Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION V
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials
School of Electrical Engineering and Computer Science of Applied Studies

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 21st-23rd September 2016.

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Dear Colleagues,

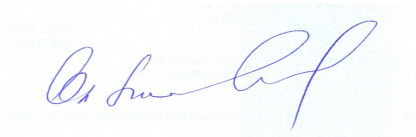
We have great pleasure to welcome you to the Advanced Ceramic and Application Conference V organized by the Serbian Ceramic Society in cooperation with the Institute for Testing of Materials, Institute of Technical Sciences of SASA, Institute of Chemistry Technology and Metallurgy, Institute for Technology of Nuclear and Other Raw Mineral Materials and School of Electrical Engineering and Computer Science of Applied Studies.

Advanced Ceramics today include many old-known ceramic materials produced through newly available processing techniques as well as broad range of the innovative compounds and composites, particularly with plastics and metals. Such developed new materials with improved performances already bring a new quality in the everyday life. The chosen Conference topics cover contributions from a fundamental theoretical research in advanced ceramics, computer-aided design and modeling of a new ceramics products, manufacturing of nanoceramic devices, developing of multifunctional ceramic processing routes, etc. Traditionally, ACA Conferences gather leading researchers, engineers, specialist, professors and PhD students trying to emphasizes the key achievements which will enable the wide speared use of the advanced ceramics products in High-Tech industry, renewable energy utilization, environmental efficiency, security, space technology, cultural heritage, prosthesis, etc.

Serbian Ceramic Society has been initiated in 1995/1996 and fully registered in 1997 as Yugoslav Ceramic Society, being strongly supported by American Ceramic Society. Since 2009, it has continued as Serbian Ceramic Society in accordance to the Serbian law procedure. Serbian Ceramic Society is almost the only one Ceramic Society in the South-East Europe, with members from more than 20 Institutes and Universities, active in 16 sessions, by program and the frames which are defined by the American Ceramic Society activities.

Advanced Ceramic & Application Conference V is dedicated to Academician Momčilo Ristić.

Prof. Dr Vojislav Mitić
President of the Serbian Ceramic Society
World Academy Ceramics Member
European Academy of Sciences&Arts Member



Prof. Dr Olivera Milošević,
President of the General Assembly of the Serbian Ceramic Society
Academy of Engineering Sciences of Serbia Member

General Conference Topics

- Basic Ceramics Science
- Nanostructural, Bio- and Opto-Ceramic Materials and Technologies
- Multifunctional Materials
- Magnetic and Amorphous Materials
- Construction Materials and Eco-ceramics
- Composite Materials, Catalysis and Electrocatalysis
- Artistic Ceramics and Design, Archaeology and Heritage
- Young Researchers
- Sintering processes
  -kinetics
  -microstructure
  -thermodinamics
  -modeling

Conference Co-chairmens:
Prof. Dr. Vojislav Mitić SRB
Prof. Dr. Olivera Milošević SRB
Prof. Dr. Marcel Van de Voorde EU
Prof. Dr. Rainer Gadow GER

Conference Programme Chairs:
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David W. Johnson, Jr., PhD

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908-658-9797 fax

August 19, 2016

An open letter to the organizers, attendees and guests of the Fifth Serbian Ceramic Society Conference - Advanced Ceramics and Application V

Dear Conference organizers, attendees and guests:

It is my honor to introduce myself and remark on your forthcoming Serbian Ceramic Society Conference titled: Fifth Serbian Ceramic Society Conference - Advanced Ceramics and Application V.

I am retired from the position of Director of the Materials Research Department at Bell Laboratories. I am currently an Editor-in-Chief of the Journal of The American Ceramic Society and Senior Advisor at Stevens Institute of Technology. I am a member of the National Academy of Engineering (USA) and a past president of the American Ceramic Society. I have come to be familiar with the Serbian Ceramic Society through Prof. Dr. Vojislav Mitić, who is also well known in the American Ceramic Society.

I have reviewed the advance agenda for your meeting and find that your speaker list includes many well known and talented people in the field of ceramics. Some of them are my friends and others I would welcome as friends. For this reason and because of the interesting program, I am sorry that I am unable to attend this meeting. I applaud the healthy mix of good science and interesting engineering applications in the program.

I regret that I am not attending this meeting. Nevertheless, I offer to all organizers, attendees, and guests my greetings and my belief that yours will be a most rewarding meeting.

Sincerely,

David W. Johnson, Jr.

Conference Program and Abstracts

Program and Abstract's Contents

Conference Information:

Venue: Serbian Academy of Sciences and Arts, Great Hall (second floor) and Halls 1, 2 (first floor), Knez Mihailova 35, Belgrade, Serbia

Conference fee: Standard fee for foreign participants: 100 EUR; Standard fee for domestic participants: 50 EUR, Members of SCS and PhD Students: 30 EUR, last year winners for oral and poster presentations: free of charge.

Abstracts and papers publication: The official language of the conference is English. Conference abstracts are published in this Book of Abstracts. Contributions presented at the conference can be submitted for publishing in peer-reviewed Journals Science of Sintering and Journal of Multifunctional Materials and Ceramics as well as for Conference Proceedings published by Atlantic Press.

Type of presentation: Visuals for oral presentations should be in Microsoft PowerPoint, versions up to 2007 (.ppt or .pptx, or Adobe Acrobat Reader 9 (.pdf)). Any animation or video files must be compatible with Windows 7 and Windows Media Player. Please bring your presentation to the reception desk at the beginning of the Conference on flash memory. Posters should be prepared in dimension: 70x100 cm. The official language of the conference is English.

Restaurant Peking, Vuka Karadžića 2 (50m from the Conference Venue).

Additional Conference information

Phone: +381-11-2027-247

E-mail: nina.obradovic@itn.sanu.ac.rs

http://www.serbianceramicsociety.rs/about.htm

Program Overview

Date	Time	Programme	Floor, Room
September, 21, Wednesday	08.00-09.00	Registration	2nd Floor, Hall
	09.00-09.20	Opening Ceremony	2nd Floor, Great Hall
	09.20-09.30	Short Break	2nd Floor, Hall
	09.30-12.00	Plenary Session 1	2nd Floor, Great Hall
	12.00-12.30	Coffee Break & Photo Session	2nd Floor, Hal
	12.30-14.00	Plenary Session 2	2nd Floor, Great Hall
	14.00-15.00	Buffet Lunch	Club SASA, Mezzanine
	15.00-17.00	Plenary Session 3	2nd Floor, Great Hall
	17.00-17.30	Coffee Break	2nd Floor, Hall
	17.30-19.00	Plenary Session 4	2nd Floor, Great Hall
	20.00	Conference Dinner (with invitation only)	Restaurant Peking
September, 22, Thursday	08.00-09.00	Registration Poster and Exhibition Installation	1st Floor, Hall
	09.00-10.40	Keynote Session 1	1st Floor, Blue Hall
	10.40–11.00	Coffee Break	1st Floor, Hall
	11.00-13.00	1st Session: Basic Ceramic and Sintering	1st Floor, Blue Hall
	13.00-14.00	Buffet Lunch	Club SASA Mezzanine
	14.00-15.40	Keynote Session 2	1st Floor, Blue Hall
	15.40-16.10	Coffee Break	1st Floor, Hall
	16.10-17.55	2nd Session: Nano, Opto, Bio and Multifunctional Ceramic	1st Floor, Blue Hall
	17.55-18.15	Round table 1 Atlantis Press Publishing	1st Floor, Blue Hall
	18.15-19.15	Poster Session	1st Floor, Hall
September, 23, Friday	09.00-11.05	Keynote Session 3	1st Floor, Blue Hall
	11.05-11.30	Coffee Break	1st Floor, Hall
	11.30-13.15	3rd Session: Magnetic, Amorphous, Composites and Catalysts	1st Floor, Blue Hall 2
	13.15-14.15	Buffet Lunch	Restaurant Peking
	14.15-16.35	4th Session: Construction materials, Eco-ceramic and Heritage	1st Floor, Blue Hall 2
	16.35-17.30	Round Table 2 Intelligent materials for the future: Serbia-EU cooperation perspectives	1st Floor, Blue Hall 2
	17.30	Closing Ceremony	1st Floor, Blue Hall 2

Wednesday, September 21st, 2016

Hall, 2nd Floor

08.00–09.00 **Registration**

Great Hall, 2nd Floor

09.00–09.20 **Opening Ceremony of the Fifth Serbian Ceramic Society Conference: Advanced Ceramics and Application**
Prof. Dr. Vojislav Mitić, Prof. Dr. Olivera Milošević, Prof. Dr. Vladimir Pavlović, Prof. Dr. Danilo Suvorov, Dr. Zeger Karssen, Prof. Dr. Muamer Zukorlić, High-representative of Government

09.20–09.30 **Short break**

Great Hall, 2nd Floor

09.30–12.00 **Plenary Session 1**
Chairpersons: Branislav Vlahović, Vladimir Pavlović

09.30–10.00 **PL1 Novel Graphene and Graphene like 2D materials synthesis**
Chuanbao Cao
Research Center of Materials Science, Beijing Institute of Technology, China

10.00–10.30 **PL2 Fundamental mechanisms that determine the loss tangent and temperature coefficient of resonant frequency (τ_F) in modern microwave ceramic dielectrics**
Nathan Newman[1], Shengke Zhang[1], Hasan Sahin[2,4], Engin Torun[2], Francois Peeters[2], Dinesh Martien[3], Tyler DaPron[3], and Neil Dilley[3]
[1]Arizona State University, Tempe, AZ
[2] Dept. Of Physics, University of Antwerp, Belgium
[3]Quantum Design, San Diego, CA
[4]Department of Photonics, Izmir Institute of Technology, Turkey

10.30–11.00 **PL3 PL3 Rare earth oxide stabilized zirconia ceramics and composites with enhanced mechanical and functional properties**
Frank Kern
Universität Stuttgart, IFKB Stuttgart, Deutschland

11.00–11.30 **PL4 New Superionic Conductor Narpsio Glass-Ceramics**
Toshinori Okura
Department of Applied Chemistry, School of Advanced Engineering, Kogakuin University, Tokyo, Japan

