Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION

Organized by
Serbian Ceramic Society
&
Institute of Technical Sciences of SASA

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
May 10-11th, 2012, Belgrade, Serbia

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Dear Colleagues and friends,

We have great pleasure to welcome you to the Advanced Ceramic and Application Conference organized by the Serbian Ceramic Society in cooperation with the Institute of Technical Sciences of SASA.

This conference brings together researchers from academia and industry to present the latest advances in synthesis and characterization in the field on new ceramic structures. Chosen conference topics open the new frontiers in designing of advanced ceramic materials, since they cover fundamental theoretical research, modeling and simulation, controlled nanostructured materials synthesis and optimization of the consolidation process, which all together should provide device miniaturization and better perspective in energy-materials-information integration process.

General conference topics include:

- Basic Ceramic Science
- Multifunctional Ceramics
- Nanostructural Ceramics
- Bio- and Opto- Ceramics
- Constructive and Eco- Ceramics
- Magnetic and Amorphous Materials
- Composite Materials, Catalysis and Electrocatalysis
- Artistic Ceramic and Design

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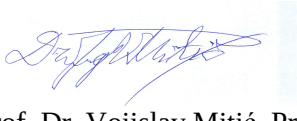

Prof. Dr. Vojislav Mitić, President
Serbian Ceramic Society
World Academy Ceramics' Member

Conference Program

Programme

The First Serbian Ceramic Society Conference »Advanced Ceramics and Application«

Thursday, May 10th, 2012
Hall, 1st floor

08.30 – 09.30 Registration

Great Hall, 2nd floor

09.30 – 10.00 Opening Ceremony of the First Serbian Ceramic Society Conference »Advanced Ceramics and Application«
Prof. Dr. Vojislav Mitić, President of the Serbian Ceramic Society
Dr. Olivera Milošević, President of the Serbian Ceramic Society Assembly

10.00 – 12.00 Plenary Session

10.00 – 10.30 Nanomaterials: Research, Development and Technology (R&D&T) Roadmaps - 2020
Marcel H. Van de Voorde
Delft University of Technology, Delft, The Netherlands

10.30 – 11.00 Preparing and Application of TiO_2 Based Semiconductors as Photocatalysts Activated Under UV and Visible Light Irradiation
S. Rakovsky[1], V. Iliev[1], A. Eliyas[1], D. Jovanović[2]
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11.00 – 11.30 Transition Metals in ZnO Nanocrystals – Magnetic and Structural Properties
I. Kuryliszyn-Kudelska[1], W. Dobrowolski[1] M. Arciszewska[1], N. Romčević[2], M. Romčević[2], B. Hadžić[2], P. Dziawa[1], D. Sibera[3], U. Narkiewicz
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11.30 – 12.00 Fractals in Powder Technology
Ljubiša M. Kocić
University of Niš, 18000 Niš, Serbia

Club SASA, Mezzanine

12.00 – 13.00 Cocktail

Hall, 1st floor

13.00 – 13.30 Poster installation

Hall 1, 1st floor

13.30 – 15.30 1st Session – Basic & Multifunctional
Chairpersons: Dr. Nina Obradović and Prof. Karel Maca

13.30 – 13.55 The Influence of Various Variables on Sintering of Advanced Ceramics
Karel Maca
Dept. of Ceramics and Polymers, Brno University of Technology, Technicka 2, 616 69 Brno, Czech Republic; CEITEC BUT, Brno University of Technology, Technicka 10, 616 00 Brno, Czech Republic

13.55 – 14.15 New Frontiers: Miniaturization and Higher Level $BaTiO_3$ -Ceramics Microelectronics Circuits Integration
V.V. Mitić[1,2], V. Paunović[1], Lj. Kocić[1], S. Janković[3], V. Pavlović[2,4]
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14.15 – 14.35 Influence of Mechanical Activation on the Constituents of the MgO-Al_2O_3-SiO_2-TiO_2 System
N. Đorđević[1], N. Obradović[2], S. Filipović[2], J. Živojinović[2], M. Mitrić[3], S. Marković[2]
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14.35 – 14.55 Explanation of the Driving Force of the Sintering Process on the Basis of Integral Characteristic of the Functions of the Distributions
H. Stefanović, D. Blagojević, Z. Popović, D.Č. Stefanović
Faculty of Electrical Engineering, Niš, Serbia

14.55 – 15.10 Study of Dielectric Behavior and Electrical Properties of Hematite a-Fe_2O_3 Doped with Zn
M.V. Nikolić[1], M.P. Slankamenac[2], N. Nikolić[1], D.L. Sekulić[2], O.S. Aleksić[1], M. Mitrić[3], T. Ivetić[4], V.B. Pavlović[4], P.M. Nikolić[4]
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15.10 – 15.30 Influence of Mechanical Activation on Structural and Properties of Sintering $MgTiO_3$
Vera V. Petrović
School of Electrical Engineering and Computer Science Applied Studies, Belgrade, Serbia

15.30 – 16.00 Coffee break

16.00 – 17.45 2nd Session – Basic & Multifunctional &Magnetic/Amorphous & Constructive/Eco

Chairpersons: Dr. Nina Obradović, Dr. Vesna Paunović, Prof. Nadežda Talijan and Dr. Ljubica Pavlović

16.00 – 16.15 The Master Sintering Surface of Alumina Ceramics Sintered by Spark Plasma Sintering
V. Pouchly[1], K. Maca[1,2], J.Z. Shen[3]
[1]Dept. of Ceramics and Polymers, Brno University of Technology, Technicka 2, 616 69 Brno, Czech Republic, [2]CEITEC BUT, Brno University of Technology, Technicka 10, 616 00 Brno, Czech Republic, [3]Dept. of Materials and Environmental Chemistry, Arrhenius Laboratory, Stockholm University, Svante Arrhenius Vag 16C, S 106 91 Stockholm, Sweden

16.15 – 16.30 Ho_2O_3 Additive Effects on Microstructure and Dielectrical Properties of $BaTiO_3$ Ceramics
Vesna Paunović[1], Vojislav V.Mitić[1,2], Ljiljana Živković[1], Miroslav Miljković[3],
[1]University of Niš, Faculty of Electronic Engineering, Aleksandra Medvedeva 14, Niš, Serbia, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia, [3] University of Niš , Center for Electron Microscopy, Serbia

16.30 – 16.45 Soft Magnetic Properties of MnZn Ferrites Prepared by Powder Injection Molding
Nebojša. S. Mitrović [1], Branislav S. Zlatkov[2], Marija Vesna Nikolić[3], Aleksa M. Maričić[1], Obrad S. Aleksić[3], Herbert Danninger[4]
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16.45 – 17.00 Influence of Thermally Induced Structural Transformations on Magnetic Properties of $Fe_{75}Ni_2Si_8B_{13}C_2$ Alloy
Vladimir Blagojević[1], Milica Vasić[1], Ana Grković[1], Dušan Minić[2], Dragica Minić[1]
[1]Faculty of Physical Chemistry, University of Belgrade, Serbia,
[2]Military Technical Institute in Belgrade, Serbia

17.00 – 17.15 Dendritic Growth of Nonlinear Optical $LiNbO_3$ Crystals in Litium Niobate Silicate Glass Matrix

J.D. Nikolić[1], V.D. Živanović[1], M.B. Tošić[1], S.R. Grujić[2], J.N. Stojanović[1], S.D. Matijašević[1], S.V. Ždrale[2]

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17.15 – 17.30 Clay Brick Compressive Strength and Water Absorption Prediction Using Non-linear Regression and ANN

Milica Arsenović[1], Lato Pezo[2], Zagorka Radojević[1]

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17.30 – 17.45 Pozzolanic Activity Measurements of Domestic and Commercial Clay Materials

E. Lončar[1], S. Pašalić[2], S. Vučetić[1], D. Zorić[1], O. Rudić[1] J. Ranogajec[1]

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Hall 2, 1st floor

13.30 – 15.30 3rd Session – Nano/Bio/Opto-materials and Nanotechnology

Chairpersons: Dr. Lidija Mančić, Dr. Zorica Lazarević, Dr. Vukoman Jokanović

13.30 – 14.00 Contemporary Dental Ceramics

Z.R. Vuličević[1], T. Zupančič Hartner[2], I. Radović[1], V.P. Pavlović[3], V.B. Pavlović[4,5]
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14.00 – 14.30 Mechanochemical Synthesis of Nanocrystalline Multiferroics Based on Bismuth Manganite

Zorica Marinković Stanojević[1], Lidija Mančić[2], Marko Jagodič[3], Zvonko Jagličić[3], Aleksander Rečnik[4], Zorica Branković[1], Goran Branković[1]
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14.30 – 14.45 Raman Study of Ferroelectric Bismuth Titanate

N.Ž. Romčević[1], Z.Ž. Lazarević[1], M.J. Romčević[1], G. Stanišić[1], B. Stojanović[2]
[1]Institute of Physics, University of Belgrade, Pregrevica 118, Zemun, Belgrade, Serbia, [2]The Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia

14.45 – 15.00 Characterization of Nanostructured Spinel $NiFe_2O_4$ Obtained by Soft Mechanochemical Synthesis

Z.Ž. Lazarević[1], Č. Jovalekić[2], M. Slankamenac[3], D. Sekulić[3], M. Romčević[1], A. Milutinović[1], N.Ž. Romčević[1]
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15.00 – 15.15 Sol-gel as a Method to Tailor the Magnetic Properties of $Co_{1+y}Al_{2-y}O_4$

Dušan Milivojević[1], Branka Babić-Stojić[1], Vukoman Jokanović[1], Zvonko Jagličić[2], Dušan Branković[1], Nataša Jović[1], Božana Čolović[1], Svetlana Čupić[1], Dušan Kojić[3]
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15.15 – 15.30 Mechanochemical Preparation of CaO·ZnO – catalyst for Fatty Acids Methyl Esters Synthesis

