

DEPARTMENT FOR NANOSTRUCTURED MATERIALS K-7

The basic and applied research in the Department for Nanostructured Materials includes ceramic materials, metals, intermetallic alloys and minerals. Our research encompasses conventional processing as well as the development of new technologies and methods for preparing new materials with novel properties. It includes experimental and theoretical investigations of structures, analyses of chemical compositions at the atomic level, and measurements and calculations of physical properties, all of which help us to improve the properties of micro- and nanostructured materials.

One-dimensional and two-dimensional Fe-Pd-based nanostructures were prepared on conductive substrates and via template-assisted electro-deposition into high-aspect-ratio track-etched polycarbonate and alumina membranes. Successful co-deposition of both metals was achieved after complexing them with citrate and ammonia. The formation of complexes was confirmed by UV-VIS spectroscopy. Based on that knowledge an efficient recipe for the preparation of a stable electrolyte was proposed. $\text{Fe}_{50}\text{Pd}_{50}$ tubes were then successfully electrodeposited. The as-deposited nanotubes had an fcc crystal structure, which results in low coercivity ($H_c \approx 10$ kA/m). Angular-dependence measurements of the coercivity, where the hysteresis loops were measured as a function of the angle (Θ) of the applied demagnetizing field, revealed a combination of magnetization-reversal mechanisms, consisting of the curling mechanism, which dominates at low angles, with a transition to coherent rotation at angles $>70^\circ$. A maximum in the coercivity of 135 kA/m was achieved upon annealing at 550 °C due to the formation of the tetragonal phase. Another composition of $\text{Fe}_{70}\text{Pd}_{30}$ was also investigated due to its magnetic shape memory effect. It was shown that the $\text{Fe}_{70}\text{Pd}_{30}$ nanotubes are ferromagnetic and stable over a wide range of pHs, both of which are important characteristics for their use in intelligent drug-delivery systems. With a proper FEGSEM set-up and taking into account the specifics related to the X-ray spectroscopy of excited spectral lines in the low-energy range (< 5 keV) we have accurately determined the elemental composition of the Fe-Pd nanostructures (rods, tubes, films).

Using EDS and WDS methods, which were optimized for nanometer-scale compositional analyses, we studied the composition of the reaction phase, which was formed by diffusion of terbium (Tb) into the $\text{Nd}_2\text{Fe}_{14}\text{B}$ hard-magnetic materials for improved coercivity. Analyses were carried out at a sub-micrometer analytical resolution (0.1–0.4 μm). Accurate quantitative analyses, performed using different combinations of Tb-L,M, Nd-L,M and Fe-K,L spectral lines, gave consistent results, which confirmed that the composition of the reaction phase corresponds to $(\text{NdTb})_2\text{Fe}_{14}\text{B}$, with a ratio Nd:Tb = 1:1.

In the field of magnetocaloric materials we investigated a wide range of Fe substitutions of the $\text{Gd}_5\text{Si}_2\text{Ge}_2$ basic alloy with the aim to quantitatively clarify the effect of iron with respect to the reduction in entropy and hysteresis losses. Our activity was focused on substituting both elements (Si and Ge) with Fe ($\text{Gd}_5\text{Si}_{2Z/2}\text{Ge}_{2Z/2}\text{Fe}_Z$). We were looking for a possible explanation for the interesting magnetic properties of the newly formed $\text{Gd}_5(\text{Si},\text{Ge})_3$ phase. All three systems X for the Si, Y for the Ge and Z for the Si/Ge substitutions were compared in a systematic approach. The final results showed that the refrigeration capacity (RC) was optimized with 0.125 % of Fe addition and the simultaneous substitution of both Ge and Si. The GS alloy can be used at room temperature. The hysteresis losses were drastically decreased with a small decrease in the net refrigeration capacity (NRC).

We also continued our search for magnetocaloric materials with second-order magnetic transitions to be implemented into a cooling device for computers, which work at elevated temperatures. These iron-based alloys have to be both rare-earth free and cost effective.

In the continuation of the research in quasicrystals-forming alloys we prepared a series of Ti-Zr-Ni samples by melt-spinning and subsequent thermal treatment at 700°C for 2 hours in a dynamic 10^{-5} mbar vacuum in order



Head:

Prof. Spomenka Kobe

Fe₇₀Pd₃₀ nanotubes were successfully functionalized with a model drug, i.e., paracetamol. The proposed type of release, with an initial burst and a slower release of the remaining drug, could be suitable for applications where a fast action is required, which then has to be maintained for a certain time period.

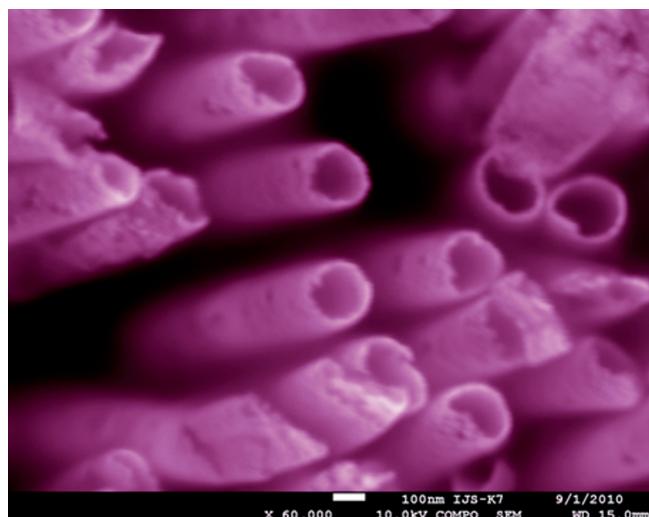


Figure 1: Ferromagnetic Fe-Pd-based electrodeposited nanotubes

An important achievement was the interpretation of the magnetic and magneto-elastic measurements on the multiferroic $\text{Sr}_2\text{CrReO}_6$. On the basis of ab-initio calculations a model, which relates the two properties, was proposed.

showed no selective hydrogenation and absorbed more than 1.5 mass% H in the interval of compositions where the i-phase is formed. XPS analysis revealed that the oxide layer thickness is similar after melt-spinning and thermal treatment for both types of samples, i.e., from inside and outside of the zero-zone. However, after hydrogenation the zero-zone samples had a 5-times thicker surface oxide layer. In order to find, whether this is correlated with a different electronic structure, the DOS near the E_F was compared by ^1H NMR. In addition, the thermal desorption of hydrogen revealed that H-bonding sites are not correlated with selective hydrogenation.

A detailed transmission electron microscopy study confirmed the formation of solid spheres filled with nitrogen gas in their central regions, thus forming gas nano-containers.

to obtain a mixture of hexagonal C14 Laves and α,β -(Ti, Zr) phases. These samples were exposed to hydrogen gas at 300°C and 50 bar for 16 hours. The mass% of H was determined gravimetrically and volumetrically. When approximately 1 % of air was present in absorption chamber we found relatively narrow area in the Ti-Zr-Ni phase diagram, the so-called zero-zone, where the amounts of hydrogen in the crystalline samples varied between 0 and 0.8 mass%. Surprisingly, icosahedral quasicrystalline (i-QC) samples

In the frame of the EU's MNT ERA-Net project Hydrogen-impermeable nanomaterial coatings for steels (Hy-nano-IM) we entered the final year of the project to develop hydrogen-impermeable coatings for the long-term storage and transport of gaseous and liquid hydrogen. Just recently we published a paper entitled Hydrogen permeation through TiAlN-coated Eurofer '97 steel in the journal Surface Coatings and Technology (10.1016/j.surfcoat.2010.08.133) where we report on a permeation reduction factor for hydrogen of up to 20,000 using TiAlN coatings.