11.30–12.00 **PL5 Oxides Powders Produced by Plasma-Spray Pyrolisys Technique and Sintered Ceramics for Structural and Biomedical Applications**
Sergey N. Kulkov
Ceramic Composites Lab., Inst. of Strength Phys. and Material Sciences, RAS, Tomsk, Russia and Tomsk State University

12.00–12.30 **Coffee Break and Photo Session** **Hall, 2nd Floor**

Great Hall, 2nd Floor

12.30–14.00 **Plenary Session 2**
Chairpersons: Chuanbao Cao, Lidija Mančić

12.30–13.00 **PL6 Morpho-Genetic Materials: Functional Materials Replicated from Superstructures of Natural Species**
Di Zhang
State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University, China

13.00–13.30 **PL7 Air-Stable High Efficiency Hybrid Solar Cells Based on Metal Oxide and Graphene**
Yoon-Bong Hahn
School of Semiconductor and Chemical Engineering, Chonbuk National University, Republic of Korea

13.30–14.00 **PL8 Modelling of Weakly Coupled Nanoparticles**
Branislav Vlahovic, Igor Filikhin
North Carolina Central University, Durham, New York, USA

14.00–15.00 **Buffet Lunch** **Club SASA, Mezzanine Hall, 1st floor**

Great Hall, 2nd Floor

15.00–17.00 **Plenary Session 3**
Chairpersons: Frank Kern, Dušan Jovanović

15.00–15.30 **PL9 $Zr_{n+1}AlC_n$ MAX phases for future fission environments**
Eugenio Zapata Solvas
Centre for Nuclear Engineering, Department of Materials, Imperial College London, UK

15.30–16.00 **PL10 Geopolimers: Versatil Ceramic Composites Made at Ambient Temperatures, or Precursors to HT Structural Ceramic Powders**
Waltraud Kriven
Department of Material Science & Engineering, University of Illinois USA

16.00–16.30 **PL11 Spectroscopic studies of heavy metal glasses**
Saleem Farooq Shaukat, Robina Farooq
COMSATS Institute of Information Technology, Lahore, Pakistan

16.30–17.00 **PL12 The Role of Microstructural Features in High Frequency and Energy Ceramics**
Danilo Suvorov
Advanced Materials Department, Jozef Stefan Institute, Ljubljana, Slovenia

17.00–17.30 **Coffee Break** **Hall, 2nd Floor**

Great Hall, 2nd Floor

17.30–19.00 **Plenary Session 4**
Chairpersons: Di Zhang, Dragoljub Mirjanić

17.30–18.00 **PL13 Design and development of car body from composite materials using single step resin infusion process**
Zaffar M. Khan
Department of Aeronautics and Astronautics, Institute of Space Technology Islamabad, Pakistan

18.00–18.30 **PL14 Porous Mano Structured Ceramics – From Bulk to Nanofibers**
G. S. Grader
Chemical Engineering Department, Technion, Haifa, 32000, ISRAEL

18.30–19.00 **PL15 Multi Layer Ceramics: Design and Process Methods**
Krishnamurty Balasubramanian
Nonferrous Materials Technology Development Centre, Kanchanbagh, Hyderabad, India

20.00 **Conference Dinner (with invitations)** **Restaurant Peking**

Thursday, September 22nd, 2016

Hall, 1st floor

08.00–09.00 **Registration**
Posters Installation

Blue Hall 2, 1st floor

09.00–10.40 **Keynote Session 1**
Chairpersons: Smilja Marković, Suzana Filipović

09.00–09.25 **KN1 Bioelectrochemical harvesting of greenhouse gases**
Robina Farooq, Saleem Farooq Shaukat
COMSATS Institute of Information Technology, Lahore, Pakistan

09.25–09.50 **KN2 Metallic Butterfly Scales: Fabrication and Their Plasmonic Applications**
Jiajun Gu
State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University, China

09.50–10.15 **KN3 Modeling Liquid Bridge Rupture Induced by Grain Rearrangement**
Zoran S. Nikolic
University of Niš, Faculty of Electronic Engineering, Department of Microelectronics, Niš, Serbia

10.15–10.40 **KN4 Electric Discharge Coating of Metals with Ceramic Compounds**
Şükrü Talaş
Department of Metallurgical and Materials Engineering, Faculty of Technology Afyon Kocatepe University, A.N.S. Campus, Turkey

10.40–11.00 **Coffee Break** **Hall, 1st floor**

Blue Hall 2, 1st floor

11.00–13.00 **1st Session: Basic Ceramic and Sintering**
Chairpersons: Vaclav Pouchly, Nina Obradović

11.00–11.20 **INV1 Curie-Weiss Law Fractal Corrections and Clausius-Mossotti Equation**
Vojislav V. Mitić[1,2], Ljubiša M. Kocić[1], Vesna V. Paunović[1]
[1]University of Niš, Faculty of Electronic Engineering, Niš, Serbia
[2] Institute of Technical Sciences of SASA, Belgrade, Serbia

11.20–11.40 **INV2 Resonant ultrasound spectroscopy in the study of relaxation processes in tetragonal tungsten bronzes**
Andrei Rotaru
INFLPR – National Institute for Laser, Plasma and Radiation Physics, Laser Department, Bucharest, Romania

11.40–12.00 **INV3 Modeling, designing and processing of barium titanate stannate functionally graded electroceramics**
Smilja Marković[1], Srečo Davor Škapin[2], Boban Stojanović[3], Danilo Suvorov[2], Dragan Uskoković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia
[2]Jožef Stefan Institute, Ljubljana, Slovenia
[3]Faculty of Science, University of Kragujevac, Serbia

12.00–12.15 **OR1 The Rare-Earths influences on doped BaTiO3 Ceramics Microstructure and Electric Characteristics**
Vesna V. Paunović[1], Vojislav V. Mitić[1,2], Ljubiša M. Kocić[1], Miloš Marjanović[1], Miloš Đorđević[1]
[1] University of Nis, Faculty of Electronic Engineering, Niš, Serbia
[2] Institute of Technical Sciences of SASA, Belgrade, Serbia

12.15–12.30 **OR2 Implementation of Wide-Bandgap Materials in Power Electronics Components**
Jelena Milojković[1], Simon Le Blond[2], Vojislav Mitić[3], Vančo Litovski[2]
[1]Inovation centre of advanced technologies, Niš, Serbia
[2]University of Bath, Bath, UK
[3]Serbian Academy of Science and Arts, Belgrade, Serbia

12.30–12.45 **OR3 The nonorthogonality effects on capacitive behaviour of quantum dot**
Miloš S. Dražić, Ivana Đurišić, Viktor Z. Cerovski and Radomir Žikić
Institute of Physics, University of Belgrade, Pregrevica 118, Belgrade

12.45–13.00 **OR4 Spectroscopy characterization of $YFeO_3$ obtained by the mechanochemical synthesis**
Zorica Ž. Lazarević[1], Čedomir Jovalekić[2], Dalibor Sekulić[3], Valentin N. Ivanovski[4], Ana Umićević[4], Martina Gilić[1], Nebojša Ž. Romčević[1]
[1]Institute of Physics, University of Belgrade, Belgrade, Serbia
[2]The Institute for Multidisciplinary Research, University of Belgrade, Serbia
[3]Faculty of Technical Sciences, University of Novi Sad, Serbia
[4]Institute of Nuclear Sciences Vinča, University of Belgrade, Serbia

13.00–14.00 **Buffet Lunch** **Club SASA, Mezzanine**

Blue Hall 2, 1st floor

14.00–15.40 **Keynote Session 2**
Chairpersons: Vladimir Blagojević, Dragana Jugović

14.00–14.25 **KN5 Environmental forensics – concepts and contemporary challenges**
Goran Kniewald
Rudjer Bošković Institute, Zagreb, Croatia

14.25–14.50 **KN6 Fractals, Materials and Energy Technologies**
Ljubiša M. Kocić[1], Vojislav V. Mitić[1,2], Vesna V. Paunović[1]
[1]University of Niš, Faculty of Electronic Engineering, Niš, Serbia
[2]Institute of Technical Sciences of SASA, Belgrade, Serbia

14.50–15.15 **KN7 Yttrium doped barium cerate: ceramic matrix in the solid oxide fuel cells**
Margarita Gabrovska[1], Dimitrinka Nikolova[1], Slavcho Rakovsky[1], Daria Vladikova[2], Emiliya Mladenova[2], Zdravko Stoynov[2]
[1]Institute of Catalysis, Bulgarian Academy of Sciences, Sofia, Bulgaria
[2]Acad. Evgeni Budevski Institute of Electrochemistry and Energy Systems, Bulgarian Academy of Sciences, Sofia, Bulgaria

15.15–15.40 **KN8 Implementation of innovations in the field of solar energy in Southeast Europe through the analysis and encouraging the development of solar energy on a global scale**
Dragoljub Lj. Mirjanić[1], Snežana Pelemiš[2]
[1] Academy of Sciences and Arts of Republic of Srpska, B&H
[2] Faculty of Technology, University of East Sarajevo, B&H

15.40–16.10 **Coffee Break** **Hall, 1st floor**

Blue Hall 2, 1st floor

16.10–17.55 **2nd Session – Nano, Opto, Bio and Multifunctional Ceramic**
Chairpersons: Zorica Lazarević, Vesna Paunović

16.10–16.30 **INV4 Electrical characterization of YFeO3 nanoferrite and its potential application for humidity sensing**
Dalibor L. Sekulić[1], Zorica Ž. Lazarević[2], Čedomir D. Jovalekić[3], Nebojša Ž. Romčević[2]
[1]University of Novi Sad, Faculty of Technical Sciences, Novi, Serbia
[2]University of Belgrade, Institute of Physics, Belgrade, Serbia
[3]University of Belgrade, The Institute for Multidisciplinary Research, Belgrade, Serbia

16.30–16.50 **INV5 Development and Evaluation of glass-like coatings for cardiovascular implant applications such as stents**
M. Amlung[1], K. Kiefer[1,2], P. W. de Oliveira[1], H. Abdul-Khaliq[2]
[1]INM – Leibniz-Institute for New Materials, 66123 Saarbrücken, Germany
[2]Clinic for Pediatric Cardiology, Saarland University, 66124 Homburg, Germany