Ivana Lukić[1], Zeljka Kesić[1], Miodrag Zdujić[2], Dusan Jovanović[3], Hui Liu[4], Dejan Skala[1,3]

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15.30 – 16.00 Coffee break

16.00 – 17.30 4th Session – Nanomaterials & Composites/Electromaterials & Artistic Ceramics

Chairpersons: Dr. Lidija Mančić, Dr. Aleksandra Milutinović-Nikolić and Prof. Zvonko Petković

16.00 – 16.15 Biocompatibility of the Two Materials Based on Porous Apatite after Subcutaneous and Intraperitoneal Implantation

Milena Aleksić[1], Andrea Žabar[1], Perica Vasiljević[1], Ljubiša Đorđević[1], Stevo Najman[2], Vukoman Jokanović[3]

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16.15 – 16.30 Al,Fe-pillared Clay in Catalytic Wet Peroxide Oxidation of Azo Dyes: the Influence of Dye Structure

Predrag Banković, Aleksandra Milutinović-Nikolić, Zorica Mojović, Anđela Abu Rabi-Stanković, Nataša Jović-Jovičić, Tihana Mudrinić, Dušan Jovanović

University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Njegoševa 12, 11000 Belgrade, Serbia

16.30 – 16.45 Surface Modification of High Density Polyethylene by Au^+ ion Implantation Observed by Phase Imaging Atomic Force Microscopy

M. Nenadović[1], J. Potočnik[1], S. Štrbac[2], Z. Rakočević[1]

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16.45 – 17.00 Organo-composite Ceramics: Synthesis and Application

Nataša Jović-Jovičić, Aleksandra Milutinović-Nikolić, Marija Žunić, Predrag Banković, Anđela Abu-Rabi Stanković, Ana Ivanović-Šašić, Dušan Jovanović
University of Belgrade – Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Njegoševa 12, 11000 Belgrade, Serbia

17.00 – 17.15 Structure–property Relationships in Poly(glycidyl methacrylate-co-ethylene glycol dimethacrylate)/clay Nanocomposites

M. Žunić[1], Z. Vuković[1], D. Lončarević[1], D. Maksin[2], Z. Sandić[4], A. Nastasović[3], A. Milutinović-Nikolić[1], D. Jovanović[1]
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17.15 – 17.30 Conservation, Restoration and Reconstruction of Wall Paintings in St. Nikola Church - Palez, near Studenica

Radomir Samardžić
University of Arts in Belgrade, Faculty of Applied Arts, Kralja Petra 4, 11000 Belgrade, Serbia

Hall, 1st floor

18.00 – 19.00 Poster Session

P01 Electrical Properties of Sintered Magnesium- titanate Ceramics
S. Filipović[1], N. Obradović[1], M. Šćepanović[2], V.B. Pavlović[1], V. Paunović[3]
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P02 Kinetics of Mechanically Activated TiO_2-based Oxides Followed by DTA
N. Obradović[1], V.P. Pavlović[2], S. Filipović[1], D. Kosanović[1], V.B. Pavlović[1]
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P03 The Influence of Mechanical Activation on Sintering Process of $BaCO_3$-$SrCO_3$-TiO_2 System
D. Kosanović[1], N. Obradović[1], M. Mitrić[2], V. Pavlović[1], M.M. Ristić[3]
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P04 Structural Changes, Dielectric and Ferroelectric Properties of Tribophysically Activated $BaTiO_3$
V.P. Pavlović[1], V.B. Pavlović[2,3], J. Blanuša[4], G. Branković[5], M. Spreitzer[6], J. Krstić[7]
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P05 Obtaining of Ceramic Materials by the Method of the Thermal Transformation of Cation Exchanged Zeolites
Ana Radosavljević Mihajlović[1], Jovica Stojanović[2], Anja Došen[1], Predrag Vulić[3]
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P06 Pore Geometry of Ceramic Device: the Key Factor of Drug Release Kinetics
Božana Čolović, Dušan Milivojević, Branka Babić Stojić, Vukoman Jokanović
Institute of Nuclear Sciences "Vinča", Laboratory for Radiation Chemistry and Physics, University of Belgrade, 11000 Belgrade, Serbia

P07 Up-conversion Luminescence in Ho^{3+} and Tm^{3+} co-doped Y_2O_3 :Yb^{3+} Fine Powders

V. Lojpur[1], M. Nikolić[2], L. Mančić[1], M.D. Dramićanin[2], O. Milošević[1]
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P08 Aerosol-assisted Processing of Dopamine-TiO_2 Colloidal Solution

Ivan Dugandžić[1], Dragana Jovanović[2], Lidija Mančić[1], Zoran Šaponjić[2], Olivera Milošević[1], Jovan Nedeljković[2]
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P09 Structural Characterization of the Nickel Thin Film Deposited by GLAD Technique

J. Potočnik[1], M. Nenadović[1], B. Jokić[2], S. Štrbac[3], Z. Rakočević[1]
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P10 Characterization of Mechanochemically Synthesized CaO•ZnO/K_2O Mixed Oxides

Željka Kesić[1], Ivana Lukić[1], Miodrag Zdujić[2], Dusan Jovanovic[3], Hui Liu[4], Dejan Skala[1,3]
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P11 Structural Investigations of Polyvinyliden Fluoride Thin and Thick Films

V.B. Pavlović[1,2], D.K. Božanić[3], V.P. Pavlović[4], R. Dojčilović[3], J. Pajović[3], M. Dukić[5], B. Vlahović[5,6]
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P12 A Matlab/Simulink 3D Model of Metal Rings and Discs for Ultrasonic Sandwich Transducer Design

Igor Jovanović[1], Dragan Mančić[1], Vesna Paunović[1], Milan Radmanović[1], Vojislav V. Mitić[1,2]
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P13 Structure and Properties of Nanosized Nickel Ferrite Synthesized by Solid-State Reaction Route

Vladan Ćosović[1], Nadežda Talijan[1], Aleksandar Ćosović[2], Dragana Živković[3], Ljubiša Balanović[3], Tomáš Žák[4], Bohumil David[4]

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P14 Magnetic Properties of NiCuZn LTCC Ferrite Material

Nebojša Mitrović[1], Nelu Blaž [2], Andrea Marić[2], Goran Radosavljević[3], Ibrahim Atassi[3], Walter Smetana[3], Ljiljana Živanov[2]

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P15 Evaluation of Fly Ash Pysico-chemical Characteristics as Component for Eco-ceramic and Sintered Materials

Anja Terzić[1], Ljubica Pavlović[2], Nina Obradović[3], Vladimir Pavlović[4], Zagorka Radojević[1], Ljiljana Miličić[1], Zagorka Aćimović-Pavlović[4]

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P16 Principles of Choice of Refractory Coatings Used in Lost Foam Casting Process

Aurel Prstić[1], Zagorka Aćimović-Pavlović[2], Anja Terzić[3], Ljubica Pavlović[4]

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P17 Properties of Cement Composites Made With Silica Fume and Microfibers

Dragica Lj. Jevtić, Aleksandar R. Savić

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P18 Methanol Electrooxidation on PtRu Modified Zeolite X

Zorica Mojović, Tihana Mudrinić, Anđela Abu Rabi-Stanković, Ana Ivanović, Sanja Marinović, Marija Žunić, Dušan Jovanović

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P19 Organobentonites as Multifunctional Adsorbents of Organo/inorganic Aquatic Mixtures

Nataša Jović-Jovičić[1], Aleksandra Milutinović-Nikolić[1], Marija Žunić[1], Predrag Banković[1], Biljana Dojčinović[2], Ana Ivanović-Šašić[1], Dušan Jovanović[1]

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P20 p-Nitrophenol Electro-oxidation on BTMA- bentonite Modified Electrode

A. Abu Rabi-Stanković, A. Milutinović-Nikolić, N. Jović-Jovičić, P. Banković, M. Žunić, Z. Mojović, D. Jovanović

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P21 Amino-modified Poly(glycidyl methacrylate) Based Nanocomposites: Textural Properties and Application

M. Žunić[1], S. Marinović[1], A. Milutinović-Nikolić[1], Z. Vuković[1], D. Maksin[2], A. Nastasović[3], D. Jovanović[1]

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P22 The Influence of Synthesis Parameters on the Porous Structure of Ceramic Catalyst Supports

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P23 Microstructure and EDS Contact Surfaces Characterization for Statistical Analysis of Doped $BaTiO_3$-Ceramics

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Friday, May 11th, 2012

10.00 – 13.00 Visits to the selected institutes and faculties in Belgrade, consultations with project leaders and round tables

13.00 Sightseeing in and around Belgrade

Abstracts

PS1 – plenary

Nanomaterials: Research, Development and Technology (R&D&T) Roadmaps - 2020

Marcel H. Van de Voorde

Delft University of Technology, Delft, The Netherlands

An overview will be given of nanomaterials and composite developments in the world.

Fundamental research will be the backbone for future industrial success including new theories; design of third generation nanomaterials,; macro, mico-nano computer modelling, …Potential nanomaterials and composites will be highlighted.

Research-development-technology "nanomaterials/composites" roadmaps: 2012 - 2025 for:

- Breakthroughs in communication and information
- Grand challenges in life science and medical applications
- Nanomaterials with tailored functionalities for new generation energy sources
- Role of nanomaterials in transportation: aeronautics and car industry
- Potentials for the chemical industry
- NanoConsumer products
- ……..

Roadmaps 2012 – 2020 for nanoscience environment & climate change and safety

- Man-Made environment
- Climate Change
- Nanopotentials in Safety (Toxicology) and Security
- ……

Guidelines for a prosperous modern university - industry and welfare for the society

- Initiate "university – science/technology institutes -industry" partnerships
- Create European NanoMaterials R&D&T Centres
- Install a European Agency
- Promote Nanoindustrialisation: Technology Parks, nanometrology and standardisation, …
- Initiate European Infrastructures for nanomaterials R&D&T
- Familiarise the Society with the new Culture of NanoTechnology"
- .....