We investigated technologically interesting properties of materials within the framework of the density-functional theory. We were focused on the modelling of mechanical and tribological properties of a diamond-like carbon (DLC). We were also involved in the calculation of the transport properties of the approximants of quasicrystals. Part of theoretical research was focused on the interpretation of the magnetic and magneto-elastic measurements of the multiferroic $\text{Sr}_2\text{CrReO}_6$. Experimental results demonstrate large magneto-elastic properties and the dependence of the magnetic anisotropy on the substrate crystalline phase.

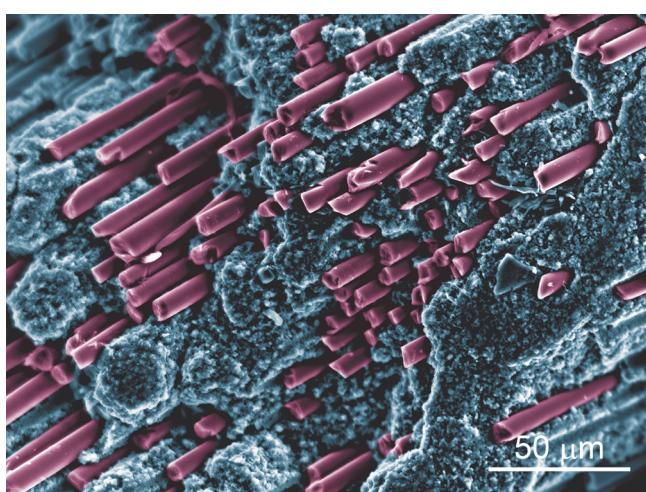


Figure 3: Fracture surface of the SiC/SiC composite prepared by SITE-P process.

Hollow nanospheres as gas containers. One can imagine a cup of fine dust that can supply astronauts with their daily oxygen needs while in space or to picture a bag of dust rich with hydrogen gas, safe and easy to transport, that can provide enough hydrogen for fuel-cell-powered vehicles that can drive you from one city to another. All this is one step closer with a novel approach to the formation of metallic nanospheres filled with gas, based on a melt-solidification mechanism, which could be in principle applied to most metallic systems. For the first time, this phenomenon was observed during the formation of Sm-Fe-Ta nano-spheres by pulsed-laser deposition in nitrogen gas.

The formation of hollow spheres filled with gas is believed to be related to the general affinity of liquid metals for gas intake. During the rapid solidification the dissolved gas in the molten sphere is trapped due to the formation of a solid rim, preventing the outward diffusion of the gas. If the melt contains more than an equilibrium amount of nitrogen it is possible that the gas recombines to form N_2 molecules, filling the void inside the nanosphere.

A noticeable advance has also been achieved in the development of fusion-relevant material (FP7, EURATOM). A new process "SITE" for the

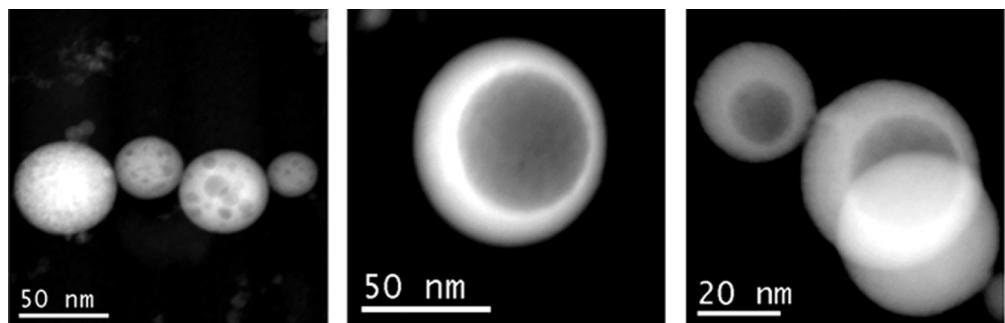


Figure 2: Hollow nanospheres filled with nitrogen gas

fabrication of ceramic matrix composites has been introduced and has been well recognised internationally. The process paralleled with the Japanese process "NITE" is based on electrophoretic infiltration of the ceramic fabric with ceramic powder, followed by infiltration with sintering aids or a pre-ceramic polymer precursor. In this way the material's properties have closely matched the requirements given by the European Fusion Development Agreement, EFDA. The results have been partially published in J. of Nuclear Materials.

Within the FP7 IP project Meddelcoat we achieved the target properties of the coatings for Ti-based bone implants. The second sort of coating developed within the project has been designed for improvement of implants' osteointegration. It is composed of a porous titanium layer (Altenia, Switzerland) coated with sol-gel-synthesised bioactive glass. Both coatings have been patented.

The research of biomaterials also involved the development of silicon carbide ceramics as a metal-free alternative to some metallic implants. Sintering without undesired metals represents quite a challenging task and was found to be possible only if the green density is sufficiently high. The most favourable result was recently achieved by using Mg-compounds as a sintering aid and sintering in the presence of oxygen.

Perovskite BaTiO_3 nanorods and SrTiO_3 nanotubes were synthesized by sol-gel electrophoretic deposition into anodic aluminum oxide (AAO) membranes. Measurements of electrical conductivity on individual BaTiO_3 nanorods showed the linearity and high reversibility of the electrical conductivity as a function of humidity. This is why single BaTiO_3 nanorods are potentially used for micro-nano humidity sensors. On the other hand, the SrTiO_3 single nanotubes exhibited a photo-effect under UV radiation.

Homogeneous nucleation inside the pores of a template produces a critical number of crystallites leading to their self-organization when the nanocrystals reach the sizes that are equal to the mean free distance between the nuclei. Due to steric constraints the crystals start to organize in order to most efficiently fill the available surface of the pore walls. This process leads to the formation of domains containing a large number of idiomorphic SrTiO_3 nano-cubes that are self-aligned into an almost perfect cube-on-cube and cube-to-wall registry, which makes up the walls of the tubules. The described mechanism shows the ability of nanocrystals with well-defined morphologies to adapt spatial constraints and self-organize into desired architectures. By optimizing the processing parameters to control the rates of nucleation and growth as well as the morphology dictated by the crystallography of the nanocrystals units one should be able to design layers of any desired material in a chosen crystallographic orientation in virtually any geometrical setting.

For the synthesis of nano-sized TiO_2 powders in either rutile or anatase crystal form we have successfully tailored the sol-gel and gel-sol processes so that we are able to produce TiO_2 nano-powders with the desired nanocrystal sizes, size distribution, morphology, and crystal structure. Synthesized particles were thoroughly investigated using electron microscopy and microanalytical methods and the nucleation and growth of specific bi-pyramid morphologies were explained. Nanosized anatase was used and tested in DSSC (dye-sensitized solar cells) solar cells.

The self-assembly of Ge quantum dots in an amorphous silica matrix after irradiation with high-energy ions was investigated using electron microscopy and microanalysis. Together with colleagues from Croatia, Italy and Czech Republic we published an explanation for the self-assembly and the influence of various parameters on the final ordered structure. In collaboration with scientists from Portugal the influence of size and morphology of CeO_2 and TiO_2 substrates and catalytic Au and Pt particles on the final catalytic properties of the material was studied and four papers were published in different international journals.

In the frame of a national project "Research and conservation of natural heritage in the field of mineralogy in Slovenia" we published a book "Minerals of the lead and zinc ore deposit Mežica", which is the first

In the research field of materials for biomedical applications we confirmed the bioactivity and photocatalytic activity of the hydrothermally synthesised TiO_2 -coating as well as the sufficient adhesion strength, which makes it applicable for implants to prevent inflammation.