16.50–17.10 **INV6 A review on the selection of anode materials for solid-oxide fuel cells**
Shabana P. S. Shaikh, and K.P.Adhi
Advanced Materials Processing Lab, Department Of Physics, SBP, Pune University, Pune, India

17.10-17.25 **OR5 Synthesis and structural characterization of some cathode materials for lithium-ion batteries**
Dragana Jugović[1], Miodrag Mitrić[2]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia
[2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

17.25-17.40 **OR6 Application of Ceramic Components in Knee Arthroplasties**
Aleksandar Radunović[1], Zoran Popović[2], Aleksandar Jevtić[1]
[1]MD,MMA, Belgrade, Serbia
[2]Vožd clinic, Belgrade, Serbia

17.40-17.55 **OR7 In vivo degradation of Bio-Oss® in implants loaded with macrophages treated with lipopolysaccharide**

Jelena Živković[1], Sanja Stojanović[1], Marija Vukelić-Nikolić[1], Jelena Najdanović[1], Vladimir Cvetković[2], Maja Čakić-Milošević[3], Stevo Najman[1]
[1]University of Niš, Faculty of Medicine, Institute of Biology and Human Genetics, Department for Cell and Tissue Engineering, Niš, Serbia
[2]University of Niš, Faculty of Science and Mathematics, Department of Biology and Ecology, Niš, Serbia
[3]University of Belgrade, Faculty of Biology, Belgrade, Serbia

17.55-18.15 **Round table 1 Atlantis Press Publishing**
Moderator: Zeger Karssen

18.15-19.15 **Poster Session** **Hall, 1st floor**

Friday, September 23rd, 2016

Blue Hall 2, 1st floor

09.00-11.05 **Keynote Session 3**
Chairpersons: Goran Kniewald, Ljubiša Kocić

09.00-09.25 **KN9 Energy storage systems for stationary applications**
Palani Balaya
Department of Mechanical Engineering, National University of Singapore, Singapore

09.25-09.50 **KN10 Smart composite materials for waste water remediation**
Ajay Kumar Mishra
Nanotechnology and Water Sustainability Research Unit, College of Science, Engineering and Rechnology, University of South Africa, South Africa

09.50-10.15 **KN11 Magnetic properties of melt-spun alnico-v alloy ribbon**
Feroz A. Khan
Department of Physics, Bangladesh University of Engineering and Technology (BUET), Dhaka-1000, Bangladesh

10.15-10.40 **KN12 The rainbow ion-solid interaction potential**
Srđan Petrović
Laboratory of Physics, Vinča Institute of Nuclear Sciences, University of Belgrade, P. O. Box 522, 11001 Belgrade, Serbia

10.40-11.05 **KN13 An overview of ceramics in dentistry: Basic properties and clinical applications**
Csaba Hegedűs
University of Debrecen, Department of Biomaterials and Prosthetic Dentistry, University of Debrecen, Hungary

11.05-11.30 **Coffee Break** **Hall, 1st floor**

Blue Hall 2, 1st floor

11.30-13.15 **3rd Session: Magnetic, Amorphous, Composites and Catalysts**
Chairpersons: Dalibor Sekulić, Christina Graf

11.30-11.50 **INV7 Silica-based Catalytic Systems Prepared by Sol-Gel Methods**
Raed Abu-Reziq
Institute of Chemistry, Casali Center for Applied Chemistry, Center for Nanoscience and Nanotechnology, The Hebrew University, Jerusalem, Israel

11.50-12.10 **INV8 Ceramic powder compaction: numerical simulation and calibration through inverse analysis**
Vladimir Buljak, Shwetank Pandey, Milorad Milovancevic
University of Belgrade, Mechanical Engineering Faculty, Department of Strength of Materials

12.10-12.30 **INV9 Comparative fractal analysis of Valeriana officinalis roots shrinkage during drying**
Ivan J. Zlatanović[1], Dragana V. Rančić[1], Vojislav V. Mitić[2,3], Ljubiša Kocić[3]
[1]University of Belgrade – Faculty of Agriculture
[2]Institute of Technical Sciences of SASA
[3]University of Niš – Faculty of Electronic Engineering

12.30-12.45 **OR8 Mo-doped TiO_2 nanocomposite coatings: visible light photocatalytic activity and antifungal efficiency**
Bojan Miljević[1], J. M. Van der Bergh[1], S. Vučetić[1], A.Vidaković[1], S. Markov[1], D. Lazar[2], J. Ranogajec[1]
[1]University of Novi Sad, Faculty of Technology, Novi Sad, Serbia
[2]University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia

12.45-13.00 **OR9 Characterisation of $Mn_{0.63}Zn_{0.37}Fe_2O_4$ powders after intensive milling and subsequent thermal treatment**
Nebojša Labus[1], Zorka Vasiljević[1], Obrad Aleksić[1], Miloljub Luković[1], Smilja Marković[1], Vladimir Pavlović[1], Slavko Mentus[2,3], Maria Vesna Nikolić[4]
[1]Institute of Technical Sciences of SASA, Beograd, Serbia
[2]Faculty of Physical Chemistry, University of Belgrade, Serbia
[3]Serbian Academy of Sciences and Arts, Belgrade, Serbia
[4]Institute for Multidisciplinary Research, University of Belgrade, Beograd, Serbia

13.00-13.15 **OR10 Optical and structural characterization of Se–$CuSe_2$ thin films**
Martina Gilić[1], Milica Ćurčić[1], Jovana Ćirković[2], Uroš Ralević[1], Miodrag Mitrić[3], Tanja Barudžija[3], Svetlana Savić-Šević[1], Nebojša Romčević[1], Ibrahim Yahia[4]
[1]Institute of Physics Belgrade, University of Belgrade, Belgrade, Serbia
[2]The Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia
[3]Institute of Nuclear Sciences Vinča, University of Belgrade, Belgrade, Serbia
[4]Nano-Science and Semiconductors Labs., Physics department, Faculty of Education, Ain Shams University, Roxy, Cairo, Egypt

13.15-14.15 **Buffet Lunch** **Restaurant Peking**

14.15-16.35 **4th Session: Constructional, Eco-ceramic and Catalysts**
Chairpersons: Vladimir Pavlović, Darko Kosanović

14.15-14.35 **INV10 Silica particles with controlled roughness – synthesis, characterization, and use as building blocks for non-close packed arrays**
Christina Graf, Christian Goroncy, Madlen Schmudde, Christian Grunewald, Thomas Risse
Institut für Chemie und Biochemie, Freie Universität Berlin, Germany

14.35-14.55 **INV11 Influence of different pore-forming agents on wollastonite microstructures**
Nina Obradović[1], Suzana Filipović[1], Smilja Marković[1], Miodrag Mitrić[2], Vesna Antić[3], Vladimir B. Pavlović[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia
[2]Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia
[3]Faculty of Agriculture, University of Belgrade, Belgrade, Serbia

14.55-15.15 **INV12 Education and materials science in cultural heritage preservation**
Jonjaua Ranogajec[1], Slavica Vujović[2], Snežana Vučetić[1], Bojan Miljević[1], Helena Hiršenberger[3], John Milan van der Bergh[1]
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[3]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

15.15-15.35 **INV13 Characteristics of mortar from the archeological site Romuliana – Gamzigrad**
Gordana A.Topličić-Ćurčić[1], Ana J. Momčilović-Petronijević[1], Vojislav V. Mitić[2,3], Vesna V. Paunović[2], Dušan Z. Grdić[1], Nenad S. Ristić[1], Zoran J. Grdić[1]
[1]University of Nis, Faculty of Civil Engineering and Architecture, Nis, Serbia
[2]University of Nis, Faculty of Electronic Engineering, Nis, Serbia
[3]Serbian Academy of Science and Art, Institute of Technical Sciences, Belgrade, Serbia

15.35-15.50 **OR11 Conservation and restauration of seven paintings by Veljko Zecevic on canvas**
Filip Jankovic
Graduated painter-restorer, a freelancer, Belgrade, Serbia

15.50-16.05 **OR12 Detoxication of methanol from water solution using zeolite**
Milena S. Stojiljković[1], Staniša T. Stojiljković[2]
Faculty of Technology Leskovac, University of Niš

16.05-16.20 **OR13 Importance of the synergical application of the EU regulation on construction products (EU CPR 305/2011) from the fire safety aspect**
Edin Garaplija, Sanin Džidić
Institute for Fire and Explosion Safety and Protection, Sarajevo

16.20-16.35 **OR14 The in-situ challenge of better understanding structure-properties relationship in nanomaterials**
Dušan Popović
Analysis

16.35-17.30 **Round table 2 Intelligent materials for the future: Serbia-EU perspectives for cooperation**
Moderators: Vladimir Pavlović, Nina Obradović

17.30 **Closing Ceremony**

Book of Abstracts

PL1

Novel Graphene and Graphene like 2D materials synthesis

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Here we report a general synthetic strategy for monolayer graphene preparation. The novel synthetic method is based on a direct solid-state pyrolytic conversion of sodium carboxylate, such as sodium gluconate and sodium citrate, assisted by Na_2CO_3 salt. Gram-scale quantity of monolayer graphene can be readily prepared in several minutes. Raman spectrum, high resolution transmission electron microscopy (HRTEM) and atomic force microscope (AFM) clearly demonstrate that the pyrolytic graphene is monolayer graphene. The present pyrolytic conversion can overcome low monolayer content of exfoliation method and low production of chemical vapor deposition (CVD). The new synthetic technique might provide an opportunity for the practical applications of monolayer graphene materials in batteries, supercapacitors, catalysts, and sensors.
Graphene- like two-dimensional multicomponent transition-metal oxide nanosheets are the most promising candidate in energy storage/conversion devices. Here, we report a general method to synthesize ultrathin 2D multicomponent nanosheets such as NiO, $Ni(OH)_2$, Co_3O_4, $ZnCo_2O_4$, $NiCo_2O_4$ et.al. by microwave-assisted liquid-phase growth with post annealing. The well-defined nanosheets show a micron-sized planar area and ultrathin (1-2nm) thickness, suggesting high surface atom ratio with unique surface and electronic structure, thus facilitate the charge transfer and enhance the overall electrochemical performances.