Countries and Industries investing in NanoMaterialsand Composite Sience & Technology

Model for a global nanocmaterials and Composites landscape

NanoMaterials - science, technology and nanoindustrialisation are complex topics and cannot be subject anymore for one institute or industry, or nation. The success rate will depend on joining brilliancies. Models for research and industrial collaboration will be elaborated and mechanisms for execution proposed.

PS2 – plenary

Preparing and Application of TiO_2 Based Semiconductors as Photocatalysts Activated Under UV and Visible Light Irradiation

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Different nano-sized powder photocatalytic materials were prepared based on TiO_2 modified with SiO_2, noble metals (Au, Ag, Pt, Pd) or other semiconductors like WO_3. Modifying TiO_2 with SiO_2 (4%) enables high temperature treatment of the material without the undesired anatase-rutile transition, which deteriorates the photonic efficiency. At modification of TiO_2 surface with noble metals particles the role of the metals is to separate the charge carriers – the photo-excited electrons and the positively charged holes The appearance in that case of Schottky barriers at the metal/semiconductor inter-phase surface preventing the return of the electrons and hindering the recombination process.

The powder photocatalytic materials, as prepared, can be tested directly for their activity only in a suspension (the so called slurry reactors), which are effective but these are batch reactors for water purification only. If you want to test your material in a continuous flow water purification process or in gas phase air purification you have to support the powder on different carriers. We obtained coatings on quartz tubes, glass beads, mullite fibers, SS plates, SS mesh, microscopic glass, TLC silica gel covered Al sheets and cordierite honey comb monolith plates.

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PS3 – plenary

Transition Metals in ZnO Nanocrystals – Magnetic and Structural Properties

I. Kuryliszyn-Kudelska[1], W. Dobrowolski[1] M. Arciszewska[1], N. Romčević[2], M. Romčević[2], B. Hadžić[2], P. Dziawa[1], D. Sibera[3], U. Narkiewicz

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Currently, wide-gap ZnO nanoparticles bear important potential application in electro-optical devices, transparent ultraviolet protection films, and spintronic devices. We have studied the magnetic properties of nanocrystals of ZnO(Fe, Co, Mn) prepared by two methods of synthesis. We have used the microwave assisted hydrothermal synthesis and traditional wet chemistry method followed by calcination. The detailed structural characterization was performed by means of X-ray diffraction and micro-Raman spectroscopy measurements. The morphology of the samples was studied by means of SEM microscopy. The results of systematic measurements of AC magnetic susceptibility as a function of temperature and frequency as well as SQUID magnetization are presented. The SQUID magnetization measurements revealed a clear bifurcation of the FC and ZFC plots. Such behaviour suggested superparamagnetic behaviour above the blocking temperature. The dynamic magnetic measurements were performed at small AC magnetic field with amplitude not exceeding 5 Oe and different frequency values (from 7 Hz to 9970 Hz). For ZnO(Fe) and ZnO(Mn), the AC susceptibility maxima has been found for in-phase susceptibility $Re(\chi)$ and for out of phase susceptibility $Im(\chi)$. We analyzed the observed frequency dependence of the peak temperature in the AC susceptibility curve using the empirical parameter Φ that is a quantitative measure of the frequency shift and is given by the relative shift of the peak temperature per decade shift in frequency, as well as Vogel-Fulcher law. We observed two different types of magnetic behaviour, spin-glasslike behaviour or superparamagnetic behaviour, depending on the synthesis process. For ZnO(Co) nanocrystalline samples high temperature Curie-Weiss behavior in AC magnetic susceptibility was observed. We observed that the determined negative values of the Curie-Weiss temperature θ depend strongly on the nominal content of cobalt oxide. It was shown that for calcination method the values of θ increase with the increase of magnetic ion content indicating enhancement of predominance of antiferromagnetic interactions. For hydrothermal method the opposite effect was observed indicating the breakdown of predominance of aniferromagnetic coupling with the increase of nominal magnetic ion content.

This review gives an in-depth discussion of the structural and magnetic properties of ZnO nanocrystals in addition to the technological issues such as different methods of wet chemical synthesis.

PS4 – plenary

Fractals in Powder Technology

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Although systematic exploration of fractals goes back to the end of 20th Century, the new geometry had already found its place in modern technology. Fractal geometry deals with uneven and complex objects and processes. The real breakthrough was understanding dimension, and acceptance that dimension may not be only a natural number but also a fractional one. Using sophisticated fractal techniques being developed during last 30 years, it turned that many contemporary technological issues, might be better understood by their applications. It heavily relates on powder technologies, powder metallurgy, sintering processes and ceramics of different kinds. Our stress will be set on describing application of fractal dimension, scaling power law, fractal interpolation and approximation and other tools in reversible design and simulation of ceramic grains and pores. Impact of fractal structure on some physical characteristics of ceramic materials will be separately enlightened.

S1.1 – invited

The Influence of Various Variables on Sintering of Advanced Ceramics

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There are many ways how to improve the sintering of advanced ceramic materials. As the microstructure of the green body has the basic influence on sintering, the main interest of ceramic scientist is focused on improving of synthesis of non-agglomerated nanometric powders as well as shaping them to the homogenous green body with small pores. However there are also other variables influencing sintering behaviour, final microstructure and phase composition of the sintered body, e.g. applying of external pressure, choice of sintering atmosphere and choice of sintering heating schedule.

The presentation provides the review of our recent investigations dealing with the influence of various variables on sintering of advanced oxide ceramic materials (alumina, zirconia, ceria, …). Special attention will be paid on the choice of different pressure-less heating profiles, and their influence on the final microstructure of oxide ceramic materials. It was examined whether, with the same final density achieved, some sintering profiles can lead to a decrease of the grain size of sintered ceramics. The concept of Master Sintering Curve was applied to describe sintering kinetics.

S1.2

New Frontiers: Miniaturization and Higher Level $BaTiO_3$ -Ceramics Microelectronics Circuits Integration

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Since that the scientific and technological efforts to further miniaturization, "better packaging" and higher levels of integration of electronic components and subsystems, and modern microelectronics devices are increasingly limited, the new field of scientific views and perspectives in previously presented scientific work, contribute and create new solutions of electronics and materials science higher unity with the goal to be recognized the desired functions and highly integrated electronic properties with in the different microstructures levels.

In this study, in order to establish grain shapes of sintered ceramics, new approach on correlation between microstructure and properties of rare-earth doped $BaTiO_3$ -ceramics based on fractal geometry, related to intergranular contact surfaces and mathematical statistics calculations has been developed.

$BaTiO_3$-ceramics doped with different additives (Mn, La, Er, Yb, Ho,) were prepared using conventional solid state procedure and sintered at 1320°C.

The microstructure of specimens was investigated by SEM-5300 and capacitance has been done using LCR-meter Agilent 4284A. By using fractal modeling method of microstructure configurations reconstruction, like shapes of grains or intergranular contacts has been successfully done. Furthermore, the area of grains surface was calculated using fractal correction that expresses the irregularity of grains surface through fractal dimension

For better and deeper characterization of the ceramics material microstructure the Voronoi model, mathematical statistics calculations, microstructure analysis on vertical view od the fracture between two pieces of samples, and contact surfaces analysis between the particles and grains, are applied

The presented results indicate that fractal method for analysis of the structure of ceramics provides a new approach for describing, predicting and modeling the grain shape and relations between the $BaTiO_3$ -ceramic structure and dielectrical properties.

S1.3 – invited

Influence of Mechanical Activation on the Constituents of the $MgO-Al_2O_3-SiO_2-TiO_2$ System

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Cordierite, $2MgO{\cdot}2Al_2O_3{\cdot}5SiO_2$, is a very attractive high-temperature ceramic material, due to its outstanding electrical characteristics, such as the low temperature expansion coefficient, low dielectric constant and good mechanical properties. In order to accelerate the process of sintering, 5.00 mass% TiO_2 has been added to the starting mixtures. The mechanical activation of the starting mixtures was performed in a high energy ball mill during 0-80 minutes. The particle size analysis (PSA) was employed in order to determine the changes in the particle size of the mechanically treated powders. The phase composition of the starting powders was analyzed by the X-ray diffraction method. XRD showed decrease in peaks intensities and no new phases. Furthermore, differential thermal analysis (DTA) was used in order to determine characteristic temperatures within the system during heating. Based on the obtained DTA results, it was established that mechanical activation has some influence on temperatures of phase transitions.

S1.4 – invited

Explanation of the Driving Force of the Sintering Process on the Basis of Integral Characteristic of the Functions of the Distributions

H. Stefanović, D.Blagojević, Z. Popović, D.Č. Stefanović

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The well known electronic theory of the sintering process is based on the configuration model of material. At the same time the macroscopic theory of the sintering process is based on the thermodynamically analyses of different models of diffusion and different models of defects. By analyzing the diffusion of atoms during the isothermal sintering process, by separating subsystems with constant number of the particles, and with constant energy, for maximal subsystem entropies, and on the basis of integral characteristics of the function of the distribution of the grain size, we are made the contributions to the theory of sintering process. It leads to changes of the particle number in accessible states. This way, an original model of thermo diffusion was obtained which enables a relatively simple analysis of some stages of the sintering process. Using obtained results, with unique view, we were able to consider different ways during the sintering process of ceramic powders.