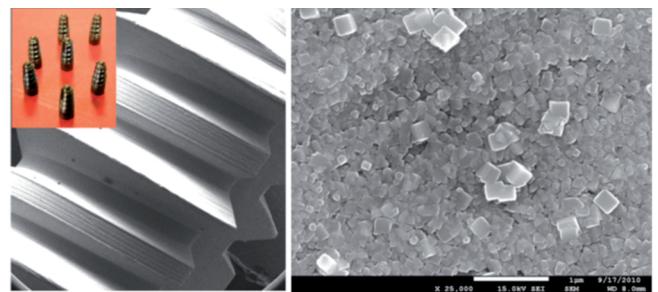


Figure 4: Bioactive and photocatalytic TiO_2 -based coating on dental implant

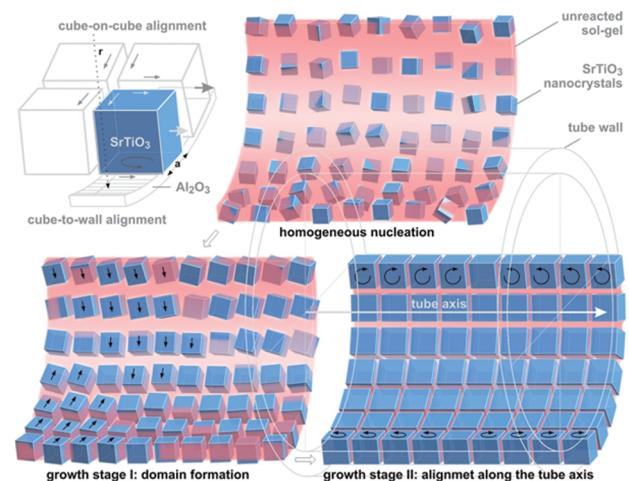


Figure 5: Self-assembly of SrTiO_3 nanocrystals in tubular geometry. The process of self-assembly of SrTiO_3 nanocrystals in AAO templates comprises three basic mechanisms: (i) homogeneous nucleation of SrTiO_3 crystals in thin film of precursor sol-gel, (ii) domain formation due to cube-on-cube alignment of SrTiO_3 nanocrystals and (iii) final cube-to-wall alignment.

We reported an unusual crystallization phenomenon that results in the self-assembly of sub-micron tubules of crystalline SrTiO_3 . The deposition of the tubular structures was done in the pores of anodized aluminum oxide templates by the electrophoretic deposition of SrTiO_3 sols and subsequent annealing. A mechanism for this phenomenon was proposed.

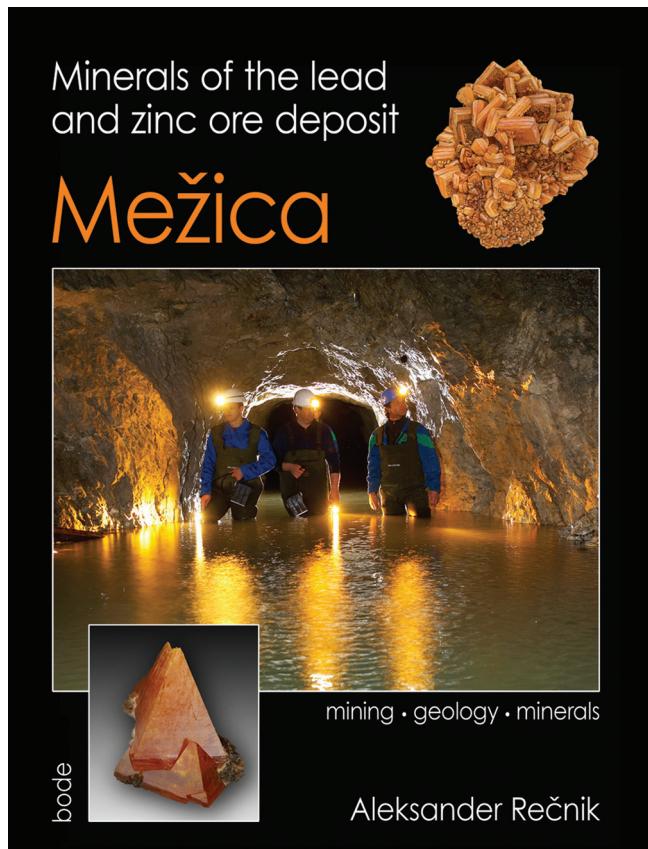


Figure 6: Cover page of the monograph: Minerals of the lead and zinc ore deposit Mežica

detailed description of Slovenia's largest ore deposit. The book is a first comprehensive overview of mining history, geology and mineralogy of the Mežica mine (Carinthia, Slovenia), where over 1000 km of tunnels were excavated together with several hundred kilometers of stopes and mine workings on the existing ore bodies. The most abundant mineral of the deep oxidation zone is wulfenite, which has been mined as a molybdenum ore. The Mežica mine became famous for the unusual pyramidal and bi-pyramidal wulfenite crystals. On these material two types of wulfenite twins were identified and named after their localities as the Igrčovo- and the Doroteja-Law of twinning. Today, Mežica is known as one of the world's richest wulfenite deposits and one can barely find any major mineralogical collections or museums that do not have a specimen from this classic Slovenian locality. This richly illustrated monograph has over 240 high-quality photographs of superb older and also new specimens collected during 2005-2010 in the frame of a research project guided by the author. The book was published in Slovene, English and German editions.

Slovenian meteorite. We started with systematic studies of a stony meteorite that fell in 2009 on Slovenian territory, more specifically on the Mežaklja plateau. This finding is of utmost importance for Slovenia as well as for the wider European area. This is due to the fact that the number of intact, well-preserved extraterrestrial relicts, where the weathering processes did not destroy their original structure, is very limited. As such, they can give important information about the formation of the early solar system as well as the origin and evolution of the Earth and other planets.

After successful synthesis of nano-powders of ZnO with rod-like and plate-like grains, our focus was on the preparation of spherical ZnO nano-powders. Via an appropriate gelatin process of Zn-acetate solution in alcohol media using Li-hydroxide we prepared ZnO nano-powder of highly uniform spherical grains with a size of about 5 nm. Transparent and conductive ZnO thin films are in great demand for applications in optoelectronics. We studied the synthesis of ZnO thin films on the glass substrates from water solutions of Zn-nitrate at 90 °C, which is much below the typical temperature of the hydrothermal synthesis at 150 °C. The ZnO films with the thickness of about 5 µm and about 75% translucency were successfully prepared. We also continued with a study of the nucleation and crystallization of ZnO bipods where we explained the origin of inversion-domain boundary in a series of papers.

We performed a quantitative evaluation of ZnO grain growth with Bi_2O_3 and SnO_2 additions by a classic grain-growth kinetic analysis. We found that a low grain-growth exponent (N) of 2 is characteristic for the initial growth stage, when ZnO grains grow exaggeratedly under the influence of inversion boundaries (IBs). At a lower sintering temperature of 950°C this stage is predominant up to 240 minutes of sintering, whereas at higher temperatures (1100-1300°C) it ends already after 15 minutes. In this IB-induced growth stage, the N -values are even lower with higher sintering temperatures and reach values as low as 1.4. In this stage, the apparent grain-growth energy for the growth of ZnO grains is $\sim 148 \text{ kJ/mol}$. After the impingement of the plate-like ZnO grains with IBs, further growth follows the Ostwald-ripening mechanism, which is an incomparably slower growth process. In this growth stage, the N -value increases to ~ 3.5 and the apparent grain-growth energy is increased to $\sim 353 \text{ kJ/mol}$. After long sintering times, the samples reach an equilibrium microstructure and the grain growth is virtually stopped, which is reflected in very high N -values of 20 and more.

We started research in the field of oxide thermoelectric (TE) materials on the n-type compounds from the system Zn-In-O and the p-type compounds from the Ca-Co-O system. The influence of the starting composition and the preparation process on the formation of the TE compounds, their structure, phase composition and microstructure of the samples was studied. The assembling of the measuring system for the TE characterization of materials up to the temperature of 1000K is the final stage.