PL2

Fundamental mechanisms that determine theloss tangent and temperature coefficient of resonant frequency (τ_F) in modern microwave ceramic dielectrics

Nathan Newman[1], Shengke Zhang[1], Hasan Sahin[2,4], Engin Torun[2], Francois Peeters[2], Dinesh Martien[3], Tyler DaPron[3] and Neil Dilley[3]

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Despite the practical importance of achieving a small loss tangent (tan δ) and near-zero temperature coefficient of resonant frequency (τ_F) for microwave communication systems, afundamental understanding of what mechanisms determine these important parameter had not been firmly established. In this talk, I will focus on my group's work using modern experimental and theoretical condensed matter methods to identify the responsible mechanisms. We will focus our discussions on results from Ni-doped $BaZn_{1/3}Ta_{2/3}O_3$(BZT), since it is the highest performer

at room temperature. We will also show that the conclusions are general for other commonly-used materials.
$Ba(Zn_{1/3}Ta_{2/3})O_3$ exhibits the unusual combination of a large dielectric constant, e_r, and a small loss tangent at microwave frequencies. Using ab-initio electronic structure calculations, we show that *d*-electron bonding in BZT and related materials is responsible for producing a more rigid lattice with higher melting points, enhanced phonon energies than comparable ionic materials and thus inherently low microwave loss.
The properties of commercial materials are optimized by adding dopants or alloying agents, such as Ni or Co to adjust the temperature coefficient, t_F to zero. This occurs as a result of the temperature dependence of $e_r$offseting the thermal expansion. At low temperatures, we show that the dominant loss mechanism in these commercial materials comes from spin excitations of unpaired transition-metal d electrons in isolated atoms (light doping) or exchange coupled clusters (moderate to high doping), a mechanism differing from the usual suspects. At high temperatures, we give evidence that loss also arises and may be dominated by localized hopping transport.
The temperature coefficient of resonant frequency (τ_f) of a microwave resonator is determined by three materials parameters according to the following equation: $\tau_f = -(½\,\tau_\varepsilon + ½\,\tau_\mu + \alpha_L)$, where α_L, τ_ε and τ_μ are defined as the linear temperature coefficients of the lattice constant, dielectric constant, and magnetic permeability respectively. We have experimentally determined each of these parameters for undoped and Ni-doped $Ba(Zn_{1/3}Ta_{2/3})O_3$ materials. These results, in combination with density functional theory (DFT) calculations, have allowed us to develop a nearly complete understanding of the fundamental mechanisms responsible for τ_f.

PL3

Rare earth oxide stabilized zirconia ceramics and composites with enhanced mechanical and functional properties

Frank Kern
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After publication of “ceramic steel” in 1975 fifteen years of intensive research and development followed which can be called the golden age of zirconia ceramics. After this period zirconia ceramics exploiting the effect of transformation toughening were establishedmaterials with a variety of mechanical engineering and biomedical applications. Until recently it seemed that there is nothing new in the world of zirconia. However over the last decade some developments mainly based on improvements in powder technologies have led to new zirconia materials with improved properties which may open up new perspectives.
This talk will - after a brief introduction of the basics and state-of-the art - focus on the development of rare earth oxide stabilized and co-stabilized powders coated withdifferent stabilizer oxides and the implications of this technology to enhancing mechanical properties of TZP (tetragonal zirconia polycrystals) manufactured on this basis.
These TZP materials due their non-equilibrium distribution of stabilizer offer unique combinations of strength and fracture resistance in combination with excellent low temperature degradation resistance.

Manufacturing of ED-machinable composites of TZP with an electrically conductive dispersion of transition metal carbides, borides or nitrides consolidated by hot pressing or spark plasma sintering opens provides a key technology to produce custom made ceramic components of high complexity and dimensional accuracy.

PL4

New Superionic Conductor Narpsio Glass-Ceramics

Toshinori Okura
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This paper describes a series of studies on the Na^+ superionic conducting glass-ceramics with $Na_5YSi_4O_{12}$ (N5)-type structure synthesized using the composition formula of $Na_{3+3x-y}R_{1-x}P_{y}Si_{3-y}O_9$ for a variety of rare earth elements, R, under the appropriate composition parameters (Narpsio). The possible combinations of *x* and *y* became more limited for the crystallization of the superionic conducting phase as the ionic radius of R increased, while the Na^+ conduction properties were more enhanced in the glass-ceramics of larger R. The meaning of the composition formula can be signified in the thermodynamic and kinetic study of crystallization and phase transformation of metastable to stable phase in the production of N5-type glass-ceramics. It was demonstrated that the medium value of content product as [P]×[R] is important in the crystallization of N5 single phase. The Narpsio family has great potential, and is one of the most important groups of solid electrolytes, not only because it is practically useful for advanced batteries, but also because it is a three-dimensional ionic conductor, which comprises 12-$(SiO_4)^{4-}$-tetrahedra membered skeleton structure, from which or by analogy with which various kinds of solid electrolyte materials can be derived. It is a solid solution in the Na_2O-R_2O_3-P_2O_5-SiO_2 system.

PL5

Oxides Powders Produced by Plasma-Spray Pyrolisys Technique and Sintered Ceramics for Structural and Biomedical Applications

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In a paper have been shown state-of-arts the studies of zirconia/alumina-based ceramics obtained from ultra-fine powders.
It was shown that during mechanical activation zirconia-based nanosystem was divided into two subsystems with the average size of structural elements differing by two orders of magnitude. The fraction of the quasi-amorphous (X-ray amorphous) phase therewith increases.
In this ceramics during sintering were formed rod-like structures with a high macro-defor-

mation, which was realized as quasi-elastic area due to micromechanical instability in matrix under deformation. In this case, the attainable strain and ultimate stress of ceramics produced from such powders greatly exceed the values for coarse-grained ceramics with similar parameters of the porous structure.
It have been shown that microdamage accumulation has a threshold character and after local fracture the material is deformed by the previous law. There is direct correlation between macrostresses and local (meso-) parameters of strain distribution. The regions of uniform strain accumulation alternate with the regions where strains change abruptly, which leads first to local and then to macrofracture of the entire material.
It has been found out also the correlation between the sizes of crystallites, fractal dimension, and porosity, which associated with transition of the isolated porous structure to the continuous one and the porosity of 20%, corresponds to the first percolation threshold. It was shown that these sintered porous ceramics has very similar mechanical properties and morphology structure as compare natural bone.

PL6

Morpho-Genetic Materials: Functional Materials Replicated from Superstructures of Natural Species

Di Zhang

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Biological species naturally display an astonishing variety of sophisticated nanostructures that are difficult to obtain even with the most technologically advanced synthetic methodologies. Inspired by these natural superstructures, a series of functional materials are developed based on templating synthesis route. This talk will introduce such a way to fabricate novel functional metals based on natural bio-structures with a great diversity of morphologies and corresponding powerful functionalities.

We mainly focus on replicating the morphological characteristics and the functionality of butterfly wings, plant leaves, and diatoms, et al. We change their original components into our desired materials including oxides and metals with original bio-morphologies faithfully kept. Properties of the obtained materials are studied in details. Based on these results, we discuss the possibility of using these materials in light-harvesting, gas-sensors, and SERS, et al. Such a strategy could also be applied to other natural templates and inorganic systems, which could eventually lead to the production of optical, magnetic or electric devices or components as building blocks for nanoelectronic, magnetic, or photonic integrated systems. These bioinspired functional materials with improved performance are becoming increasing important, which will have great values on the development on structural function materials in the near future.

PL7

Air-Stable High Efficiency Hybrid Solar Cells Based on Metal Oxide and Graphene

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One of critical issues for practical applications of hybrid solar cells is how to enhance the photocurrent and air stability of the peovskite materials. To solve this issue, we synthesized $CH_3NH_3PbI_3$-NiO nanoparticles ($MAPbI_3$-NiO NPs) composite by blending $MAPbI_3$ and NiO NPs and Ag nanoparticles-anchored reduced graphene oxide (Ag-rGO) composite via a simple, eco-friendly one-step microwave-assisted reduction. By introducing the former into the active layer of hole-conductor-free perovskite solar cells (HCF-PSCs) with FTO/c-TiO_2/mp-TiO_2/$MAPbI_3$-NiO/Au architecture, dramatic enhancement of photocurrent density (J_{sc}) was attained, i.e. 26.41 mA/cm^2 which is 97% of theoretical maximum (i.e., 27.2 mA/cm^2). Compared to the power conversion efficiency (PCE) of $MAPbI_3$ only HCF-PSC (i.e., 5.43%), the $MAPbI_3$-NiO NPs composite-based HCF-PSC showed a high PCE of 12.14 %. As-synthesized Ag-rGO composite was introduced into the active layer of P3HT:PCBM based bulk-heterojunction solar cells (BHJ-SCs). Compared to the P3HT:PCBM only device, the Ag-rGO implemented BHJ-SCs showed dramatic enhancements in photocurrent (33 % increase) and PCE (42% increase). More interestingly, the composite-based HCF-PSCs and BHJ-SCs without encapsulation showed remarkable air stability with retaining ~90 % of its original PCE and ~94% of photocurrent for 60 days under ambient environment.

PL8

Modelling of Weakly Coupled Nanoparticles

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Presented will be results on electron localization, tunneling and energy spectrum for systems of weakly coupled nanoparticles. Ceramic nanoparticles are modeled using single sub-band effective mass approach and a confined potential chosen to be ~3 eV. The initial model developed for Si/SiO2 nanoparticles reproduces well optical experimental data. The violation of symmetry in quantum systems (double and triple nanostructures) is considered as one of the conditions for chaotic behavior of energy spectrum. The tunneling with the change of single electron localization in double nanoparticle system is studied by varying the inter-dot distances. The effects of particles overlapping and adding a third particle to a nanoparticle pair are investigated. Tunneling rates for different shapes of the double nanoparticle system are considered in relation to the shape symmetry violation. Localization of an electron is calculated for each energy level of the whole spectrum for a double system. We show that violation of symmetry of double and triple nanoparticle systems geometry reduces tunnel-

ing. Chaotic behavior of energy spectrum is demonstrated for different imperfections of the shape of double particles system. Extension of the model for larger band gaps (potential > 3 eV) is used to describe the difference in electronic properties of semiconductor and ceramic nanoparticle systems.