S1.5

Study of Dielectric Behavior and Electrical Properties of Hematite α-Fe_2O_3 Doped with Zn

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The effects of Zn-doping on the dielectric behavior and electrical properties of bulk α-Fe_2O_3 have been studied. X-ray diffraction analysis revealed the presence of two phases in all samples: hematite and spinel $ZnFe_2O_4$, with the amount of spinel phase increasing with increasing Zn content. Scanning electron microscopy analysis combined with energy dispersive X-ray spectroscopy showed that the Zn-bearing phase occurred in the form of individual spinel $ZnFe_2O_4$ grains in a hematite matrix. DC conductivity was measured in the temperature range 25-225^oC (298-498 K). Impedance spectroscopy measurements in the same temperature range were carried out in the frequency range 100Hz to 10 MHz. Increase in the Zn content resulted in increased electrical conductivity and higher values of the dielectric constant. The resistance and capacitance of grains and grain boundaries were analyzed by modeling the experimental results using an equivalent circuit.

Keywords: X-ray diffraction; scanning electron microscopy, SEM; dielectric response; electrical transport.

S1.6

Influence of Mechanical Activation on Structural and Properties of Sintering $MgTiO_3$

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Magnesium titanate based dielectric materials are used for producing type-I capacitors. A common way of obtaining this material is a solid-state reaction during reaction sintering. The process of sintering can be enhanced if mechanical activation precedes. In this work starting powders of magnesium carbonate ($MgCO_3$) and titanium dioxide (TiO_2) with a rutile crystal modification. Mechanical activation of the starting mixture was performed by high energy ball milling using ZrO balls and vessels with a ball to powder mass ratio of 40:1. The observed grinding times were 15, 30, 60 and 120 minutes. Powder characterization was conducted using DTA analysis up to 1000^oC and particle morphology changes were observed with Scanning Electron Microscopy. Isothermal sintering of compacted powders was conducted at 1100^oC during 30, 60 and 180 minutes. For specimens synthesized in such a manner, microwave dielectric properties were measured, quality factor *Q*, specific electrical resistivity (ρ) and the dielectric constant (ε_r).

S2.1

The Master Sintering Surface of Alumina Ceramics Sintered by Spark Plasma Sintering

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The concept of Master Sintering Curve (MSC), in which densification curve for any pressure-less heating profile can be predicted, was applied on sintering of alumina ceramics in Spark Plasma Sintering (SPS) apparatus. The Master Sintering Curve was enhanced by pressure variable to create so-called Master Sintering Surface (MSS). Since the construction of MSS requires many repeated calculations, the new software for fast finding of MSS was developed. The MSS was successfully constructed for Spark Plasma Sintered alumina powder for pressure range 0-100 MPa. The activation energy of Spark Plasma Sintering was very similar to activation energy of conventional pressure-less sintering: ~600kJ/mol. Validity of the model was verified through experimental data which showed good agreement with predicted densification curves in a wide range of relative densities.

S2.2

Ho_2O_3 Additive Effects on Microstructure and Dielectrical Properties of $BaTiO_3$ Ceramics

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Doped $BaTiO_3$-ceramics is very interesting for its application as resistors with PTCR, multilayer ceramics capacitors, thermal sensors etc.

Ho doped $BaTiO_3$ ceramics, with different Ho_2O_3 content, ranging from 0.01 to 1.0 wt% Ho, were investigated regarding their microstructural and dielectric characteristics. The samples were prepared by the conventional solid state reaction and sintered at 1320°, 1350 ^oC and1380^oC in an air atmosphere for 4 hours.

The grain size and microstructure characteristics for various samples and their phase composition were carried out using a scanning electron microscope SEM equipped with EDS system. SEM analysis of Ho/$BaTiO_3$ doped ceramics showed that in samples doped with a low level of rare-earth ions, the grain size ranged from 10-40μm, while with the higher dopant concentration the abnormal grain growth is inhibited and the grain size ranged between 2-10μm.

Dielectric measurements were carried out as a function of temperature up to180°C. The low doped samples sintered at 1380°C, display the high value of dielectric permittivity at room temperature, 2500 for 0.01Ho/$BaTiO_3$. A nearly flat permittivity-response was obtained in specimens with higher additive content. Using a modified Curie-Weiss low the Curie constant (C') and a critical exponent γ were calculated.The obtained values of γ pointed out the diffuse phase transformation in heavily doped $BaTiO_3$ samples.

S2.3

Soft Magnetic Properties of MnZn Ferrites Prepared by Powder Injection Molding

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In this work, properties of soft-magnetic manganese zinc ferrite manufactured by powder injection molding – PIM technology were presented. A fine powder consisting of $Mn_{1-x}Zn_xFe_2O_4$ with small addition of hematite □-Fe_2O_3 as used in mass ferrite production was mixed with an organic binder (Solvent System) to form ferrite feedstock for powder injection molding – PIM technology. The ferrite feedstock was injected in a mold with a cavity shaped like a small cylinder with a hole on the main axis. Injection molded samples were then solvent and thermally debinded and sintered in air atmosphere. Structures of sintered samples were characterized using X–ray diffractometry, scanning electron microscopy and thermomagnetic measurements. Magnetic properties were measured by hysteresis graph at different frequencies up to 1 kHz.

Sintered sample contains a mixture of two phases $Mn_{0.6}Zn_{0.4}Fe_2O_4$ (68 wt. %) and α-Fe_2O_3 (33 wt. %). The Curie temperature is $T_C \approx 490$ K for the green sample but after the heating up to 500 K, T_C increase up to about 570 K. The high increase of normalized magnetic permeability of about 800 % was observed after the heating up to 750 K due to melting and burning of binder. The hysteresis loop of MnZn ferrite toroidal cores has an R-shape with saturation of 0.44 T and remanence ratio of 0.49. The low value of coercivity (only 47 A/m) was related to the presence of α-Fe_2O_3 crystalline phase, attained already optimum density (ρ = 4.8-4.9 g/cm³) i.e. observed low level of porosity. Attained relative magnetic permeability □$_r \approx 2000$ is in agreement with the MnZn ferrite commercial samples (initial permeability 2500 ± 25%) prepared by traditional sintering technology.

S2.4

Influence of Thermally Induced Structural Transformations on Magnetic Properties of $Fe_{75}Ni_2Si_8B_{13}C_2$ Alloy

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Thermal treatment of $Fe_{75}Ni_2Si_8B_{13}C_2$ amorphous alloy induces changes in its magnetic properties. Some of these changes are caused by crystallization and crystal growth processes induced by thermal treatment. In order to correlate changes in magnetic properties with structural changes induced by thermal treatment, phase composition microstructure of $Fe_{75}Ni_2Si_8B_{13}C_2$ alloy had been investigated using XRD, SEM and Mössbauer spectroscopy, while thermally stability were monitored using DSC. Changes in magnetic susceptibility were monitored by recording a thermomagnetic curve for the alloy in temperature range of 25-800^{o}C. The measurements showed a correlation between thermally induced structural transformations of $Fe_{75}Ni_2Si_8B_{13}C_2$ amorphous alloy and the observed changes in its magnetic properties, especially in the region of crystallization of the alloy.

S2.5

Dendritic Growth of Nonlinear Optical $LiNbO_3$ Crystals in Litium Niobate Silicate Glass Matrix

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The aim of this work is the study of the crystallization mechanism of the $LiNbO_3$ crystals in litium niobate silicate glass. The parent transparent glass composition of $30Li_2O{\cdot}15Nb_2O_5{\cdot}50SiO_2{\cdot}5TiO_2$ (mol%) was obtained by standard melt quenching technique. The glass crystallization experiments were performed in the temperature range T=590-840 ^{o}C for different times under isothermal condition. As-quenched and heat treated glass samples were studied by DTA, XRD and SEM methods. It was shown that at T = 660 ^{o}C for t=2h only $LiNbO_3$ crystal precipitated in a glass matrix while at higher temperatures $Li_2Si_2O_5$ and SiO_2-quartz were formed. The volume fraction of $LiNbO_3$ crystals in fully crystallized sample calculated from XRD data for T= 840 ^{o}C and t=100 h is 55,86 wol%. SEM micrographs revealed that the surface and bulk crystallization mechanism coexist and the crystal growth morphology is dendritic. A random orientation of the $LiNbO_3$ crystals in glass matrix was observed. By analysis of Bragg peaks of XRD patterns the nano-sized $LiNbO_3$ crystallites which do not show preferential growth direction along c-axis were determined. It was established that the increase of crystallites dimension strongly depend on temperatures and times of the glass heat treatment.

S2.6

Clay Brick Compressive Strength and Water Absorption Prediction Using Non-linear Regression and ANN

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Heavy clay samples used in this research were collected at 84 locations in Serbia. The effects of chemical composition, various firing temperatures, and several shape format of laboratory samples on the compressive strength and water absorption were investigated in this paper. Prediction of compressive strength and water absorption was done by non-linear regression analysis and five artificial neural networks. Analysis of variance showed significant effects ($p<0.05$) of all processing factors. The statistical comparison methods such as r^2, χ^2, MBE and RMSE were used to explore the confidence level of the models. Developed models were able to predict compressive strength and water absorption in a wide range of chemical composition and temperature treatment data, and the highest average regression coefficient (r^2) of 0.993 for compressive strength was obtained, while r^2 for water absorption was 0.996. Obtained ANN model performs better when compared to developed empirical non-linear multivariable regression model. The wide range of processing variables were considered for the formulation of this model, and its easy implementation in a spreadsheet using a set of equations, makes it very useful and practical for compressive strength and water absorption prediction

Key words: clay brick, compressive strength, water absorption, regression, artificial neural network
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S2.7

Pozzolanic Activity Measurements of Domestic and Commercial Clay Materials

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One of the main problems of immovable cultural and historical monuments protection is the selection of an appropriate mortar. New designed mortars in the field of cultural heritage need to possess certain properties. Pozzolanic activity is one of the most important. The aim of this work is pozzolanic activity quantification of two types of domestic raw clay materials from Serbia and two types of commercial materials previously used for restoration and conservation of cultural heritage objects. New methods based on spectrophotometric and volumetric measurements were developed in order to assess the pozzolanic activity in addition to the standard flexural strength and conductometric methods. The new developed methods of the pozzolanic activity quantification were based on the measurement of calcium ions consumption in $Ca(OH)_2$ aqueous solutions of examined clay materials. The design of new mortars with adequate mechanical and pozzolanic properties based on domestic clays presents a significant step toward solving restoration problem of cultural and historical monuments.