We continued the development of the low-doped varistor ceramics with only about 3 wt% of dopants added to the ZnO. The compositions which enable the preparation of either coarse- or fine-grained ceramics with breakdown voltages in the range from 60 to 350V/mm were optimized for the amount of added oxides of Co, Mn and Ni in order to enhance the energy characteristics of the varistor ceramics at high currents.

Within the project on the development of surge protections for solar panels and wind-turbine generators the influence of the thermal treatment and the nature of the secondary intergranular phases on the dc stability of the ZnO-based varistor ceramics was studied for its enhancement. The processing of the tubes by the slip-casting of

the stable varistor powder mixture water suspension into the gypsum moulds was developed. Varistor tubes with lengths in the range from 25 to 60 mm, diameter 12 to 14 mm and wall thickness from 1.5 to 4 mm, were successfully prepared within the project for the industrial partners.

We have performed the characterization of various materials on the micro- and nanoscales using a high-resolution scanning electron microscope FEGSEM combined with analytical methods of energy-dispersive and wavelength-dispersive X-ray spectroscopy, EDS and WDS. Numerous analyses and expertise relating to microstructural characterization of materials were performed for domestic industrial partners in order to solve technological problems in current production and/or in the research and development of new products. The main collaborations were realized with the companies LE Tehnika, SwatyComet, Hidria AET, Iskra-Zaščite, Termoelektrarna Toplarna Ljubljana, BiaSeparations, Cinkarna Celje, and ITW Metalflex.

One of important research areas of the group is the implementation and development of various electron microscopy analytical techniques within the existing EU project ESTEEM, such as electron energy-loss spectroscopy (EELS), high-resolution scanning transmission electron microscopy (STEM, HAADF-STEM) electron holography and mechanical preparation of the TEM samples. In atomically-resolved HAADF-STEM we were among the first to show on model ceramic materials that realistic values of the Debye-Waller factor for atoms comprising the investigated structure (interface, planar fault, etc.) are needed for an exact quantitative interpretation of experimental HAADF-STEM intensities. The research group is additionally strongly involved in managing the Center for Electron Microscopy within the frame of the national infrastructure Center for microstructural and surface analysis. Implementation of various electron microscopy analytical techniques and the possibility for researchers to access research infrastructure for electron microscopy is of utmost importance for numerous research institutions, industrial partners, as well as for graduate and post-graduate education.

Some outstanding publications in the past year

1. Kristina Žagar, Aleksander Rečnik, Pulickel M. Ajayan, Miran Čeh. Oriented cube-on-cube nanocrystal assembly of SrTiO_3 tubules. *Nanotechnology* (Bristol), 2010, vol. 21, no. 37, p. 375605-1-375605-7.
2. Sašo Šturm, Kristina Žužek Rožman, Boštjan Markoli, Evangelia Sarantopoulou, Zoe Kollia, Alciviadis-Constantinos Cefalas, Spomenka Kobe. Formation of core-shell and hollow nanospheres through the nanoscale melt-solidification effect in the Sm-Fe(Ta)-N system. *Nanotechnology* (Bristol), 2010, vol. 21, no. 48, p. 485603-1-485603-8.
3. Saša Novak, Goran Dražić, Katja König, Aljaž Ivetović. Preparation of SiC_x/SiC composites by the slip infiltration and transient eutectoid (SITE) process. *J. nucl. mater.* [Print ed.], 2010, vol. 399, no. 2/3, p. 167-174, doi: 10.1016/j.jnucmat.2010.01.014.
4. Darja Pečko, Kristina Žužek Rožman, Paul J. McGuiness, Boris Pihlar, Spomenka Kobe. Temperature-driven microstructural, compositional, and magnetic changes in electrodeposited Fe-Pd thin films. *J. appl. phys.*, 2010, vol. 107, no. 9, p. 09A712-1-97A712-3.
5. Matej Komelj. Magnetoelasticity driven magnetic anisotropy changes in strained $\text{Sr}_2\text{CrReO}_6$. *Phys. rev., B, Condens. matter mater. phys.*, 2010, vol. 82, no. 1, p. 012410-1-012410-3.
6. Andraž Kocjan, Paul J. McGuiness, Spomenka Kobe. Desorption of hydrogen from Ti-Zr-Ni hydrides using a mass spectrometer. *Int. j. hydrogen energy*. [Print ed.], 2010, vol. 35, no. 1, p. 259-265, doi: 10.1016/j.ijhydene.2009.10.081.

Awards and appointments

1. Saša Novak Krmpotič, Aljaž Ivetović, Goran Dražić: "Densification of SiC by electrophoretic deposition and polymer infiltration and pyrolysis process". Aljaž Ivetović "The Best Poster Award in the Category Microstructure & Properties", 11th ICCPS International Conference on Ceramic Processing Science, Zürich, Switzerland, 29 August - 1 September 2010
2. Tea Toplišek: "Microstructure and mechanical properties of SiC fibers for potential use in a future fusion reactor". Best Poster Award in the appreciation of outstanding work and attractive visual presentation, Nuclear Energy for New Europe 2010, Portorož, Slovenia, 6–9 September 2010.

Organization of conferences, congress and meetings

1. 21st International Workshop on Rare-Earth Permanent Magnets and their Applications-REPM'10, Bled, Slovenia, 29 August - 2 September 2010
2. Fusion EXPO, Barcelona, Spain, 17–21 March 2010 (co-organisers)

3. Fusió. Energia per al futur, Fusion EXPO, the Science Museum of Terrassa, Terassa, Spain, 4 March–2 May 2010 (co-organisers)
4. Fusion EXPO, ESOF - Euro Science Open Forum 2010, Torino, Italy, 2–7 July 2010 (co-organisers)
5. Fusion Roadshow, Llowlab, Biddinghuizen, The Netherlands, 20–22 August 2010 (co-organisers)
6. Fusion – Energy of the future, Maxi Fusion EXPO, Palace of the Academies, Brussels, Belgium, 24 September 2010 and 25 October–15 November 2010 (co-organisers)
7. MACAN Partner Meeting, Bohinj, 25–28 July 2010
8. Slovenia-China Workshop, Jožef Stefan Institute, Ljubljana, Slovenia, 4 June 2010
9. 18th Conference on Materials and Technologies, 15–17 November 2010 (co-organisers)
10. European School in Materials Science: Properties of Complex Metallic Alloys: Modeling, Simulation and Experiment, Ljubljana, Slovenia, 24–29 May 2010 (co-organisers)