PL9

$Zr_{n+1}AlC_n$ MAX phases for future fission environments

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After Fukushima's nuclear disaster there has been a growing interest in introducing new safety concepts for future fission reactors. One approach is to develop Accident Tolerant Fuels (ATF) that can withstand the harsh environment within a fission reactor for at least 10 hours in a Loss-of-Coolant-Accident (LOCA). MAX phases are potential candidates for use in ATF as cladding. The system that has been targeted is $Zr_{n+1}AlC_n$. Zr offers compatibility with the zircaloy cladding, Al offers resistance to corrosion and oxidation, while C limitsnucleartransmutation.
This work studies the stabilization of $Zr_{n+1}AlC_n$ MAX phases by partial substitutions in the quaternary systems$(Zr,M')_{n+1}AlC_n$ and $Zr_{n+1}(Al, A')C_n$. Synthesis and sintering of MAX phases will be discussed as well as DFT calculations, indicating possible phase stability, will be shown.

PL10

Geopolymers: Versatile Ceramic Composites Made at Ambient Temperatures, or Precursors to HT Structural Ceramic Powders

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"Geopolymer" is a charge balanced, aluminosilicate, ceramic-like gel made by from a liquid suspension undergoing dissolution, polycondensation or precipitation under ambient conditions. It has a nominal chemical composition of $M_2O•Al_2O_3•4SiO_2•11H_2O$ where M could be Group I elements of Li, Na, K, Rb or Cs. The inorganic polysialate polymer is made by high shear mixing metakaolin ($Al_2O_3•2SiO_2$) with waterglass (an alkali metasilicate solution). The resulting microstructure is impervious, nanoporous (of diameter~6.8 nm), contains 40% porosity by volume, and is nanoparticulate (5-40 nm diameter depending on composition). Alternative aluminosilicate sources are waste materials such as fly ash, slag, basalt or red mud. Geopolymer composites have been make with reinforcements of: chopped particulates (chamotte, granite sediment and graphene nanoplatelets); chopped fibers of graphite (60 mm and 100 mm in length), chopped fibers of Saffil alumina 3 mm in diameter; basalt (1/4 or 1/2

inch long or chopped strand matt) or polypropylene fibers (0.5", 1", 1.5"); alumina platelets 50 mm diameter; long, uni-directional fibers of carbon; felt matt of fiberglass or basalt; and weaves of Nextel 610 alumina, Nextel 720 mullite plus alumina and basalt. In addition, geopolymer composites containing natural fibers of corn husks, jute, Colombian fique, Amazonian curua and malva have been made. The mechanical properties of various ceramic particulate, chopped fiber and fiber-reinforced compositesare summarized as a function of temperature, both post-heat treatment, or in situ at high temperatures to 1400 °C.
A series of geopolymers were prepared using NaOH, KOH, CsOH alkaline solution by mixing metakaolin (Al_2O_3•$2SiO_2$) and then a nanopowder carbon source was added these geopolymers. Geopolymer test samples were hand fabricated to determine the best composition for carbothermal reduction and carbothermal reduction and nitridization, with and without carbon. The viscous and homogenous slurries was poured into a mold to obtain bar samples at ambient temperature and cured in a constant 50 °C temperature humidity oven for 24 h. After determining the best composition forK and Cs-based geopolymer, these geopolymer compositions were carbothermally reacted under argon or nitrogen gas flow. Thecarbothermal reduction or nitridization processes of the samples were carried out inan atmosphere-controlled, tube furnace under argon or nitrogenflow, respectively, of 5 $cm^3.min^{-1}$, at temperatures varying between 1400-1550 °C for 2h. XRD and SEM analyses were used to determine transformationand morphology of all the products after carbothermalreduction. The results were briefly discussed with respect to thepossibility of conversion of specific geopolymer composition intotheir SiC, Si_3N_4or SiAlON analogues.

PL11

Spectroscopic studies of heavy metal glasses

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Extensive research has been carried out to characterize the Heavy Metal Fluoride (HMF) glasses meant for the electromagnetic calorimeter at Large Hadron Collider (LHC) at CERN and for the optical fiber.
A variety of optical techniques like fluorescence, absorption / transmission spectroscopy, x-ray photoelectron spectroscopy (XPS), UV edge attenuation, refractive index, dispersion and x-ray diffraction (XRD) were applied to the HMF glass samples.
The band edge attenuation was derived by fitting the Urbach formula to the measured absorption coefficient data. The energy levels of the ingredients of HMF glasses were determined by XPS technique. XRD and Fourier Transformation (FT) confirmed the local environment of the samples.
It has been revealed that the HMF glasses were fast scintillators, less dispersive, dense and stable glasses and can be used for the homogeneous electromagnetic calorimeter at CERN and the ultra-low loss repeater less optical fiber for communication systems as signal amplifiers.

PL12

The Role of Microstructural Features in High Frequency and Energy Ceramics

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Ferroelectric-based electronic materials for future applications should possess a novel combination of properties and better energy efficiency with further miniaturization of the components and relevant devices. Ceramics of interest for such development consist of well characterized materials having well controlled chemical composition and phase distribution architecture in the desired heterostructures with optimized electronic properties. In this respect several new synthesis techniques will be required which enable downsizing towards the formation of thinner films based on nano-sized particles and heterostructures on nearly atomic scale. Apart from crystal chemistry and crystal structure it is mostly the microstructure that governs the properties of functional ceramics. We have identified several features in microwave and thermoelectric ceramics, which influence development of the microstructure and consequently influence dielectric and electrical properties of the materials. The control over the formation of such microstructural features and their role in tailoring the electrical response of a material will be discussed.

PL13

Design and development of car body from composite materials using single step resin infusion process

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The advanced composite materials are increasingly being used in the mass transportation systems for their ultra light and super strong properties. Application of this new generation of engineering materials in the car body has led to weight saving of upto 25% which translates into 5% of fuel saving. The US government launched a massive energy efficiency program (ACEE) in 1970 which investigated application of such kind of materials in the aircraft bodies for enhancing fuel efficiency. Sheet Molding Compound process is generally used for manufacturing automobile structural components but is highly capital investment.
This research involves development of complete body of an all composite economy car in a single step resin infusion process. Three different scaled down models of the car were manually developed according to user's technical requirements focusing on minimal weight and air drag coupled with aesthetics. Structural design and analysis was carried out to determine the optimal shape, geometry and strength using the Pro/E and Ansys tools. The digital model of exterior shape of car body was developed through coordinate measuring machine using selected model instead of Pro-E modeling due to time constraints. The digitalized data was used for develop-

ment of Pro-E model. The Pro-E model was scaled up to generate CAD drawings for tool development. Different stations were marked on the model and sliced virtually for development of pattern. After developing pattern, the mold was manufactured from carbon and glass / polyester composites for prototype manufacturing of the car body. The prototype manufacturing involved manual placement of desired number of carbon layers as perform on female side of the mold. The vacuum sucked the resin through a number of carefully selected entry ports. Multiple resin delivery ports ensured effective resin distribution and impregnation. After curing, cutting, trimming and drilling was carried out to finish car body to actual size. Polycarbonate wind shield was thermoformed in the convection oven according to streamlined geometry of car body and hinged. The car body was integrated with the compatible floor panels and accessories. The crumble zone shock absorbers in the bumper was manufactured using successive layers of nomex honeycomb and PVC rigid foam to dampen the accidental shock. The successful test runs were made to qualify the car body according to the user's technical requirements.

PL14

Porous Mano Structured Ceramics – From Bulk to Nanofibers

G. S. Grader
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The generation of porous ceramics has been an objective of much research for decades. Clearly the size and structure of the porosity in the material are of key importance to different applications such as catalysis, filtration, adsorption and thermal insulation. This talk will concentrate on porosity driven by in-situ chemical transformations within the material. The origin and mechanism of pore formation in different systems will be discussed.
On the one hand, the formation of ultralightbulk ceramics using a non-hydrolytic sol-gelfoaming process will be described. The unique foaming mechanism involves simultaneous phase separation, gelation and drying, yielding highly porous foams with a porosity that can exceed 99%. The work has been demonstrated on alumina and alumino-silicate ceramics – however the foaming mechanism is generic and can be applied to other systems.
On the other hand, sub-micron fibers are of great interest in the field of heterogeneous catalysis. Such fibers can potentially provide superior transport properties between the catalytic sites and the bulk. Providing the fibers with internal nano porosityincreases the catalytic surface, enables better mass transport and catalyst efficiency and lowers the deactivation rates. This part of the talk will focus the pore formation mechanism in Fe-Al-O ceramic nano fibers with mesoporous structure.
Both examples will demonstrate how internal chemical transformation can be harnessed to generate controlled porosity in functional ceramics.

KN1

Bioelectrochemical harvesting of greenhouse gases

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[2]Department of Physics, COMSATS Institute of Information Technology, Lahore, Pakistan

The present study demonstrates bioelectrochemical reduction of inorganic carbon dioxide to organic compounds using Sporomusa Ovata in a tube shaped bioelectrochemical cell (BEC). Among biosynthesized products acetate, ethanol, n-butyric acid and iso-pentanoic acid, 142.9 mg/L of acetate produced in 72 hours. This increase in acetate yield is attributed to improved parameters adopted during reactor design. Average bioelectrochemical acetate synthesis rate was found to be $1.3\pm0.67 mgL^{-1}h^{-1}$. Cyclic voltameteric study confirmed redox activity of S.Ovata on poised biocathode. The percentage electron recovery as total organic compounds is found to be in the range of 84± 13% to 65± 11%. The second major product is ethanol, formed by the conversion of acetaldehyde into ethanol. The presence of ethanol assumed to be due to electro activity and metabolic shift from acetate to ethanol in the biochemical-producing S.Ovata in BEC. The current research opens up the prospects of improving processes for bioelectrosynthesis of electron dense organic compounds from renewable energies and waste greenhouse gases instead of synthesizing them from non-renewable and energy rich compounds.