S3.1 – invited

Contemporary Dental Ceramics

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The aim of this study was to provide an overview of evolution of ceramic systems and future perspectives related to computer-aided design and computer-aided manufacturing (CAD/CAM) technology.

Dental ceramics were introduced to restorative dentistry at the beginning of the XX century as porcelain jacket crowns. However, their limited use in clinical practice was mainly associated to the mechanical shortcomings. In the early sixties porcelain-fused to-metal restorations were developed and for years have represented the “gold standard”, thanks to their good mechanical properties and to somewhat satisfactory esthetics. In the last thirty years, the growing demand for highly esthetic restorations has led to development of new all-ceramic materials and techniques.

All-ceramic restorations combine esthetic veneering porcelains (consisting of a glass and a crystalline phase of fluoroapatite, aluminum oxide, or leucite) with strong ceramic cores, mainly made of lithium-disilicate, aluminum-oxide or zirconium-oxide. The most common complication is fracture that can initiate from several different sites on the surface, at interfaces, or within the material.

While conventional methods of ceramic fabrication usually contain internal porosity, CAD/CAM technology ensures almost no internal defects. Such improvements in ceramic processing have allowed better structural reliability and greatly contributed to the success of all-ceramic systems.

S3.2 – invited

Mechanochemical Synthesis of Nanocrystalline Multiferroics Based on Bismuth Manganite

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Multiferroic materials simultaneously possess two or more ferroic orders, and enable a coupling interaction between them. Multiferroic bismuth manganite is known as a material that exhibits both ferromagnetic and ferroelectric properties making it interesting for various technological applications. Unfortunately, preparation of $BiMnO_3$ is not possible by conventional solid state reaction and $BiMnO_3$ has been synthesized from the mixture of oxides only at high pressures (> 40 kbar). The aim of this work was to synthesize $BiMnO_3$ (BMO) without additional heating or application of high pressures. Nanocrystalline single-phased $BMnO_3$ was prepared for the first time by mechanochemical synthesis directly from the highly activated constituent oxides, Bi_2O_3 and Mn_2O_3, in a planetary ball mill. The obtained materials were characterized by X-ray diffraction, SEM with EDS analysis, HRTEM and magnetization measurements. All the samples were found to be tetragonal perovskite with P4mm crystallographic group. The broad maxima reflections of BMO samples can be ascribed to an amorphous/disordered phase. HRTEM micrographs give clear evidence of core-shell structure with amorphous shell around the nanocrystalline BMO particles. The magnetic hysteresis behavior is similar to that of a soft ferromagnet. The magnetic properties of the obtained BMO powders were found to change as a function of milling time in a manner consistent with the variation in the nanocomposite microstructure.

S3.3

Raman Study of Ferroelectric Bismuth Titanate

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$Bi_4Ti_3O_{12}$ powder was synthesized from bismuth oxide and titanium oxide in the planetary ball-mill during 1 to 6 h. Extended time of milling directed to formation of higher amount of titanates perovskite phase. The phase formation of $Bi_4Ti_3O_{12}$, crystal structure and powder particle size were followed by XRD, Raman and SEM analysis. Only 12 Raman active modes are clearly observed. When reducing the particle size, quantum effects at the Raman spectra, is reflected in the mode position change against bulk crystal. Main difference in obtaining Raman spectra of nanosized powders $Bi_4Ti_3O_{12}$ from mechanically activated Bi_2O_3-TiO_2 mixture, in regard to obtaining Raman spectra of samples the same through other procedures of synthesis or bulk crystals can be notice in simultaneous existence Raman lines which correspond to both orthorhombic and tetragonal structure. Smanjenje dimenzije kristalita utiče da se na sobnoj temperaturi, ispod nekih karakterističnih dimenzija, površina kristalita ponaša kao da je prisutna samo tetragonalna faza, dok se unutrašnjost ponaša kao da je prisutna ortorombična faza.

S3.4

Characterization of Nanostructured Spinel $NiFe_2O_4$ Obtained by Soft Mechanochemical Synthesis

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Powdery $NiFe_2O_4$ has been obtained by soft mechanochemical synthesis in a planetary ball mill. $Ni(OH)_2$ and $Fe(OH)_3$ are used as initial compounds. This mixture was mechanically activated for 25h, 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 298-473K. A personal computer with in-house-built software was used for acquisition of measured data. The samples were made in the form of circular pellets. Before starting the measurements the samples were heated at 373K for 1h, so as to homogenize the charge carriers and to remove the moisture content therein. The surface of the disks was coated on adjacent faces with silver paste, thereby forming parallel plate capacitor geometry. For analysis of the relaxation mechanism the sintered $NiFe_2O_4$, we can use the complex impedance spectrum of which explains what kind of dielectric relaxation exists in the frequency-dependent response of the samples.

S3.5

Sol-gel as a Method to Tailor the Magnetic Properties of $Co_{1+y}Al_{2-y}O_4$

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The magnetic properties of mesoscopic materials are modified by size and surface effects. We present a sol-gel method used to tailor these effects, and illustrate it on $Co_{1+y}Al_{2-y}O_4$ spinel. Nanocomposites made of spinel oxide $Co_{1+y}Al_{2-y}O_4$ particles dispersed in an amorphous SiO_2 matrix were synthesized. Samples with various mass fractions -*x* of $Co_{1+y}Al_{2-y}O_4$ in composite, ranging from predominantly SiO_2 (x = 10 wt%) to predominantly spinel (x = 95 wt%), and with various *y* were studied. The spinel grain sizes were below 100 nm with a large size distribution, for samples with predominant spinel phase. Those samples showed Curie-Weiss paramagnetic behavior with antiferromagnetically interacting Co ions ($\theta \approx$ -100 K). The grain sizes of spinel stays confined in 100 nm range even in the spinel samples diluted with as low as 5 wt% concentration of amorphous SiO_2. For the samples with predominant SiO_2 the crystalline nanoparticles are well separated and of size of around 100 nm, but with presence of much smaller spinel nanoparticles of about 10 nm. The magnetic properties of the samples with predominant spinel phase showed complex behavior, spin-glass magnetic freezing at the lowest temperatures and lower absolute value of θ and consequently lower exchange constant.

S3.6

Mechanochemical Preparation of CaO·ZnO – catalyst for Fatty Acids Methyl Esters Synthesis

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One of the catalysts that show excellent activity in the methanolysis of vegetable oil under moderate reaction conditions is the mixture of CaO and ZnO oxides. In this study CaO·ZnO catalyst was synthesized by mechanochemical treatment of ZnO and $Ca(OH)_2$ or CaO powder mixture (using molar ratio of CaO (or $Ca(OH)_2$):ZnO of 1:2) with the addition of required water amount to form calcium zinc hydroxide hydrate ($CaZn_2(OH)_6 \cdot 2H_2O$) and subsequent calcinations at 700 °C in air atmosphere. The methanolysis of sunflower oil was studied at 60 ^oC with the molar ratio of methanol to oil of 10:1 and with 2 wt% of catalyst based on oil weight. Characterisation of the catalyst was performed by XRD, TGA/DSC, FTIR, the particle size distribution and Hammett indicator method. The solubility of the catalyst in methanol at 60 °C was also determined by measuring the calcium(II) and zinc(II) concentration. The results showed that whether $Ca(OH)_2$ or CaO were used as a starting material, after calcination an active catalyst composed of CaO and ZnO was obtained. When CaO was used in the starting mixture, basicity was slightly higher, while the amount of present carbonates was lower.

S4.1

Biocompatibility of the Two Materials Based on Porous Apatite after Subcutaneous and Intraperitoneal Implantation

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Bone tissue reconstruction and reparation is big challenge in medicine. Biomaterials based on apatite are widely used in reparation of bone defects. The aim of the study was to examine the biocompatibility of two materials, porous apatite (PA) and porous apatite with a thin film of polymer-based ether modified starches (PA+S) *in vivo*. Biomaterials PA and PA+S were implanted in BALB/c mice subcutaneously in the interscapular region and intraperitoneally. Each material has been implanted alone and with blood plasma. After two weeks, the implants with surrounding tissue were surgically removed from mice. The tissues were then fixed in 10% formalin, decalcified in formic acid and further processed by making histological preparations. Histological sections were stained with Harris haematoxylin and eosin and Masson trichrome stains, and observed using light microscopy. In all implants after 2 weeks we observed macrophage/osteoclasts activity, angiogenesis and genesis of collagen. These results showed that PA and PA+S have good biological properties.

S4.2

Al,Fe-pillared Clay in Catalytic Wet Peroxide Oxidation of Azo Dyes: the Influence of Dye Structure

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Bentonite clay from "Bogovina" (Serbia) was pillared with Al^{3+} and Fe^{3+} pillaring cations. Iron to aluminium content in the pillaring solution was adjusted to be $[Fe^{3+}/(Al^{3+} + Fe^{3+})]\times100=15\%$. Obtained pillared clay (denoted as AlFe15 PILC) was characterized and used as catalyst in the catalytic wet peroxide oxidation (CWPO) of Tartrazine and Acid Yellow 99 azo dyes. The effect of initial dye concentration, ranging from 10–50 ppm, was studied on the example of Tartrazine. On the basis of obtained results the initial reaction order was estimated. The conversion after 4 h reached 99.8% in the most diluted Tartrazine solution at 60°C. The efficiency of the conversion of Acid Yellow 99 on AlFe15 PILC by CWPO was tested, and the results were compared. It was shown that the rate of conversion of Acid Yellow 99 was much higher. Complete decolorization in the case of 25 ppm solution of Acid Yellow 99 was achieved after 1 h. Correlation between structural properties of the dyes and their removal efficiency was proposed.