INTERNATIONAL PROJECTS

1. Tailoring of Tribological Interfaces for Clean and Energy-Efficient Diesel and Gasoline Power Trains
2020 INTERFACE
7. FP, 234324, SCP8-GA-2009-234324
EC; Jackie Kidd, PA - Support Officer to Director of Research, Institute of Engineering Thermofluids, Surfaces and Interfaces, School of Mechanical Engineering, The University of Leeds, Leeds, Great Britain
Asst. Prof. Matej Komej
2. Merging Atomistic and Continuum Analysis of Nanometer Length-scale Metal-oxide Systems for Energy and Catalysis Applications
MACAN
7. FP, 233484, NMP3-CA-2009-233484
EC; Prof. Wayne Kaplan, Technion - Israel Institute of Technology, Haifa, Israel
Asst. Prof. Aleksander Rečnik
3. Improving the Gender Diversity Management in Materials Research Institutions
DIVERSITY
7. FP, 230253
EC; Dr. Oliver Gutfleisch, Leibniz-Institut für Festkörper- und Werkstoffforschung, Dresden, Germany
Prof. Spomenka Kobe
4. Cooperation of Space NCPs as a Means to Optimise Services
COSMOS
7. FP, 218813
EC; Dr. Adrien Klein, Deutsches Zentrum für Luft und Raumfahrt e.v., (DLR), Köln, Germany
Prof. Spomenka Kobe, Dr. Boris Pukl, Dr. Špela Stres
5. Fusion Expo Activities under an EFDA
EURATOM - MHEST
7. FP, EURATOM, Slovenian Fusion Association - SFA
WP10-PIN-FUSEX
EC; Republic of Slovenia, Ministry of Higher Education, Science and Technology, Ljubljana, Slovenia
Asst. Prof. Saša Novak Krmpotič, Melita Lenosk Kavčič, B. Sc.
6. Development of Beta SiC Fibres with W Core - 4.1.1.- FU
EURATOM - MHEST
7. FP, EURATOM, Slovenian Fusion Association - SFA
3211-08-000102, FU07-CT-2007-00065
EC; Republic of Slovenia, Ministry of Higher Education, Science and Technology, Ljubljana, Slovenia
Asst. Prof. Goran Dražić
7. Development of Dense Beta SiC Matrix in 3D Preform - 4.1.1.2 - FU
EURATOM - MHEST
7. FP, EURATOM, Slovenian Fusion Association - SFA
3211-08-000102, FU07-CT-2007-00065
EC; Republic of Slovenia, Ministry of Higher Education, Science and Technology, Ljubljana, Slovenia
Asst. Prof. Saša Novak Krmpotič
8. SiC/SiC Composite for Structural Application in Fusion Reactor - 4.1.1.2 - PS
WP10-MAT-SiC/SiC (02-02/PS)
EURATOM - MHEST
7. FP, EURATOM, Slovenian Fusion Association - SFA
3211-08-000102, FU07-CT-2007-00065
EC; Republic of Slovenia, Ministry of Higher Education, Science and Technology, Ljubljana, Slovenia
Asst. Prof. Saša Novak Krmpotič
9. Public Information; Research Unit - Administration and Services - RU-FU
EURATOM - MHEST
7. FP, EURATOM, Slovenian Fusion Association - SFA
3211-08-000102, FU07-CT-2007-00065
EC; Republic of Slovenia, Ministry of Higher Education, Science and Technology, Ljubljana, Slovenia
Asst. Prof. Saša Novak Krmpotič, Prof. Milan Čerček
10. Fusion Expo Activities under an EFDA
WP08-PIN-FUSEX
EURATOM - MHEST
7. FP, EURATOM, Slovenian Fusion Association - SFA
3211-08-000102, FU07-CT-2007-00065
EC; Republic of Slovenia, Ministry of Higher Education, Science and Technology, Ljubljana, Slovenia
Asst. Prof. Saša Novak Krmpotič, Melita Lenosk Kavčič, B. Sc.
11. Multifunctional Bioresorbable Biocompatible Coatings with Biofilm Inhibition and Optimal Implant Fixation
6. FP, MEDDELCOAT
NMP3-CT-2006-026501
EC; Prof. Jozef Vleugels, Katholieke Universiteit Leuven, Research & Development, Leuven, Belgium
Asst. Prof. Saša Novak Krmpotič
12. Distributed European Infrastructure of Advanced Electron Microscopy for Nanoscience
ESTEEM
6. FP, 026019
EC; Prof. Gustaaf Van Tendeloo, Universiteit Antwerpen, Antwerpen, Belgium
Prof. Miran Čeh, Asst. Prof. Sašo Šturm
13. Complex Metallic Alloys
CMA
6. FP, NMP3-CT-2005-500140
EC; Centre National de la Recherche Scientifique, Paris, France
Prof. Spomenka Kobe, Prof. Janez Dolinšek, Dr. Peter Panjan
14. Hydrogen Impermeable Nano-material Coatings for Steels
Hy-nano-IM
MNT ERA NET
Asst. Prof. Paul McGuiness
15. Investigation of Electrical Mobility and Dielectric Relaxation of Bioactive Glass
BI-HR/10-11-002
Dr. Andrea Moguš-Milanković, Ruder Bošković Institute, Zagreb, Croatia
Asst. Prof. Saša Novak Krmpotič
16. Correlation of Structure and Properties of Nanostructured Perovskites
BI-HR/10-11-027
Dr. Andreja Gajović, Ruder Bošković Institute, Zagreb, Croatia
Asst. Prof. Sašo Šturm
17. Nano-crystalline Si as a Possible Candidate for Third Generation Solar Cells
BI-HR/09-10-053
Dr. Andreja Gajović, Ruder Bošković Institute, Zagreb, Croatia
Prof. Miran Čeh
18. Advanced Methods and Technologies for Processing of a New Generation of ZnO-based Varistor Ceramics
BI-CN/09-11-017
Dr. Zheng Liaoying, The Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China
Asst. Prof. Slavko Bernik
19. Novel Magnetocaloric Materials for Ecological Refrigeration
BI-CN/09-11-009
Dr. Yan Gaolin, School of Physics and Technology, Wuhan University, Wuhan, Hubei Province, China
Asst. Prof. Paul McGuiness

20. Nanostructural Studies of Phase Transformations and Defect Structures in Iron Oxides and Sulfides
BI-HU/09-10-007
Prof. Mihály Pósfai, University of Pannonia, Department of Earth and Environmental Sciences, Veszprém, Hungary
Asst. Prof. Aleksander Rećnik
21. Nanofabrication and Advanced Characterization of Functionalised Materials
BI-PT/10-11-009
Dr. Adrian M. T. Silva, Laboratory of Catalysis and Materials, Faculty of Engineering, University of Porto, Porto, Portugal
Asst. Prof. Goran Dražić
22. Investigation of High Temperature Reactions between Doped Perovskite Components in a Solid Oxide Fuel Cell
BI-TR/10-12-005
Asst. Prof. Mehmet Ali Gülgün, Sabancı University, Faculty of Engineering and Natural Science, Istanbul, Turkey
Prof. Miran Čeh

R & D GRANTS AND CONTRACTS

1. Exploration and preservation of mineralogical heritage
Asst. Prof. Aleksander Rećnik
2. Ecotechnological 1D Nanomaterials: Synthesis and Characterisation of 1D Titanate Nanomaterials Doped with Transition Metal Ions
Dr. Polona Umek, Asst. Prof. Sašo Šturn
3. Physics and Chemistry of Interfaces of Nanostructured Metallic Materials
Prof. Miran Čeh

MENTORING

Ph. D. Thesis

1. Benjamin Podmiljšak, *Microstructural investigations of rare-earth transition-metal-based magnetocaloric materials for near-room-temperature applications* (mentor Spomenka Kobe; co-mentor Paul McGuiness)

VISITORS FROM ABROAD

1. Dr. Davor Gracin, Dr. Igor Djerdj, Institut Rudjer Bošković, Zagreb, Croatia, 15 January 2010
2. Dr. Jonathan P. Winterstein, Massachusetts Institute of Technology, Cambridge, USA, 31 January – 3 February 2010
3. Prof. Kristóf Kovács, Ilona Nyiro Kósa, University of Pannonia, Veszprém, Hungary, 27–28 January 2010
4. Prof. Mihaly Pósfai, Prof. Istvan Dodony, Ilona Nyiro Kósa, Dorottya Sára Csákberényi Nagy, University of Pannonia, Veszprém, Hungary, 19–26 February 2010
5. Dr. Davor Gracin, Institut Rudjer Bošković, Zagreb, Croatia, 1–2 March 2010
6. Prof. J.-M. Dubois, Ecole de Mines, CNRS, Nancy, France, 10 March 2010
7. Dr. Sehila M. Gonzalez de Vicente, European Fusion Development Agreement, Close Support Unit, Garching, Germany, 7–9 March 2010
8. Rita Marques, Faculdade de Engenharia da Universidade do Porto, Departamento de Engenharia Química, Porto, Portugal, 8–14 March 2010
9. Dr. Vladimir Jović, Dr. Borka Jović, Institute for Multidisciplinary Research, Belgrade, Serbia, 17–21 March 2010
10. Dr. Andrea Mogus-Milankovic, Dr. Ana Šantić, Institut Rudjer Bošković, Zagreb, Croatia, 26 March 2010
11. Dr. Adrian Silva, Faculdade de Engenharia da Universidade do Porto, Departamento de Engenharia Química, Porto, Portugal, 30 March – 4 April 2010