KN2

Metallic Butterfly Scales: Fabrication and Their Plasmonic Applications

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To survive the natural selection process, biological species have developed an large variety of sophisticated morphologies that are powerful in functionality and yet difficult to achieve even by the most advanced synthetic methodologies. Gleaning natural hierarchical structures, scientists have developed a broad range of novel functional materials based on the template synthesis method. This talk will introduce how to fabricate novel functional metals based on natural bio-structures with a great diversity of morphologies.
We mainly focus on replicating the textures and the functionalities of butterfly wing scales in metals. We convert their original components into seven different metals with original bio-morphologies well-inherited. For Ag, Au, and Cu scales, their plasmonic performance is studied. Results show that Au scales as SERS substrates can exhibit SERS properties higher

than their commercial counterparts. A preliminary mechanism responsible for this phenomenon will be introduced. These bio-structured functional metals will have great values for the development of novel materials in the near future, which are otherwise unavailable.

KN3

Modeling Liquid Bridge Rupture Induced by Grain Rearrangement

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The rearrangement process during liquid phase sintering has been generally accepted that driven by the capillary forces between solid grains embedded in liquid. This process assumes that if there is good wetting between liquid and solid phases, solid grains will rearrange themselves under the action of surface tension forces, producing more stable packing. The rearrangement of such system results from the attractive forces developed between the grains through the liquid bridges, where the forces may be capillary and viscous in nature (i.e. static and dynamic, respectively). Capillary forces usually dominate in cases where the liquid exists as isolated (discrete) bridges, but viscous forces can become significant when the liquid viscosity is very high or at high interparticle velocities.
The rearrangement process during liquid phase sintering has been recognized by remarkable approaching of some grains combined with the filling pores process, but also by the enlargement of some inter-grain distances followed by the growing of some inter-grain pores. The overall effect of separating the grains while keeping constant the liquid volume is therefore an elongation of the bridge, which becomes longer and thinner and less concave. At greater separation distances such bridges are not stable any more and formation of liquid droplets on the surfaces of grains is possible. Our consideration will also take into account a maximum value of the separation distance which corresponds to liquid bridge rupture. Note that such liquid bridge elongation combined with liquid bridge rupture can reinforce grain rearrangement, but also generate non-uniform distribution of small and large pores.
All mentioned phenomena will be the subject in our study, where investigation of the model system densification combined with liquid bridge rupture will be analyzed in a simple grain arrangement. The unstable (pendular) bridge will be modeled as ruptured bridge replaced by two liquid droplets. When two grains are pulled apart due to rearrangement, the liquid bridge and corresponding capillary force within it evolve from a static state toward a critical configuration in which, at some point, the liquid menisci first touch each other (meniscus radius approaches zero) and the liquid bridge ruptures. The ruptered liquid bridge can be considered so that it breaks into two smaller liquid droplets adhere to the surface of each grain. We will assume that their volumes are proportional to the grain size ratio, as well as that their shape can be approximated by a perfect sphere because gravity has negligible effects on their small liquid volumes.

KN4

Electric Discharge Coating of metals with ceramic compounds

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Resistance spot welding is often used to spot weld sheet steels to join different sections of a car. This welding procedure is specifically carried out in short time and in elevated numbers with a certain pressure applied on them. In addition, copper electrodes are expected to endure against mechanical pressure and temperature that is released during the passage of the current. The deformation and oxidation behaviour of copper electrodes during service appear with increasing temperature of medium and they also need to be cleaned and cooled or replaced for the continuation of joining process. The coating of copper electrodes with ceramic matrix composites can provide excellent high temperature strength and ensures both economic and efficient use of resources. Studies show that the ESD coating of copper electrodes with a continuous film of ceramic phase ensures an improved resistance to thermal effects from heated zone and electric current passing through it. The change in content of film layer and its thickness are critical for overall performance of the welding process by means of electrical and heat transfer susceptibility.

KN5

Environmental forensics–concepts and contemporary challenges

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Environmental forensics is defined as a combination of various analytical techniques and biogeochemistry, serving the needs of legal proceedings in the environmental crime sector. This branch of forensics has received increased attention over the last decades when many countries have classified in fractions against the environment under the penal law. Directive 2004/35/EC of the European Parliament on environment alliability with regard to the prevention and remedying of environmental damage (ELD) establishes a framework based on the polluter pays principle to prevent and remedy environmental damage. The polluter pays-principle is set out in the Treaty on the Functioning of the European Union. As the ELD deals with the “pure ecological damage”, it is based on the power sand duties of public authorities (“administrative approach”) as distinct from a civil liability system for “traditional damage” involving damage to property, economic loss, personal injury. In all cases forensic investigations are of paramount importance inproviding requisite data or evidence. Such a task will often involve a site visit, an examination of the title sand a search of various in formation sources including the national archives, regulations on healthy and safety, aerial photography, any monitoring and assessment reports, relevant correspondence, the planning and building control files and witness statements.

Professional forensic laboratories, usually associated with national police departments, are often understaffed with experts on the environmental investigation techniques. Thus, all efforts need to be made to provide appropriate education to all stake holders – from first response teams to law-enforcement professionals, at torney and judges.

KN6

Fractals, Materials and Energy Technologies

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World's perennial need for energy yields the whole spectra of technological challenges and scientific tasks. An important stream in finding new solutions leads over materials characterized by precise microstructural architecture based on fractal geometry/analysis covering wide size ranges down to nano scale. Having such a deep geometric hierarchy opens new possibilities in energy storage capacities supported by fractal resources. These novel ideas are natural continuation of some early fractal applications have been used as a tool in energy research, applying on diverse energy technologies, from photovoltaics to fuel cells and carbon capture.
All three items that are essential regarding energetic questions, free energy stocks location, energy harvesting and short/ long term energy storage have their specific common points with fractal nature. Also, the concept of energy as physical objects property, share some features characteristic to fractal objects. In other words, fractal, as a crucial concept of modern theoretical-experimental physics is tightly connected with the process of cultivating the wild energy as well. Here, the above items will be discussed. The term "geometry" as it is custom in plain language, understands "shape" rather than the science of geometry. In this sense, "geometry" describes property of hierarchy that is more present in every day's life than we are usually aware of. Just note that all our senses often convey information on the quality of some matter by absorbing certain hierarchical order. The touch feeling of smooth or rough surface, olfactory or taste data differ by energetic level that generates according to geometry of particles or clusters that follow fractal patterns. Adjusting specific, a priori constructed fractal micro or nano architecture make the energetic flow more effective by decrease losses made by non-conformal geometry.

KN7

Yttrium doped barium cerate: ceramic matrix in the solid oxide fuel cells

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Yttrium-doped barium cerate $BaCe_{0.85}Y_{0.15}O_{2.925}$ (BCY15) possesses ABO_3 perovskite-type structure is a classical proton conductive electrolyte which may be exploited in three different functional layers of solid oxide fuel cell (SOFC): as proton conducting electrolyte, Ni-cermet anode and proton conducting component in the mixed conducting central membrane electrolyte. Nowadays, the metal Ni is an attractive anode component for SOFC because expresses similar performance to the expensive precious metal-based catalysts. Although one-step, the preparation of Ni cermet by oxides powder mixture reaction or combustion process leads to obtaining of coarse and inhomogeneous products.
The aim of investigation is characterization of the BCY15 structure after Ni incorporation in the anode ceramic matrix by using different wet-chemical routes, namely impregnation, precipitation and deposition/precipitation.
X-ray diffraction, N_2-physisorption and SEM techniques used for characterization of BCY15/Ni powders disclose formation of Ni-containing surface structures with different textural parameters and presence of varying in shape and size both identical fine-grained particles and large isolated particles, depending on the preparation approach.
It was found that the BCY15 original structure is significant preserved when Ni introduction in anode ceramic matrix is accomplished by deposition/precipitation route. This provides a precondition for good electrochemical efficiency.

KN8

Implementation of innovations in the field of solar energy in Southeast Europe through the analysis and encouraging the development of solar energy on a global scale

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This presentation treats the analysis of the development of solar energy in the world, for a period of 2000-2015., with an emphasis on innovation and trends that accompanied the development of solar energy and technology resources and technology of reproduction of natural resources through the analysis of socio-economic benefits and risks of their evaluation. Screening and selection mechanism that determines the interest of economy entities in the implementation

of "green alternative" technologies, conservation of resources and the choice of methods to improve the availability of resources is performed. The recommendations in the field of green economy, which need to be presented to interested parties, should be used for the development of economics, the implementation of solar energy systems important role engineers, economists, environmentalists, business leaders, representatives of state administration, as well as students, graduate students, teachers and a wide range of trained readers interested in the problems of environmental management and sustainable development of the economy.

KN9

Energy Storage Systems for Stationary Applications

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Deployment of micro-grid using intermittent renewable energy sources such as solar and wind power requires electrical energy storage systems. Large scale stationary storage systems (250 – 1000 kWh) are to be designed with very different power and energy to solve two distinct issues viz. frequency regulation and load shifting. For frequency regulation (to deliver smooth power), the storage system has to be designed with high power. However, for load shifting (peak shaving) the storage system should have high energy (capacity), thereby allowing the load at any time to be serviced by the lowest-cost renewable energy.

Among several storage options, electrochemical energy storage systems seem to be attractive to achieve either high power or high energy or both. Specifically lithium-ion batteries are the preferred one for micro-grid applications. They have been proven to be effective because they are long-lasting with high energy density, yet compact and lightweight. However, currently lithium-ion battery systems are expensive about $600-1000/kWh. Besides, lithium is a scarcity and may not meet proliferating large scale needs of the future. Sodium, on the other hand, is abundant, more environmental friendly, is also easy to recover - at a fraction of the cost of lithium based materials. Sodium-ion battery technology has attracted a great attention recently. Unlike Na-S that operates at high temperature, sodium-ion batteries operate at ambient temperature and are expected to be durable, safe and inexpensive (about $250/kWh). Regardless of the lower energy density of sodium-ion batteries, they can be effectively employed for stationary applications where the weight and footprint requirement are not serious concern.