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S4.3

Surface Modification of High Density Polyethylene by Au^+ ion Implantation Observed by Phase Imaging Atomic Force Microscopy

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High density polyethylene (HDPE) has been modified by Au^+ ions implantation with the energy of 200 keV. The doses of implanted gold ions were: 1×10^{15}, 5×10^{15} and 1×10^{16} ions/cm^2. Surface topography was observed by atomic force microscopy (AFM), while surface composition changes were detected by phase imaging AFM. Phase analysis of AFM images has shown that both physical and chemical changes occured on the surface of HDPE and that those changes depended on the implantation dose. The implantation of gold ions caused a high degree of physical changes. Breakpoints were observed for the implantation dose of 4.4×10^{15} ions/cm^2. Physical changes are confirmed by the analysis of mean square roughness and power spectral density (PSD) slopes as functions of the implantation dose. The position and half-width of peaks in histograms of phase AFM images confirmed the changes in surface composition.

S4.4

Organo-composite Ceramics: Synthesis and Application

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The synthesis of organo-bentonites (OBs) obtained by modification with quaternery alkyl ammonium cations (QAACs), their characterization and evaluation of their efficiency as adsorbents for organic and inorganic aqueous pollutants was investigated. In this work starting material was bentonite clay from Bogovina, Serbia, with particle diameters of up to 74μm. The amount of incorporated QAACs corresponded to 0.0, 0.2, 0.5, 1.0 and 2.0 CEC value of the clay. The phase composition, textural and morphological properties of starting material and OB samples were determined by XRD and IR analyses, N_2 physisorption and SEM microscopy. It was found that the applied modification procedures resulted in the exclusive exchange of cations from the smectite interlamellar region, with no impact on the accompanying minerals present in bentonite (quartz, calcite, feldspar). The modification of clay surface with QAACs is a method to obtain organoclays by transforming clay surface from organophobic to strongly organophilic and therefore increasing the adsorption capacity for the adsorption of organic pollutants. In addition, this kind of modification greatly increases anionic adsorption capacity especially when surfactant loading exceeds the CEC of clay. This kind of QAAC-containing organobentonite has been extensively used for a wide variety of environmental applications.

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S4.5

Structure–property Relationships in Poly(glycidyl methacrylate-*co*-ethylene glycol dimethacrylate)/clay nanocomposites

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In situ polymerization was used to synthesize poly(glycidyl methacrylate-*co*-ethylene glycol dimethacrylate)/bentonite nanocomposites, by adding various amounts of raw or acid modified bentonite clays of different origin (Bogovina, Serbia and Wyoming, USA) in previously optimized reaction mixture for synthesis of macroporous crosslinked poly(glycidyl methacrylate-*co*-ethylene glycol dimethacrylate) copolymer. Samples were characterized by Attenuated Total Reflectance (ATR) Infrared (IR) spectroscopy, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), thermogravimetric (TG) and elemental and textural analysis (mercury intrusion porosimetry and low temperature physisorption of nitrogen). The FTIR and TEM confirmed incorporation of acid modified bentoniteinto the copolymer structure and formation of nanocomposites in form of both intercalated and exfoliated nanocomposites. Significant increase of specific surface area, pore volume and porosity of nanocomposites in comparison to copolymer were obtained. The obtained composites retained their macroporosity and might be used in all applications that involve macroporous copolymers and, due to the altered thermal properties, their application may be extended.

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S4.6

Conservation, Restoration and Reconstruction of Wall Paintings in St. Nikola Church - Palez near Studenica

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The goal of this project was to educate young experts-students of Faculty of Applied Arts in Belgrade in the field of conservation and restoration of wall paintings. We intended that students, by working on original 14th century wall painting, finalize their five year education, as well as to contribute to the protection of Serbian cultural and historical heritage. We used the latest methods and the most adequate materials in conservation and restoration of immovable cultural heritage, and we respected the principles of conservation-restoration ethics. The project is conducted completely successfully, wall painting is conserved, restored, reconstructed and prepared to be returned on a wall surface from which it originally fell, and it confirmed the ability level of graduate students in their line of work. This project meant extension of successful cooperation between Faculty of Applied Arts and Office of the Republic Protection of Cultural Monument in Belgrade, which entrusted this work to professors and students of the faculty.

P01

Electrical Properties of Sintered Magnesium- titanate Ceramics

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Mixtures of MgO and TiO_2 were mechanically activated in a planetary ball mill for different time intervals. Thus obtained powders were sintered in a furnace for 2 h at temperature of 1300 ^oC in air atmosphere. Raman scattering spectroscopy at room temperature has been used for characterization of sintered samples. Very similar spectra for all samples were observed, which indicate that there has been structure recovery during treatment at higher temperature. SEM analyses were performed in order to investigate effect of activation and sintering process on microstructure. Electrical measurements showed difference in dielectric constant (ε_r), loss tangent (tgδ) and specific resistance (ρ) as a function of time of mechanical treatment. The aim of this paper was to determine optimal parameters for materials preparation with a goal to obtain dense ceramic with appropriate characteristic.

P02

Kinetics of Mechanically Activated TiO_2-based Oxides Followed by DTA

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TiO_2-based materials are widely used in production of ceramic capacitors and semiconductors. The conventional method of ceramics synthesis relies on the solid-state reaction between TiO_2 and other compounds ($BaCO_3$, BaO, ZnO, MgO and $SrCO_3$) at high temperatures. During this reaction control of final stoichiometry and powder characteristics are difficult to maintain, because of the lack of the consistency in initial raw material's mixture and the existence of local inhomogeneities in reaction product which occur as a result of incomplete mixing and incomplete reaction of the constituents. In the most cases the sintering kinetics of these ceramics are determined by several parameters, including pressed powder density, material's particle size, sintering temperature, atmosphere etc. As a result, during thermal treatment mass transport by plastic flow, bulk diffusion, surface and volume diffusion, grain boundary diffusion, or a combination of these processes may occur. In order to produce nanocrystalline powders and improve the sintering kinetics, high energy mechanical activation can be employed among other methods.

DTA analyses indicated that the position of DTA exothermic peak assigned to the process of ceramics formation was shifted toward lower temperatures in activated samples. The distinction in that peak magnitude due to activation process was observed as well. These results pointed out an increase of the solid state reaction rate, due to activation process. It was concluded that mechanical activation provoked the acceleration of mass transport and enhanced the nucleation probability of a new phase, which caused the decrease of synthesis reaction temperature.

P03

The Influence of Mechanical Activation on Sintering Process of $BaCO_3$-$SrCO_3$-TiO_2 System

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In this article the influence of mechanical activation on sintering process of barium-strontium-titanate ceramics has been investigated. Both non-activated and mixtures treated in planetary ball mill for 5, 10, 20, 40, 80 and 120 minutes were sintered at 1100-1400 ^oC for 2 hours in air atmosphere. The influence of mechanical activation on phase composition and crystal structure has been analyzed by XRD, while the effect of activation and sintering process on microstructure was investigated by scanning electron microscopy. It has been established that temperature of 1100 ^oC was to low to induce final sintering stage for the system. Electrical measurements have been conducted for the densest ceramics sintered at 1400 ^oC for 2 hours.

P04

Structural Changes, Dielectric and Ferroelectric Properties of Tribophysically Activated $BaTiO_3$

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In order to obtain nanocrystalline material which can be used in MLCC production, the investigations of the influence of $BaTiO_3$ powder tribophysical activation (TPA) on its structural changes, dielectric and ferroelectric properties have been performed. Microstructure development and crystal structure have been studied by mercury porosimetry method, SEM, EDS and X-ray powder diffraction analyses. The modifications of dielectric and ferroelectric properties of sintered samples have been examined and correlated with observed structural changes induced by TPA of starting powders. It has been found that dielectric and ferroelectric properties of tribophysically activated $BaTiO_3$ could be tuned by controlling the grain size and lattice strain of activated nanostructured material.

P05

Obtaining of Ceramic Materials by the Method of the Thermal Transformation of Cation Exchanged Zeolites

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The method of the thermal treatment of cation exchanged zeolites (ZTIT) is shown as very acceptable for synthesis of alkaline earth and alkaline framework aluminosilicates. In this work, are presented the results of the thermally induced phase transformation of Ba, K, Ag and Pb-exchanged LTA zeolites. The phase conversions in the temperature range from room temperature to 1300 ºC were investigated and followed by thermal (DTA/TGA), X-ray powder diffraction and SEM/EDAX analyses. Also, we investigated the XRD pattern line broadening and influence of the different cations to the microstructure parameters. The crystal structure and microstructural parameters were refined using Rietveld method. It is concluded that the type and valence state of the extraframework cations give rise to recrystallization of amorphous substances to the different framework topologies.
Keywords - Ceramics, ZTIT synthesis, X-ray powder diffraction, microstructure.

P06

Pore Geometry of Ceramic Device: the Key Factor of Drug Release Kinetics

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Release kinetics of tigecycline, a potential antibiotic in treatment of osteomyelitis, from calcium hydroxyapatite (CHA), as one of the most important ceramic materials in bone tissue engineering, was investigated in this study. Tigecycline, in solid state, was mixed with CHA powder and the obtained mixture was compressed into tablets. The release of tigecycline from these tablets in a pH 7.4 phosphate-buffered saline solution was measured by a UV-VIS spectrophotometer. The release time varied from 5 to 30 days, depending on the applied pressure during tablet compression and drug concentration. A new drug release mechanism that determines the relationship between pore sizes and drug release rate is suggested here. It explains and quantifies the drug release kinetics based on pore sizes and pore size distribution.

