The isolated fullerenes have important optical and electronic properties and applications, such as optical limiting, incorporation in special lenses and early diagnosis of diabetes, solar cells etc.

P.S.E.21.

MONOLAYERS AND NANOAGGREGATES OF POLYMERS IN THE SYNTHESIS OF GOLD NANOPARTICLES

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In this work we have employed polymeric monolayers at the air–water interface and copolymer nanoaggregates to in situ generation of gold nanoparticles.

Gold nanoparticles-polymer monolayers were obtained using as subphase potassium tetrachloride aureate (III) in aqueous solution, and by spreading of polymers in volatile organic solvents. The synthesis was carried out using a Langmuir Balance to the temperatures of 25 and 35 °C. The gold nanoparticles-polymer monolayer characteristics were studied and compared in terms of isotherms surface pressure vs. area per repeat unit, stability curves and Brewster Angle Microscopy (BAM). The gold nanoparticles synthesis was monitored by UV – Visible spectroscopy, and Scanning Electronic Microscopy (SEM).

Gold nanoparticles-copolymer nanoaggregates were obtained by direct reaction in water between copolymer nanoaggregates and potassium tetrachloride aureate. The systems were characterized by TEM.

In both cases the obtained results are very promissory for obtain nanocomposites containing gold nanoparticles on polymer matrix, and these systems can be useful i.e. in heterogeneous catalysis.

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Keywords: nanocomposites, polymer films, gold nanoparticles, adsorption

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P.S.E.22.

FREEZE-DRYING METHOD TO PRODUCE A RANGE OF PCL PARTICLES WITH TAILORED MORPHOLOGICAL PROPERTIES

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Poly (□-caprolactone) (PCL) is a widely investigated bioresorbable polymer and it has been extensively used in numerous biomaterials applications especially in tissue engineering and drug delivery systems. Freeze-dried particles of poly (□-caprolactone), with different morphological characteristics (spherical or cube in shape), were prepared by physicochemical method with solvent/non-solvent systems and by using the different types of cryoprotectants. Natural polymer poly (L-glutamic acid) (PGA) as well as disaccharide, saccharose, were used as cryoprotectant i.e. substance that is used to protect particles from freezing damage (damage due to ice formation). PGA has dual role in the synthesis; besides as cryoprotectant, it acts as stabilizer of the particles i.e. to prevent their agglomeration. The samples were characterized by Fourier transform infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM). The biocompatibility of the samples was examined by the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay. The formation of intracellular reactive oxygen species was measured spectrophotometrically using a fluorescent probe.

P.S.E.23.

ENHANCED ANTIMICROBIAL EFFICACY BY CO-DELIVERY OF PGA CAPPED SILVER NANOPARTICLES AND ASCORBIC ACID WITH POLY(LACTIDE-CO-GLYCOLIDE)

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Silver nanoparticles (AgNps) were prepared by modified chemical reduction with poly (L-glutamic acid) (PGA) as capping agent. These Ag/PGA nanoparticles (AgNpPGAs) were highly stable over the long periods of time without signs of precipitation. Ascorbic acid, a water soluble antioxidant, was encapsulated together with these stable AgNpPGAs within poly(DL-lactide-co-glycolide) polymeric matrix and their synergistic antimicrobial effect was studied. The antimicrobial activity of the samples was investigated towards six laboratory control strains from the American Type Culture Collection (ATCC) and one clinical isolate methicillin-resistant *Staphylococcus aureus* strain by the broth microdilution method. The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay indicated good biocompatibility of the samples. To establish the influence of PLGA/AgNpPGA/ascorbic acid nanoparticles on intracellular ROS formation, we measured the kinetics of their formation in HepG2 cells by DCFH-DA assay. The samples were characterized by UV-VIS spectrometry, field-emission scanning electron microscopy, and transmission electron microscopy.

P.S.E.24.

NANOFILTRATION IN BIOMEDICINE

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Nanofiltration is separation process which involve both steric and electrostatic partitioning effects between membrane and external solution. Filtration is one of the last invasive processes; it does not require inclusion of any additives. During the last years, new membranes and modules for nanofiltration are developed, specially to meet purification requirements in biomedical application. This paper provides an overview of recent developments in membrane technology, focusing on same special nanofiltration membrane and process characteristics. Future developments of nanofiltration membrane techonology are also discussed in order to be able to meet the growing needs in solving the problems in biomedical field.

Keywords: nanofiltration, membrane, biomedicine

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P.S.E.25.

COMPARATIVE STUDY OF THE EFFECTS OF DIFFERENT NANOMATERIALS ON THE VIABILITY OF HUMAN OSTEOBLAST-LIKE CELLS

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The aim of this study was to compare the effects of two types of nanomaterials, cobalt-exchanged hydroxyapatite (CoHAp) and calcium phosphate/poly-(DL-lactide-co-glycolide) (CP/PLGA), on the viability of Saos-2 osteoblast-like cells, using MTT test. We have examined the suspension of this materials in the following concentrations: 1.6, 8, 40, 200, 1000 and 2500 μg/ml, as well as extracts in concentration range from 2,5% to 100%. Both materials showed cytotoxic effect at higher concentrations of suspension and extract, respectively, but they were not cytotoxic at lower concentrations. CP/PLGA acted stronger cytotoxic compared to CoHAp, regardless of whether it is examined suspension or extract. CoHAp in small concentrations of suspension and extract acted slightly stimulatory on cells. This suggests that CoHAp may have advantage for use in the in vivo systems.

P.S.E.26.

ADIPOSE DERIVED MESENCHYMAL STEM CELLS AS A MODEL FOR STUDY OF OSTEOINDUCTIVE ACTIVITY OF BONE SUBSTITUTING BIOMATERIALS

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Adipose derived mesenchymal stem cells (ADMSC) show remarkable plasticity because of their potential for differentiating into various cell types, including cells which are characteristic for osteogenic process, such as osteoblasts and endothelial cells. Their cultivation on biomaterial scaffolds is a common approach in tissue engineering. In our previous *in vivo* studies we used ADMSC for implantation into the experimental animals onto the bone substituting biomaterials as carriers. Our *in vitro* studies showed that cultivation of human and murine ADMSC in normal and osteoinductive medium with or without biomaterials can be a good model for assessing their bone substituting potential.

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