RESEARCH PROGRAM

1. Nanostructured materials
Prof. Spomenka Kobe

NEW CONTRACTS

1. NODISEA: Novel innovative systems for electrical equipment VARSI, d.o.o.
Asst. Prof. Slavko Bernik
2. New generation magnets - high-temperature NdFeB magnets MAGNETI LJUBLJANA, d.d.
Asst. Prof. Paul John McGuiness
3. WISEVAR: Varistors for protection of renewable energy systems VARSI, d.o.o.
Asst. Prof. Slavko Bernik
4. Exploration and preservation of mineralogical heritage Municipality Litija
Asst. Prof. Aleksander Rećnik

12. Dr. Mehmet Ali Gülgün, Sabancı University, Istanbul, Turkey, 14–18 April 2010
13. Dr. Andreja Gajović, Institut Rudjer Bošković, Zagreb, Croatia, 21 April 2010
14. Dr. Mehmet Ali Gülgün, Asst. Prof. Cleva W. OW-Yang, Sabancı University, Istanbul, Turkey, 20–25 May 2010
15. Prof. Guorong Li, Prof. Ding Aili, Prof. Wang Dong, Prof. Zeng Huarong, Dr. Zheng Liaoying, Dr. Zeng Jiangtao, Shanghai Institute of Ceramics, Shanghai, China, 2–10 June 2010
16. Bojan Gligorijević, Institut Goša, Belgrade, Serbia, 16–19 June 2010
17. Dr. Andreja Gajović, Institut Rudjer Bošković, Zagreb, Croatia, 12–16 July 2010
18. Dr. Goran Branković, Dr. Zorica Branković, Milan Žunić, Institute for Multidisciplinary Research, Belgrade, Serbia, 29 July – 4 August 2010
19. Dr. Liesl Folks, Hitachi Global Storage Technologies, San Jose, USA, 26–29 August 2010
20. Prof. Ivor Rex Harris, University of Birmingham, Birmingham, United Kingdom, 2–5 September 2010
21. Dr. Masato Sagawa, INTERMETALLICS Co., Ltd., Kyoto, Kudo Masanori and Kubota Kenta, Mitsubishi Corporation, Tokyo, Japan, 2–3 September 2010
22. Dr. Dominique Givord, Institut Néel, CNRS, Grenoble, France, 1 September 2010
23. Dr. Davor Gracin, Institut Rudjer Bošković, Zagreb, Croatia, 6 September 2010
24. Dr. Mehmet Ali Gülgün, Asst. Prof. Cleva W. OW-Yang, Melike Yıldızhan and Murat Eskin, Sabancı University, Istanbul, Turkey, 4–10 September 2010
25. Dr. Sonia Carabineiro, FEUP - Faculdade de Engenharia da Universidade do Porto, Porto, Portugal, 3–9 October 2010
26. Dr. Andreja Gajović, Institut Rudjer Bošković, Zagreb, Croatia, 15 October 2010
27. Prof. A. C. Cefalas, National Hellenic Research Foundation, Athens, Greece, 20–22 October 2010
28. Prof. Werner Mader, Universität Bonn, Bonn, Germany, 25–27 October 2010
29. Dr. Davor Gracin, Institut Rudjer Bošković, Zagreb, Croatia, 14 December 2010
30. Dr. Andreja Gajović, Institut Rudjer Bošković, Zagreb, Croatia, 27 December 2010–7. January 2011
31. Krunoslav Juraić, Institut Rudjer Bošković, Zagreb, Hrvatska, 28. December 2010
32. Damir Ivezović, Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia, 29 December 2010
33. Dr. Davor Gracin, Institut Rudjer Bošković, Zagreb, Croatia, 30 December 2010

STAFF

Researchers

1. Asst. Prof. Slavko Bernik
2. Prof. Miran Čeh
3. Dr. Nina Daneu
4. Asst. Prof. Goran Dražić
5. **Prof. Spomenka Kobe, Head**
6. Asst. Prof. Matej Andrej Komelj
7. Asst. Prof. Paul John McGuiness
8. Asst. Prof. Saša Novak Krmpotić
9. Asst. Prof. Aleksander Rećnik
10. Dr. Zoran Samardžija
11. Asst. Prof. Sašo Šturn
12. Postdoctoral associates
13. Dr. Andraž Kocjan

13. Dr. Benjamin Podmiljšak
14. Dr. Kristina Žužek Rožman

Postgraduates

15. Nataša Drnovšek, B. Sc.
16. Ana Gantar, B. Sc.
17. Barbara Horvat, B. Sc.
18. Aljaž Ivezović, B. Sc.
19. Marja Jerič, B. Sc.
20. Katja König, B. Sc.
21. Matic Krivec, B. Sc.
22. Alenka Lenart, B. Sc.
23. Darja Pečko, B. Sc.
24. Matejka Podlogar, B. Sc.
25. Mojca Presečnik, B. Sc.
26. Katarina Rade, B. Sc.
27. Marko Soderžnik, B. Sc.