P07

Up-conversion Luminescence in Ho^{3+} and Tm^{3+} co-doped $Y_2O_3:Yb^{3+}$ Fine Powders

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Fine yttrium oxide powders doped with Yb^{3+} and co-doped either with Tm^{3+} or Ho^{3+} were synthesized *via* spray pyrolysis at 900 °C using 0.1 M nitrate precursor. Synthesized powders were additionally thermally treated at 1100 °C for 24h. The characterization was done through X-ray powder diffraction (XRPD), scanning electron microscopy (SEM) and photoluminescent measurements (PL). Generation of cubic bixbyte-structure with space group *Ia*-3 is confirmed in all samples. Spherical particles with the mean size of ~ 380 nm generated through volume precipitation and collision of much smaller nano grains expose certain degree of porosity which increase further with the powder calcination. Powder's optical characterization includes infrared, visible and ultraviolet spectra measurements as well as determination of the lifetime. The amplified emission intensities and enhanced lifetime in thermally treated samples are correlated with the powders morphological and structural changes.

P08

Aerosol-assisted Processing of Dopamine-TiO_2 Colloidal Solution

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Set of colloidal TiO_2 nanoparticles solutions (TiO_2 NPs) were surface modified with the different quantities of dopamine (DA) and then are used as precursors for the synthesis of DA modified submicronic TiO_2 particles (DA-TiO_2 SPs). Low temperature (150 ^oC) aerosol-assisted route (spray drying) is used for the generation of the un-agglomerated spherical particles with the mean size of 430 nm that are composited from much smaller crystalline sub-units. Detailed structural and morphological characterization of DA-TiO_2 NPs and SPs were performed by X-ray powder diffraction (XRPD) analysis, scanning and transmission electron microscopy (SEM/TEM) and laser particle size (LPS) analysis. Particles surface structure and optical properties were followed using FT-IR and UV-Vis spectroscopy. Observed optical characteristics of both DA-TiO_2 NPs and DA-TiO_2 SPs expose narrowing of effective band gap for the same value of 1.3 eV implicating the preservation of colloidal nanoparticles characteristics in submicronic powders.

P09

Structural Characterization of the Nickel Thin Film Deposited by GLAD Technique

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In this work, a columnar structure of nickel thin film has been obtained using an advanced deposition technique known as Glancing Angle Deposition (GLAD). Nickel thin film was deposited on glass sample at the constant emission current of 100 mA. Glass sample was positioned 15 degrees with respect to the nickel vapor flux. The obtained nickel thin film was characterized by Atomic Force Microscopy (AFM) and by Scanning Electron Microscopy (SEM). The depth analysis of the structure was also examined by both AFM and SEM through a cross section imaging of the nickel thin film. Analysis indicated that the formation of the columnar structure occurred at the film thickness of 1 □m, which was achieved for the deposition time of 3 hours.

P10

Characterization of Mechanochemically Synthesized $CaO \cdot ZnO/K_2O$ Mixed Oxides

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Room temperature ball milling of CaO and ZnO powder mixture (using molar ratio of CaO:ZnO of 1:2) with the addition of stoichiometrically required amount of water to form calcium zinc hydroxide hydrate ($CaZn_2(OH)_6 \cdot 2H_2O$) and subsequent calcination at 700 ^oC was conducted. In order to improve basicity of mixed oxides, calcium zinc hydroxide hydrate was modified by the addition of promoters. The addition of promoter in initial powder mixture such as K_2CO_3 and KOH (with molar ratio of promoter to CaO of 1:10) was shown to effect the mechanochemical reaction. The prepared catalysts were characterized by X-ray diffraction (XRD), thermogravimetric analysis (TGA), base strength using Hammett indicator method and scanning electron microscopy (SEM and SEM-EDS). The results showed that, during mechanochemical treatment, CaO, ZnO and H_2O reacted rapidly to form $CaZn_2(OH)_6 \cdot 2H_2O$, and this was the same when promoters were used. Only difference was in basicity of the catalysts, and opposite of the expected, results showed that the addition of promoters did not cause an increase of basicity. On the other hand, addition of KOH to initial powder mixture caused increase of carbonates formation during mechanochemical treatment.

P11

Structural Investigations of Polyvinyliden Fluoride Thin and Thick Films

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Polyvinyliden fluoride (PVDF) is a low-density fluoropolymer that exhibits piezoelectric and pyroelectric properties. It can be used in the chemical, semiconductor, medical and defense industries, as well as in aviation and aerospace applications. Crucial factors that lead to the PVDF ferroelectric properties and determine its piezoelectric, mechanical, optical, electrical and thermal properties are its polar conformations, crystal structure, and crystallinity. These characteristics of the material significantly depend on the conditions used in the processing of polymer films. Therefore, we investigated structure and morphology of thin and thick PVDF films obtained by spin coating and solution casting methods, respectively. Structural investigations of PVDF thin and thick films were performed by the X-ray diffraction (XRD), differential scanning calorimetry (DSC) and Fourier transform infrared spectrometry (FTIR) methods, while microstructure morphology has been analyzed by scanning electron microscope (SEM), transmission electron microscopy (TEM) and atomic force microscopy (AFM). Present results will enable optimization of PVDF processing techniques for the production of pressure and IR sensors.

P12

A Matlab/Simulink 3D Model of Metal Rings and Discs for Ultrasonic Sandwich Transducer Design

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Metal-endings are integral part of different ultrasonic sandwich transducers. In this paper a new Matlab/Simulink 3D model of of the finite metal rings and discs of various dimensions is realized. With this model, which describes both the thickness and the radial resonant modes, and the coupling between them, mechanical impedance of the sample can be easily computed. Resonance frequency-length curves for rings and disks with various materials and for different selected dimensions are given. Also, comparisons of the different approaches in determining of their resonant frequencies are shown. The proposed Matlab/Simulink model requires simpler implementation than other analytical models. That enabled modifying of 1D theory and simplified modelling and projecting of the ultrasonic sandwich transducers with short-endings. Finally, the computed and experimental results are compared.

P13

Structure and Properties of Nanosized Nickel Ferrite Synthesized by Solid-State Reaction Route

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The soft ferrites are the most widely used group of magnetic materials and represent very important basic functional materials. Essentially, they are non-conductive ceramic materials based on iron oxides and oxides of other metals. Synthesis of nanosized $NiFe_2O_4$ has been extensively studied and accordingly there are various synthesis techniques available. As each of them is being characterized by different disadvantages investigation of alternative processing routes is still burning topic. Considering that the magnetic properties of nanocrystalline $NiFe_2O_4$ ferrites are directly related to their structure and phase composition, formation of magnetic microstructure of the nanosized nickel ferrite, synthesized via a solid-state reaction route was analyzed and discussed through structural, compositional and magnetic characterization of obtained reaction products. Initial annealing of the starting oxides mixture at 700^{o}C did not allow us to observe formation of the desired magnetic phase. In contrast, subsequent thermomagnetic measurements (TM) up to 800^{o}C indicated the considerable increase of the net magnetic moment. This can be reasonably assigned to the changes in phase composition and formation of magnetic $NiFe_2O_4$ structure during the heating cycle as well as to "field cooling process" and overall decrease in thermal energy during the following cooling cycle. Nanosized $NiFe_2O_4$ phase formation has been confirmed by the subsequent X-Ray and Mössbauer phase analyses and its nanocrystalline structure by X-Ray and SEM/TEM techniques. The obtained hysteresis loop taken using VSM after TM suggest the increased volume of magnetically active material and thus additionally support the previous findings.

P14

Magnetic Properties of NiCuZn LTCC Ferrite Material

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In this study, properties of soft-magnetic nickel-zinc ferrite manufactured using the standard LTCC (Low Temperature Co-fired Ceramic) technology were presented. The commercial ferrite tape ESL 40012 was used for the toroidal core preparation, implementing structuring of tapes by means of laser micro-machining, laminating and co-firing the stack of 62 LTCC tape layers. Isostatic lamination of the collated layers was performed at a pressure of 140 bars, for 5 minutes. Firing of the laminated stack has been conducted in a box furnace at a peak temperature of 1160 K and a total firing cycle time of 16 hours. Dimension of the finalized ferrite toroid are: inner diameter 4 mm, outer diameter 6.6 mm and height 3 mm.

B-H hysteresis loops were measured with BROCKHAUS Tester MPG 100D system using the maximum excitation of 2 kA/m and frequencies up to 1 kHz. The hysteresis loop of LTCC NiZn ferrite toroidal cores has an R-shape with saturation of 0.33 T and remanence ratio of $B_r/B_s \approx 0.56$. The role of magnetization reversal is the real parameter of dynamic hysteresis loops. The effect of frequency with the sinusoidal flux density was examined at 50, 500 and 1000 Hz. Frequency dependence of total power loss P_s that consist of hysteresis and eddy-current losses was investigated. As the hysteresis losses are proportionally to the frequency (~ f) and eddy-current losses are proportionally to the square of frequency (~ f^2) separation between these components was performed.

Attained relative magnetic permeability $\mu_r \approx 450$ (at 0.16 T, 500 A/m) is in agreement with the ESL 40012 ferrite commercial samples ($\mu_r > 450$) prepared by LTCC technology.