In this talk, we will present recent progress made on development of cathode and anode materials for sodium-ion batteries. Strategies to reduce cost and to improve the storage capacity, rate performance and cycle life would be discussed.

KN10

Smart Composite Materials for Waste Water Remediation

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Smart composite materials have been a thrust area to the researchers in the development of new materials that lead to create new tools and techniques which will help in the development of advance technology. At the nano size, smart composite materials often take on unique and sometimes unexpected properties. “Smart composite materials” have been extensively used in a variety of applications due to the change in the characteristics of the materials with small variation on stimuli. They are also known as responsive materials. Smart composite materials change their properties abruptly in response to small changes in the environmental conditions such as pH, temperature, electric and magnetic fields. Due to the versatility of such characteristics these materials are highly applicable in the area of materials science, engineering, sensors and environmental applications. Besides, such materials are applied to develop newer composites, ceramics, chiral materials, liquid crystals, conducting polymers, hydrogels, nanocomposites, and biomaterials. These smart materials are highly potential materials to apply for environmental remediation. Focus of my talk will be the overview of the status of the smart composite materials in remediation of the contaminats from waste water.

KN11

Magnetic properties of melt-spun alinco-V alloy ribbon

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Magnetic ribbons of AlnicoV alloy is fabricated by melt spinning technique . The ribbons are fabricated at different wheel speeds from 25 m/s - 50 m/s. All the prepared samples are found to be in the ferromagnetic and crystalline state at room temperature. The measured saturation magnetization of the as made samples at different wheel speeds varied from 100 – 150 emu/gm at 300 K . Slight enhancement of this value is recorded for samples grown at higher wheel speed (50m/s). All the as made samples have shown a nominal coercivity of around 100 Oe. There is no structural phase transformation of this alloy in its ribbon form showing only the bcc phase . This phase persisted even after annealing at higher temperature (900C for 30 minutes) and the coercivity remained unchanged upon annealing. However , the coercivity has shown a significant enhancement upon annealing the sample at 900C for 30 minutes , then cooling @ 4C/minute down to 600C followed by aging the sample for 4 hours and then cooling down to room temperature, the process called Alnico V regular heat treatment. A coercivity of around 800 Oe is recorded after following the

aging process leading to a significant increase in the energy product. Addition of 2 wt% of B has improved the elastic property of the ribbons. However, the saturation magnetization has slightly reduced upon Boron addition. XRD pattern have shown small shoulders in the neighborhood of prominent bcc peaks. This small shoulder peaks are assumed to be the onset of formation of boride phase. Scanning electron microscopy images have shown equiaxed grains. Annealing followed by aging has also enhanced the coercivity of the ribbon shaped alloy . Transmission electron microscopy (TEM) images reveal the origin of coercivity of the ribbon. The magnetic properties of Alnico V is basically governed by two metallurgical transformations . The α-matrix decomposes into two different phases at high temperature. The growth of two phases α_1 (ferromagnetic) and α_2 (weakly ferromagnetic) in AlnicoV alloy is thought to be responsible for the deterioration of magnetic properties at high temperature . The composition, orientation and the distribution of α_1 precipitates in the whole matrix determines the magnetic properties of the alloy. Eventually the α_1 phase which is rich in Fe and Co is dispersed in α_2 phase at high temperature. At high temperature the second transformation occurs with the appearance of the fcc γ phase which is detrimental to the magnetic properties of the alloy. There are practically two ways to avoid formation of the γ (fcc) phase, one is the by melt spinning of the alloy to form ribbons and (b) the other is to hard press the melt-spun powders followed by heat treatment under magnetic field.

KN12

The rainbow ion-solid interaction potential

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This work is devoted to a method for obtaining very accurate ion–atom interaction potential based on the rainbow effect. The high-resolution measurements of angular distributions of 0.7 up to 2.0 MeV protons transmitted through a 55 nm thick (001) silicon membrane is presented. The method for determination of the rainbow proton-silicon interaction potential is based on the modification of the Moliere'spotential so as to be accurate both close and far from the silicon atom. This was achieved byadjusting the shapes of the rainbow lines in the angular transversal plane. As a result, the obtained theoretical proton angular distributionsare in excellent agreement with the experimental ones. Additionally, the analysis confirms accuracy of the rainbow potential in the case of the doughnut patterns observed when a 55 nm thick (0 01) silicon membrane is tilted away from the [001] direction.Possible applications of the rainbow ion–atom interaction potential are discussed.

KN13

An overview of ceramics in dentistry

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Zirconia ceramics (Y-YZP) have several advantages over other ceramic materials, consequently research on the possibility of using zirconia ceramics as biomaterials started about twenty years ago, and now zirconia (Y-YZP) is in dental usage, but developments are in still ongoing for application in other medical fields.
Mechanical properties of zirconia relate to its fine grained, metastable microstructure. The expected performances are due to the stability of this structure during the lifetime of TZP component. TZP materials, containing approximately 2-3% mol Y_2O_3, are completely constituted by tetragonal grains with sizes of the order of hundreds of nanometers. Basic properties and clinical applications as implants for surgery are now described by the standard ISO 13356. Different zirconia products and their applications were tested (flexural strength, Kic, XRD, SEM). The Kic (MPa • m1/2) Kerox HD (12.97±1.2), Upcera (9.71±1.05), Crystal (10.68±1.28), Sagemax S (9.26±0.8), KeroxET (9.79±0.95), and the flexural strength (MPa) KeroxET 1415±160., Kerox HD 1365±145, Crysta 1267±105, Upcera 1255±145, Sagemax S 1172±135 was respectively. For achieving better esthetical effect are the clinical application of these innovative ceramics and technologies, however there are not enough long term studies about these new technics. Newly proposed zirconia seems to have good biological and mechanical properties; further studies would be necessary to compare the new systems (zirconia toughened Al_2O_3, alumina toughened zirconia) and the different products.

INV1

Curie-Weiss Law Fractal Corrections and Clausius-Mossotti Equation

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The Clausius–Mossotti relation emerged as a combination of the analysis of indices of refraction (by Rudolf Clausius) and the relationship between the dielectric constants of two different media (Ottaviano-Fabrizio Mossotti). Since it connects dipole's polarizability with the electric permittivity of a material made of those dipoles, it is one of the fundamental relationship that can be derived from Maxwell's conductivity equation. Also, it is tightly connected both the Curie and Curie–Weiss laws which are correlation relations. Using fractal approach in Curie–Weiss equation and fractal correction applied recently by the authors, the Clausius–Mossotti relation is also subjected to modification with respect to ferroelectric materials fractal nature. The correction is operationally performed by introducing fractal correction factor $a_0 > 1$, as a multiplier to the usual dielectric constant e_r to gain the bigger value $a_0 e_r$. This shows that the Clausius–Mossotti relation is also "permeated" by fractal nature being inherited from the material's morphology. Our experiments were carried out on $BaTiO_3$-ceramics as characteristic representative of perovskites but the conclusions can be applied on any other ceramics materials as well as on thin film layers and coating in general. By shapes control and contact surfaces numbers on the entire BaTiO3-ceramic sample level, the control over structural properties of these ceramics can be done, with the aim of correlation between material electronic properties and corresponding microstructure. The fractal correction has wide consequences on many phenomena like PTC, ferroelectrics, ferromagnetics, piezo- and optoelectronic properties as well as electrochemical thermodynamic and fluid dynamics parameters.

INV2

Resonant ultrasound spectroscopy in the study of relaxation processes in tetragonal tungsten bronzes

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Tetragonal tungsten bronze (TTB) structures offer some promise as lead-free ferroelectrics and have an advantage of great flexibility in terms of accessible composition ranges due to the number of crystallographic sites available for chemical substitution. The ferroic properties of interest are coupled with strain, which will be important in the context of stability, switching

dynamics and thin film properties. Coupling of strain with the ferroelectric order parameter give rise to changes in elastic properties and these have been investigated for a ceramic sample of $Ba_6GaNb_9O_{30}$ (BGNO) by resonant ultrasound spectroscopy (RUS). Room temperature values of the shear and bulk moduli for BGNO are rather higher than for TTB's with related composition which are orthorhombic at room temperature, consistent with suppression of the ferroelectric transition. Instead, a broad, rounded minimum in the shear modulus measured at ~1 MHz is accompanied by a broad rounded maximum in acoustic loss near 115 K, and signifies relaxor freezing behaviour. Elastic softening with falling temperature from room temperature, ahead of the freezing interval, is attributed to the development of dynamical polar nanoregions (PNRs), while the non-linear stiffening below ~115 K is consistent with a spectrum of relaxation times for freezing of the PNR microstructure.

INV3

Modeling, designing and processing of barium titanate stannate functionally graded electroceramics

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Barium titanate stannate (BTS, $BaTi_{1-x}Sn_xO_3$) functionally graded materials (FGMs) with an uniaxial Ti/Sn concentration gradient are very useful for applications in electroceramics, due to a high dielectric constant in a wide temperature range. The relative dielectric permittivity, position and width of the transition temperature range for BTS FGM depends on the Ti/Sn concentration gradient and can be easily tailored.
Sintering is the most challenging step of FGMs processing, since the constituent layers with different chemical compositions shrink with different rates and the resulting mismatch stresses can lead to FGMs distortion. To obtain high-quality FGMs it is desirable to predict the sintering process for every graded layer and to design sintering strategy.
Two- and four-component BTS FGMs were chosen as model systems for the designing of sintering strategy. To calculate the residual stresses and predict distortions during sintering, a finite element analysis (FEA) was performed. The model was coupled with a measurement of BTS components shrinkage obtained during sintering, in a heating microscope, up to 1420 °C with heating rates of, 2, 5, 10 and 30 °/min. The linear coefficients of thermal expansion, calculated from the shrinkage data for BTS components, were used as input data for FEA. After calculation of the residual stress and prediction of a distortion, optimal heating rate was chosen and BTS FGMs were fabricated. The microstructure and chemical (Ti/Sn) gradient in the FGMs were examined by SEM–EDS methods, while the electrical characterization was done on an Impedance Analyzer at frequencies of 1 Hz–100 kHz.