28. Tea Toplišek, B. Sc.
 29. Janez Žavašnik, B. Sc.
 30. Kristina Žagar, B. Sc.

Technical officers

31. Sanja Fidler, B. Sc.
 32. Medeja Gec, B. Sc.

BIBLIOGRAPHY

ORIGINAL ARTICLES

1. Jana Bezjak, Artem M. Abakumov, Aleksander Rečnik, Marjeta Maček, Boštjan Jančar, Danilo Suvorov, "The local structure and composition of $\text{Ba}_4\text{Nb}_2\text{O}_9$ -based oxycarbonates", *J. solid state chem.*, vol. 183, issue 8, pp. 1823-1828, 2010.
2. Marko Bitenc, Goran Dražić, Zorica Crnjak Orel, "Characterization of crystalline zinc oxide in the form of hexagonal bipods", *Cryst. growth des.*, vol. 10, no. 2, pp. 830-837, 2010.
3. Marko Bitenc, Peter Podbršček, Pavo Dubček, Sigrid Bernstorff, Goran Dražić, Bojan Orel, Stane Pejovnik, Zorica Crnjak Orel, "In and ex situ studies of the formation of layered microspherical hydrozincite precursor for ZnO ", *Chemistry (Weinh., Print)*, vol. 16, issue 37, pp. 11481-11488, 2010.
4. Zorica Branković, Katarina Đuriš, A. Radojković, Slavko Bernik, Zvonko Jagličić, Marko Jagodič, Katarina Vojislavljević, Goran Branković, "Magnetic properties of doped LaMnO_3 ceramics obtained by a polymerizable complex method", *J. sol-gel sci. technol.*, vol. 55, issue 3, pp. 311-6, 2010.
5. Zorica Branković, Zorica Marinković Stanojević, L. Mančić, Vesna Vukotić, Slavko Bernik, Goran Branković, "Multiferroic bismuth manganite prepared by mechanochemical synthesis", In: *Proceedings of the ELECTROCERAMICS XI: Piezoelectrics, 1-3 September 2008, Manchester, UK*, (Journal of the European Ceramic Society), vol. 30, no. 2, Robert Freer, ed., Colin Leach, ed., Barking, Elsevier, 2010, pp. 277-281.
6. Maja Buljan, Goran Dražić, (15 authors), "Generation of an ordered Ge quantum dot array in an amorphous silica matrix by ion beam irradiation: modeling and structural characterization", *Phys. rev. B, Condens. matter mater. phys.*, vol. 81, no. 8, pp. 085321-1-085321-8, 2010.
7. S. A. C. Carabineiro, Bruno Machado, R. R. Bacsa, Philippe Serp, Goran Dražić, Joaquim Luís Faria, José Luís Figueiredo, "Catalytic performance of Au/ZnO nanocatalysts for CO oxidation", *J. catal.*, vol. 273, issue 2, pp. 191-198, 2010.
8. S. A. C. Carabineiro, Adrián M. T. Silva, Goran Dražić, P. B. Tavares, José Luís Figueiredo, "Gold nanoparticles on ceria supports for the oxidation of carbon monoxide", *Catal. today*, issue 1-2, vol. 154, pp. 21-30, 2010.
9. S. A. C. Carabineiro, Adrián M. T. Silva, Goran Dražić, P. B. Tavares, José Luís Figueiredo, "Effect of chloride on the sinterization of Au/Ce₂O₃ catalysts", In: *Proceedings of the Eleventh International Symposium on Catalyst Deactivation, October 25-28, Delft, Netherlands*, (Catalysis today, Vol. 154, no. 3/4), Jorge Gascon, ed., Amsterdam, Elsevier, 2010, pp. 293-302.
10. Alciviadis-Constantinos Cefalas, Evangelia Sarantopoulou, Zoe Kollia, C. Riziotis, Goran Dražić, Spomenka Kobe, Janez Stražišar, Anton Meden, "Magnetic field trapping in coherent antisymmetric states of liquid water molecular rotors", In: *Special issue on Technology Trends and Theory of Nanoscale Devices for Quantum Applications, 2009*, (Journal of computational and theoretical nanoscience), vol. 7, no. 9), Alciviadis-Constantinos Cefalas, ed., Stevenson Ranch, American Scientific, 2010, pp. 1800-1805.
11. Miran Čeh, Hsing-Chao Chen, Miin-Jang Chen, Jer-Ren Yang, Makoto Shiojiri, "Structure and electro-optical properties of thin films grown by alternative atomic layer deposition of ZnO and Al_2O_3 on the sapphire substrate", *Mater. trans.*, vol. 51, no. 2, pp. 219-226, 2010.
12. Andreja Gajović, Sašo Šurm, Boštjan Jančar, Ana Šantić, Kristina Žagar, Miran Čeh, "The synthesis of pure-phase bismuth ferrite in the Bi-Fe-O system under hydrothermal conditions without a mineralizer", *J. Am. Ceram. Soc.*, vol. 93, no. 10, pp. 3173-3179, 2010.
13. Andrej Gosar, Alenka Lenart, "Mapping the thickness of sediments in the Ljubljana Moor basin (Slovenia) using microtremors", *Bulletin of earthquake engineering*, vol. 8, no. 3, pp. 501-518, 2010.
14. Damir Ivecović, Andreja Gajović, Miran Čeh, Boris Pihlar, "Prussian blue-modified titanate nanotubes: A novel nanostructured catalyst for electrochemical reduction of hydrogen peroxide", *Electroanalysis*, vol. 22, no. 19, pp. 2202-2210, 2010.
15. V. D. Jović, B. M. Jović, U. Lačnjevac, Goran Branković, Slavko Bernik, Aleksander Rečnik, "An attempt to predict the mechanism of Mo-Ni-O powders electrodeposition from the results of their TEM analysis", *Electrochim. acta*, issue 13, vol. 55, pp. 4188-93, 2010.
16. Krunoslav Juraić, Miran Čeh, (9 authors), "GISAXS and GIWAXS analysis of amorphous-nanocrystalline silicon thin films", In: *X-ray techniques for advanced materials, nanostructures and thin films: from laboratory sources to synchrotron radiation: proceedings of the EMRS 2009 Spring Meeting, Strasbourg, 2009, Strasbourg, France*, (Nuclear instruments & methods in physics research, section B, Beam interactions with materials and atoms), vol. 268, no. 3/4), Federico Boscherini, ed., Amsterdam, North-Holland, 2010, pp. 259-262.
17. Andraž Kocjan, Paul J. McGuiness, Spomenka Kobe, "Desorption of hydrogen from Ti-Zr-Ni hydrides using a mass spectrometer", *Int. j. hydrogen energy*, vol. 35, no. 1, pp. 259-265, 2010.
18. Andraž Kocjan, Paul J. McGuiness, Spomenka Kobe, "The effect of hydrogen on the magnetic properties of quenched Ti-Zr-Ni rods", *J. magn. magn. mater.*, vol. 322, no. 19, pp. 2851-2856, 2010.
19. Andraž Kocjan, Paul J. McGuiness, Aleksander Rečnik, Janez Kovač, Spomenka Kobe, "Effect of composition on the i-phase cell parameter of Ti-(Zr,Cu)-Ni alloys", *J. non-cryst. solids*, vol. 356, issue 50-51, pp. 2769-2773, 2010.
20. Katja Koenig, Saša Novak, Aldo R. Boccaccini, Spomenka Kobe, "The effect of the particle size and the morphology of alumina powders on the processing of green bodies by electrophoretic deposition", *J. mater. process. technol.*, issue 1, vol. 210, pp. 96-103, 2010.
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25. Manca Logar, Boštjan Jančar, Aleksander Rečnik, Danilo Suvorov, "Polyelectrolyte multilayer template assisted in-situ synthesis of the inorganic nanostructures", *Contemporary materials*, vol. 1, no. 1, pp. 4-18, 2010.
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27. Saša Novak, Goran Dražić, Katja Koenig, Aljaž Ivecović, "Preparation of SiC_f/SiC composites by the slip infiltration and transient eutectoid (SITE) process", *J. nucl. mater.*, vol. 399, no. 2/3, pp. 167-174, 2010.
28. İ. Özgür Özer, Ender Suvaci, Slavko Bernik, "Microstructure-property relationship in textured ZnO-based varistors", *Acta mater.*, vol. 58, no. 12, pp. 4126-4136, 2010.
29. Darja Pečko, Kristina Žužek Rožman, Paul J. McGuiness, Boris Pihlar, Spomenka Kobe, "Temperature-driven microstructural, compositional, and magnetic changes in electrodeposited Fe-Pd thin films", In: *Proceedings of the 11th Joint MMM/INTERMAG Conference, January 18-22, 2010, Washington, DC*, (Journal of applied physics), vol. 107, no. 9), New York, American Institute of Physics, 2010, pp. 09A712-1-97A712-3.
30. Peter Podbršček, Goran Dražić, Jorge Antonio Paramo, Yuri M. Strzheemechny, Jadran Maček, Zorica Crnjak Orel, "Growth of zinc oxide