P15

Evaluation of Fly Ash Pysico-chemical Characteristics as Component for Eco-ceramic and Sintered Materials

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The aim of the presented study is to evaluate utilization potential of the fly ash which is the main residue from the coal combustion thermal-plants. Decades long high production of fly ash represents extreme hazard for the environment. The storage problem of this waste material is also alerting. Thus, recycling and reapplication of fly ash in construction materials industry is the only economic solution. The well-knows examples of fly-ash reapplication as a component in cement, mortar, concrete, bricks and tiles are not enough in means of reusing extreme amounts of this waste material. Therefore, new applications in ash-based composites have to be developed: eco-ceramic materials and sintered materials for refractory performances. In this investigation, characterization of three different fly ash capacities was used as base for further fly ash utilization possibilities analysis. Accent was on the investigation of the fly ash mineralogical and chemical composition. Thermal stability of crystalline phases was investigated with DTA. Macro-performance was correlated with the microstructure of fly ash studied by means of XRD and SEM analysis. Furthermore, content of trace elements, physico-chemical characteristics and leaching toxicity tests were carried out. Comparing the properties of investigated fly ashes with standard values, it could be presumed that fly ash originating from Serbian power plants can be potentially useful for high value products - eco-ceramic and refractory/sintered materials manufacturing.

Key words: fly ash, microstructure, potential reusing, eco-ceramic, sintering.

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P16

Principles of Choice of Refractory Coatings Used in Lost Foam Casting Process

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For production of the castings with favorable properties refractory coatings with the advance quality setting must be used. During the casting, the basic role of coating is creation of an efficient refractory barrier between sandy substrate and liquid metal flow. The coating properties required (refractoriness, favorable gas permeability, easy application and adhesion to sand mold surfaces and polymer model surfaces in the Lost foam casting process, easy adjustment of thickness of the coating layer, high drying rate without cracking or removal of the dried coating layers) were achieved by optimization of coating composition and their production technology. As refractory coating fillers, cordierite, talc, mica, zircon and mullite were chosen due to their properties: (1) low heat spread coefficient; (2) relatively high melting temperature; (3) no soaking up with liquid metal; (4) no gas production when in contact with liquid metal. The sediment stability of coating suspension is an important coating property. Different kinds and quantities of additives were tested, as well as their activation procedures, with an aim to enable easy additive absorption to the refractory filler particles, maintenance of the filler in a dispersed state and prevention of the filler building up. Bonding agents within the coating was chosen in regard to the size and shape of the refractory filler particles and in order to enable connection between the particles and to secure good adhesion of refractory particles to the observed surface of either the sandy mold or polymer model. Alcohol was used as a liquid solvent, as well as water. It was concluded that the optimal density of refractory coating was 2 g/cm^3.

Key words: refractory coating, Lost Foam casting process, quality of castings, high temperature material.

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P17

Properties of Cement Composites Made With Silica Fume and Microfibers

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The results of testing cement composites with addition of silica fume and monofilament polyacrylonitrile (abbreviated PAN) fibers are presented in the paper. The goal of such laboratory tests was to study the influence of silica fume and PAN fibers on cement composites. Four types of cement composites were made: M1 – reference cement composite; M2 - with the addition of silica fume in the amount of 10%, M3 - silica fume (10%) and PAN fibers (0.61 kg/m^3), and M4 - silica fume (10%) and PAN fibers (3.04 kg/m^3). Comparative tests were carried out in the fresh (density) and hardened state (density, absorption, shrinkage, compressive, flexural and tensile strength, adhesion to concrete). Based on the experimental results, silica fume and PAN fibers can enhance the properties of cement composites. The percentage of silica fume and fibers should be carefully selected on the experimental basis. The addition of silica fume and fiber reinforcement in the form of PAN fibers increases the compressive and tensile strength at 28 days up to 20% and 30%, respectively. Shrinkage can be reduced by a maximum of 9%. Also, the findings indicate that the adhesion to concrete can be increased approximately up to 15%.

P18

Methanol Electrooxidation on PtRu Modified Zeolite X

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Pt-Ru alloy is regarded as the most active electrocatalyst for both CO and methanol oxidation Different support materials for PtRu alloys such as conventional Vulcan XC carbon black, graphite, carbon nanotubes, zeolite material were investigated in order to obtain more efficient electrocatalyst for methanol electrooxidation.

The zeolite has acidic protonic entities on its surface providing more hydrophilic surface, and therefore, lower resistance and less ohmic drop than the carbon support. In this work, zeolite NaX (faujasite type) was used as a support for platinum-ruthenium catalys.t A procedure for thermal decomposition of noble metal acetylacetonates to deposit noble metal clusters on the surface of solid support was adapted by authors to introduce noble metal clusters in zeolite cavities. The effectiveness of this composite material for methanol electrooxidation from alkaline solution was investigated by cyclic voltammetry.

The influence of the concentration of supporting electrolyte, scan rate and rotation rate on the reaction of methanol oxidation was investigated. The obtained activity was compared with literature data for similar catalysts.

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P19

Organobentonites as Multifunctional Adsorbents of Organo/inorganic Aquatic Mixtures

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Partial substitution of naturally present cations in the interlayer region of bentonite clay with quaternary alkyl ammonium cations (QAACs) with 16 carbon atoms in one alkyl chain was performed. The amount of QAACs used for the modification corresponded to CEC value of ≤ 1.0. The aim was the synthesis of organobentonites (OBs) with multipurpose adsorption properties. These materials could be used for the treatment of complex and highly polluted wastewaters (e.g. from textile industry). The organo/inorganic mixtures used as adsorbates consisted of: i) three textile azo dyes (Acid Yellow 99 – AY99, Acid Orange 10 – AO10 and Reactive Black 5 – RB5); ii) three heavy metals cations (Pb^{2+}, Cd^{2+} and Ni^{2+}); iii) selected textile dyes and heavy metal cations (AY99, AO10, RB5, Pb^{2+}, Cd^{2+} and Ni^{2+}). The initial concentration of each pollutant was 50 mg dm^{-3}. Dye concentration monitoring was performed by UV-VIS spectroscopy, while metal cations concentrations were estimated using ICP-OES. The study confirmed the feasibility of using partially substituted OBs as adsorbents for the simultaneous adsorption of organic and inorganic pollutants from aqueous solutions.

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P20

p-Nitrophenol Electro-oxidation on BTMA- bentonite Modified Electrode

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A glassy carbon electrode (GCE) was modified with thin layer of Na-enriched bentonite and a series of benzyltrimethylammonium (BTMA)- bentonites with different BTMA/bentonite ratios. The aim was to investigate electrochemical behavior of synthesized BTMA-bentonites and to correlate it with the textural properties. The organo-bentonites were characterized using X-ray diffraction, Fourier transform infrared spectroscopy and nitrogen adsorption-desorption method. Monolayer arrangement of BTMA in the interlayer space of smectite was confirmed. A deterioration of textural properties was observed with the increase of BTMA loading. The cyclic voltammetry was used for the investigation of electro–oxidation of *p*-nitrophenol (*p*-NP) in acidic medium on BTMA–B modified GCE. The electrochemical activity of BTMA-B based electrodes increased with BTMA loading. It can be assumed that the increased electrode activity toward *p*–NP was achieved due to the adsorption of *p*–NP on the electrode surface, since the adsorption commonly precedes the electro-oxidation process.

P21

Amino-modified Poly(glycidyl methacrylate) Based Nanocomposites: Textural Properties and Application

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Crosslinked macroporous poly(glycidyl methacrylate-*co*-ethylene glycol dimethacrylate) and copolymer nanocomposite with acid modified bentonite clay were prepared by radical suspension copolymerization and functionalized with diethylene triamine. Both samples were characterized by elemental and textural analysis (mercury intrusion porosimetry). The incorporation of the acid modified clay into the copolymer matrix lead to the increase of porosity, total pore volume and particularly specific surface area, while the process only slightly altered the acid–base properties. The obtained amino-functionalized nanocomposite was tested as 4-nitrophenol (4-NP) sorbent. The influence of pH, sorption time and initial 4-nitrophenol (4-NP) concentration on sorption efficiency of synthesized samples was studied. Since the pH_{PZC} of the functionalized copolymer and the functionalized composite was the same, and the amount of amino groups was slightly higher for the copolymer, the enhanced sorption properties can be ascribed to improved textural properties of composite, particularly the increased specific surface area. The isotherm data were best fitted with Langmuir model, while the sorption dynamics obeyed the pseudo-second-order kinetic model. The results in this study show great potential for designing functionalized macroporous glycidyl methacrylate copolymers and their acid modified bentonite composites as promising sorbents in 4-nitrophenol removal from wastewaters.

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P22

The Influence of Synthesis Parameters on the Porous Structure of Ceramic Catalyst Supports

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Ceramic catalyst supports form an important group of commonly used support materials in heterogeneous catalysis. They are primarily used in selective oxidation reactions. A variety of materials are used to prepare catalyst supports.

The samples of aluminosilicate and magnesium oxide ceramic supports which are used in selective partial oxidation catalysts to improve primarily their porous structure have been synthesized.

In order to optimize the synthesis parameters of the supports, the influences of the type, quantity and granulation of combustible additives, pressing pressure and thermal treatment of the supports to their porous structure have been investigated. Several catalyst support composites were made using petroleum coke and sawdust as combustible additives.

The porous structure of the samples was characterized by mercury porosimetry and nitrogen physisorption.

It is shown that different amount of combustible additives, various pressing pressure, as well as different thermal treatment used for the preparation of ceramic support samples lead to a change in the pore size, pore size distribution, and structure of pores.

P23

Microstructure and EDS Contact Surfaces Characterization for Statistical Analysis of Doped $BaTiO_3$-Ceramics

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Barium-titanate based ceramics belongs to one of very important group of functional ceramics that can be used on a large scale of applications. The properties of $BaTiO_3$ based ceramics are fundamentally correlated with grain boundary effects and consequently with the microstructure developed during sintering process.

The purpose of this paper is an investigation of the effects of various dopants (La, Nb, Er, Yb, Ho, Sb) on the microstructure properties and contact surfaces.

The grain size and microstructure were investigated using SEM and EDS analysis.

SEM and EDS studies were performed by scanning electron microscopy (JEOL-JSM 5300) equipped with EDS (QX 2000S) system.