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33. B. Schwarz, Benjamin Podmiljšak, N. Mattern, Jürgen Eckert, "Magnetoacaloric effect in Gd-based $\text{Gd}_{60}\text{Fe}_{18}\text{Co}_{30}$ ", *J. magn. magn. mater.*, vol. 322, no. 16, pp. 2298-2303, 2010.
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35. Marko Soderžnik, Paul J. McGuiness, Kristina Žužek Rožman, Irena Škulj, Gaolin Yan, Spomenka Kobe, "A high-resolution field-emission gun, scanning electron microscope investigation of anisotropic hydrogen decrepitation in Nd-Fe-B-based sintered magnets", In: *Proceedings of the 11th Joint MMM/INTERMAG Conference, January 18-22, 2010, Washington, DC*, (Journal of applied physics, vol. 107, no. 9), New York, American Institute of Physics, 2010, pp. 09A742-1-09A742-3.
36. Darja Steiner Petrovič, Matjaž Godec, Boštjan Markoli, Miran Čeh, "The nanostructure of non-oriented electrical steel sheets", *J. magn. magn. mater.*, vol. 322, no. 20, pp. 3041-3048, 2010.
37. Sašo Šturm, Mehmet A. Gülgün, Gunther Richter, Francisco M. Morales, Rowland M. Cannon, Manfred Rühle, "The role of Si impurities in the transient dopant segregation and precipitation in yttrium-doped alumina", In: *New materials via: proceedings of the 7th International Workshop on Interfaces, June 22-26, 2008, Santiago de Compostela, Spain*, (International journal of materials research, vol. 101, no. 01), München, Halser, 2010, pp. 95-101.
38. Sašo Šturm, Kristina Žužek Rožman, Boštjan Markoli, Evangelia Sarantopoulou, Zoe Kollia, Alciividis-Constantinos Cefalas, Spomenka Kobe, "Formation of core-shell and hollow nanospheres through the nanoscale melt-solidification effect in the Sm-Fe(Ta)-N system", *Nanotechnology (Bristol)*, vol. 21, no. 48, pp. 485603-1-485603-8, 2010.
39. Katarina Vojislavljević, Goran Branković, Tatjana Srećković, Aleksander Rečnik, Zorica Branković, "Preparation of ultrathin PZT films by a chemical solution deposition method from a polymeric citrate precursor", In: *Proceedings of the ELECTROCERAMICS XI: Piezoelectrics, 1-3 September 2008, Manchester, UK*, (Journal of the European Ceramic Society, vol. 30, no. 2), Robert Freer, ed., Colin Leach, ed., Barking, Elsevier, 2010, pp. 485-488.
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43. Matjaž Žitnik, Andreja Kastelic, Zdravko Rupnik, Primož Pelicon, Primož Vaupetič, Klemen Bučar, Saša Novak, Zoran Samardžija, S. Matsuyama, G. Catella, K. Ishii, "Time-resolved measurements of aerosol elemental concentrations in indoor working environments", *Atmos. environ. (1994)*, vol. 44, issue 38, pp. 4954-4963, 2010.
44. Kristina Žužek Rožman, Janez Kovač, Paul J. McGuiness, Zoran Samardžija, Boštjan Markoli, Spomenka Kobe, "Microstructural, compositional and magnetic characterization of electrodeposited and annealed Co-Pt-based thin films", *Thin solid films*, vol. 518, no. 6, pp. 1751-1755, 2010.
- fiber/matrix interface in SiC based ceramic composite material for use in a fusion reactor application", In: *Ceramic materials*, Wilfried Wunderlich, ed., Rijeka, Sciendo, 2010, pp. 99-114.

PUBLISHED CONFERENCE PAPERS

Invited Paper

1. Zorica Crnjak Orel, Marko Bitenc, Goran Dražić, "Analyses of defects in zinc oxide bipod particles: [Elektronski vir]", In: *ICCE-18: [proceedings]*, The Eighteenth Annual International Conference on Composites or Nano Engineering, July 4-10, 2010, Anchorage, Alaska, David Hui, ed., New Orleans, International Community for Composites Engineering, 2010, 2 pp.

Regular papers

1. Marcela Achimovičová, Aleksander Rečnik, Maxym Myndyk, Martin Fabián, Vladimir Šepelák, "A one-step mechanochemical synthesis and characterization of SnSe and SnSe_2 ", *Diffus. fundam.*, vol. 75, spec. iss., pp. 75-77, 2010.
2. Slavko Bernik, Saša Nastran, Saša Rustja, Zoran Samardžija, Alojz Tavčar, Matejka Podlogar, Andrej Pirih, Mirjam Cergolj, "Slip-casting of tubular ZnO -based varistor ceramics", In: *Proceedings*, Denis Đonlagić, ed., Iztok Šorli, ed., Polona Šorli, ed., Ljubljana, MIDEIM - Society for Microelectronics, Electronic Components and Materials, 2010, pp. 153-158.
3. Milan Bizjak, Goran Dražić, Ladislav Kosec, Blaž Karpe, "The precipitation kinetics of rapidly solidified Al-based alloys", In: *Metallni i nemetalni materijali: proizvodnja, osobine, primjena: zbornik radova: production, properties, application: proceedings*, Zenica, Fakultet za metalurgiju i materijale, = Faculty of Metallurgy and Materials Science, 2010, pp. 62-67.
4. Milan Bizjak, Ladislav Kosec, Marko Šuler, Goran Dražić, "Phase transformations of amorphous/nanocrystalline Cu-Fe-Ti-C alloy", In: *PM 2010. Proceedings volume 1*, Powder metallurgy world congress & exhibition, Florence, Italy 10-14 October 2010, Shrewsbury, European Powder Metallurgy Association, cop. 2010, pp. 309-314.
5. S. A. C. Carabineiro, Bruno Machado, Goran Dražić, R. R. Bacsa, Philippe Serp, José Luís Figueiredo, Joaquim Luís Faria, "Photodeposition of Au and Pt on ZnO and TiO_2 ", In: *Scientific bases for the preparation of heterogeneous catalysts: proceedings of the 10th international symposium, Louvain-la-Neuve, Belgium, July 11-15, 2010*, (Studies in surface science and catalysis, vol. 175), E. M. Gaigneaux, ed., Amsterdam [etc.], Elsevier, 2010, pp. 629-633.
6. S. A. C. Carabineiro, Adrián M. T. Silva, Goran Dražić, José Luís Figueiredo, "Preparation of Au nanoparticles on Ce-Ti-O supports", In: *Scientific bases for the preparation of heterogeneous catalysts: proceedings of the 10th international symposium, Louvain-la-Neuve, Belgium, July 11-15, 2010*, (Studies in surface science and catalysis, vol. 175), E. M. Gaigneaux, ed., Amsterdam [etc.], Elsevier, 2010, pp. 457-461.
7. Goran Dražić, Marko Bitenc, Peter Podbršek, Zorica Crnjak Orel, "Analytical electron microscopy of ZnO bipods", In: *Revealing the nanoworld in life and materials science: proceedings*, IMC 17, 17th International Microscopy Congress, Sepetember 19-24, Rio de Janeiro, Brazil, [S. l.], SBMM, = Sociedade Brasileira de Microscopia e Microanálise, 2010, 2 pp.
8. Goran Dražić, Marko Bitenc, Peter Podbršek, Zorica Crnjak Orel, "Analytical electron microscopy of ZnO bipods grown from solutions", In: *Proceedings of the 68th Annual Meeting of the Microscopy Society of America ... [et al.]: August 1-5, 2010, Portland, Oregon, USA*, (Microscopy and microanalysis, vol. 16, suppl. 1/2), New York, Springer-Verlag, 2010, vol. 16, suppl. 1, pp. 1356-1357, 2010.
9. Jovica Ivković, Matej Komelj, Ana Smontara, Janez Dolinšek, Peter Gille, "Hall effect in the $\text{Y}-\text{Al}-\text{Ni}-\text{Co}$ and $\alpha-\text{Al}_{13}\text{Co}_4$ decagonal approximants", In: *Proceedings of the 6th International Conference on Aperiodic Crystals, APERIODIC'09, 13-18 September 2009, Liverpool, UK*, (Journal of physics, Conference series, vol. 226), Bristol, Institute of Physics Publishing, 2010, pp. 012032-1-012032-5.
10. Boštjan Jančar, Zoran Samardžija, Sašo Šturm, Oleg V. Ovchar, A. Bilous, "Cation-vacancy-induced microstructures of barium cobalt niobate perovskites", In: *Revealing the nanoworld in life and materials science: proceedings*, IMC 17, 17th International Microscopy Congress, Sepetember 19-24, Rio de Janeiro, Brazil, [S. l.], SBMM, = Sociedade Brasileira de Microscopia e Microanálise, 2010, 2 pp.
11. Katja Koenig, Saša Novak, Aljaž Ivetović, Katja Rade, Decheng Meng, Aldo R. Boccaccini, Spomenka Kobe, "Fabrication of CNT-SiC/SiC

REVIEW ARTICLES AND CHAPTERS IN BOOKS

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