INV4

Electrical characterization of $YFeO_3$ nanoferrite and its potential application for humidity sensing

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Yttrium orthoferrite ($YFeO_3$) nanoparticles with an average size of about 12 nm were successfully synthesized by a mechanochemical treatment of high–purity yttrium(II) –oxide (Y_2O_3) and hematite (α–Fe_2O_3) as initial precursors. X–ray diffraction analysis of prepared $YFeO_3$ confirms the formation of the pure orthorhombic crystal structure and their nano–dimensional nature. The nature of variation of AC conductivity spectra with frequency of the applied electric field from 100 Hz to 10 MHz is found to obey Jonscher's universal power law at different temperatures from ambient to 190°C. In addition, detailed analysis of the AC conductivity data has shown that correlated barrier hopping (CBH) mechanism is the most probable mechanism of electrical conduction for $YFeO_3$ nanoparticles. The activation energy for electrical conduction has been calculated from the Arrhenius plot using the results of DC resistivity measurement. Detailed study of complex impedance and related parameters indicate that the synthesized nanoparticles exhibit semiconducting nature (NTCR–type behavior) and non–Debye type of relaxation phenomena. Further, analysis of impedance spectra by means of an equivalent circuit model revealed the presence of a single temperature dependent relaxation. Decrease in resistances and relaxation times with temperature confirms the involvement of thermally activated conduction mechanism in this material. In view of the analyses of dielectric properties, it was noticed the usual dielectric dispersion, which was explained in the light of Maxwell–Wagner theory of interfacial polarization in accordance with Koop's phenomenological theory. As part of a systematic study, the humidity sensing properties of fabricated $YFeO_3$ nanoparticles were also evaluated in the relative humidity range between 15% and 85% at room temperature. The results revealed that sample responds well to the humidity by showing the significant variations in DC electrical resistivity values. High sensitivity, linearity of the sensitivity characteristic and relatively quick response time recommend that this ferrite material can be the favorable choice for the realization of a very good resistive humidity sensor.

INV5
Development and Evaluation of glass-like coatings for cardiovascular implant applications such as stents

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Aim: Glass-like materials are used due to their excellent properties in a broad application field like drug delivery systems or as implant coating for bone repair. However these glass-like materials can only be generated at relatively high temperatures that limit their application in temperature-sensitive areas. Therefore, new developments and further research is going on to provide useful coatings also in the field of cardiovascular implants such as stents.
Methods: Two glass-like coatings have been developed and characterized. These coatings have been applied on glass and nitinol (stents) using the well-known sol-gel-technique and tempered at moderate temperatures in different atmospheres. Afterwards the biocompatibility using human umbilical vein endothelial cells (HUVEC) has been investigated.
Conclusion: The developed glass-like coatings possess excellent optical, chemical, and biological properties. By altering the existing sintering atmosphere, the cellular growth could be selectively influenced in a positive and a negative way. Additionally the coatings have been proven to be of radiolucent nature that makes them attractive for different fields. Coating on nitinol (stents) was succesfull and can be base for a later cardiovascular application. First and foremost these coatings can contribute in a better acceptance of an implant in the human body.

INV6
A review on the selection of anode materials for solid-oxide fuel cells

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Solid-oxidefuelcells(SOFCs) are the most widely used fuel cellsbecausetheyexhibit flexibility, power generation efficiency,and low pollution formation. Research on SOFC anodes is a major and challenging task in the field of SOFCs.This review highlights the anode materials that may be used for SOFC applications. The use of cermet-based oxide materials as anodes for SOFCs is also discussed in detail. A literature survey conducted over the last 10 years shows that increased power generation efficiency may be attributed to anode materials used in such cells. Oxide-based anode materials with perovskite and several oxides with cubic fluorite structures are further described.Based on the review conducted, we find that cubic fluorite-structured compounds are the most promising anode materials reported thus far. Analyses of the structure and electrical performance of anode materials show as well that copper– gadolinium-doped ceriumoxide(Cu–GDC) cubic fluorite-structured anodes exhibit higher electronic conductivity potential than yttria-stabilized zirconia-based anode materials.

INV7

Silica-based Catalytic Systems Prepared by Sol-Gel Methods

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The sol-gel process is a powerful tool for preparing porous ceramic inorganic materials, in particular silica, with a high degree of purity at relatively low temperatures. The process is based on the polymerization of metal alkoxides such as $Si(OR)_4$, $Ti(OR)_4$, and $Zr(OR)_4$. The polymerization can occur mainly *via* the hydrolytic mechanism, where the metal alkoxides undergo first hydrolysis in the presence of water, followed by a polycondensation reaction to yield a three dimensional inorganic network. The properties of the resulted sol-gel materials and their molecular morphologies are influenced by several factors such as the type of the alkoxide groups, temperature, molar ratio between the metal alkoxides and water, and especially pH.
Microcapsules have taken an important role in controlled release of active agents, such as drugs and agrochemicals. In the past years, sol-gel mediated microencapsulation emerged as an important technique in the field of microencapsulation. Basically, the microcapsules are prepared by the polycondensation of alkoxysilane monomers at the interface of a droplet dispersed in a proper solvent. The droplet is usually stabilized using surface active materials like surfactants. In this talk, we will present the novel methods developed in our laboratories for preparing catalytic silica based microcapsules and their application in organic transformations including asymmetric reactions. In addition, I will demonstrate the application of sol-gel techniques for preparing silica-based catalytic nanomaterials.

INV8

Ceramic powder compaction: numerical simulation and calibration through inverse analysis

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The production of ceramic components usually involves two phases: a cold powder compaction phase, followed by a sintering phase after which the product takes its final form. During powder compaction, initially granular material gradually becomes cohesive through a mechanical densification performed on room temperature. Product that comes out of this phase is called a *green body*, with enough strength to remain intact upon the ejection from the mold.
It is very important to produce green bodies free from defects, as their presence influences the performance of the final product by affecting local shrinking, resulting in potentially high in-homogeneity, presence of residual stresses or even formation of macro cracks. Such result is easier achieved if the powder compaction process can be accurately modeled by the use of high fidelity numerical models.
To simulate this process usually soil constitutive models are employed. However during compaction phase material passes through wide range of pressure and changes significantly elastic

properties. Such circumstance limits the use of constitutive models with linear elasticity followed by appropriate hardening law, and a more general framework is required, in which elastic properties are dependent on plastic deformation. The use of complex constitutive model which takes into account elasto-plastic coupling, makes the numerical implementation challenging as the number of parameters to calibrate significantly grows, while some of them require high pressure experiments, or experimental setups that are inducing complex state of stress, which can make the industrial application potentially difficult.
An alternative and advantageous strategy for such calibration is based on the employment of inverse analysis (IA) methodology. Advantages consist in more accurate and more economical transition from experimentally measured quantities to material constitutive parameters, which are of major interest for reliable simulation of compaction process. The IA methodology is centered on appropriate minimization of a "discrepancy function" designed to quantify the difference between measured quantities and their computed counterparts. By adopting this strategy for parameter calibration of constitutive models used for powder compaction simulations, it is possible to completely eliminate the need for performing experiments on a green body. This goal requires an adequate modification of compaction tools to stimulate the sensitivity of measurable quantities to sought parameters. The fulfillment of this objective is assured by appropriate design of experimental setup, achieved through sensitivity analysis.
The purpose of this lecture is to present some of the advancements within the above outlined technology, pointing out limitations of currently applied techniques. Results from different approaches of modeling of powder compaction processes will be comparatively presented. Particular emphasis will be given to the employment of inverse analysis methodology for the calibration of constitutive models in a given context. Results recently achieved by our research team will be shown considering the above-mentioned and related topics.

INV9

Comparative fractal analysis of *Valeriana officinalis* roots shrinkage during drying

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Valerian plant roots (Valeriana officinalis)shrinkage was investigated during the convective hot air drying. Combined fractal and image analysis was performed in this study.The samples were prepared for light microscopy observation by standard paraffin wax method, sectioned by sliding microtome and stained by Alcian blue and Safranin. The fractal dimensions of sample images were calculated using the box counting method.Both polar and orthogonal meshes were used. The normalized changes of fractal dimension of the microstructural images were used to describe the shrinkage process of biomaterial. The changes of physical properties and microstructure of roots strongly depends on drying regime and drying agent properties. Comparative analysis of fresh and dry root samples shows thatmicrostructural changes in bio material can be

correlated with drying parameters during the dehydration process. Fractal dimension was found to be a good indicator of the microstructural changes of aninvestigated bio-material.

INV10
Silica particles with controlled roughness – synthesis, characterization, and use as building blocks for non-close packed arrays

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Silica nanoparticles are widely used in many applications. The reactivity and the interactions of such particles with surfaces are not only determined by their size and chemical functionalization but also by their surface roughness. Nonetheless, an exact characterization of the surface roughness of nanoparticles on a nanometer scale is challenging and different techniques lead often to significantly deviant results. Hence, a systematic investigation of this issue is highly demanded. In the present study, silica particles of 100-500 nm diameter with different surface roughnesses were prepared by a novel method yielding highly monodisperse particles on a several gram scale. Their roughness is tuned by using different tetraethyoxysilane (TEOS) to octadecyltri-methoxysilane (ODS) ratios. Other approaches for controlling the surface roughness including the approach of Hartlen et al.[1] and the use of CTAB (cetrimonium bromide) as a pore builder are also discussed.
BET was applied for the determination of the total surface area and the porosity of the particles. However, this method yields only indirect information on the extent of the outer surface area and the related surface roughness. In addition, the results are influenced by the decreasing polarity of inner and outer surfaces with increasing ODS:TEOS ratios. Atomic force microscopy (AFM), the standard technique for the determination of surface roughness was also utilized, but accurate measurements of strongly curved small objects as in the present case are challenging. Further, a novel approach based on the analysis of TEM images for determining the surface roughness is presented. The results of the different techniques are compared.
In the second part of the presentation, we show that the surface roughness of silica nanoparticles is a key issue for the preparation of non-close-packed ordered two-dimensional nanostructures. [2] Such structures are needed for a variety of technological applications and consequently, the quest for simple and reliable preparation methods for such structures is ongoing. In the present approach, positively charged amino-functionalized silica nanoparticles (118-162 nm diameter) were self-assembled from dispersion on gold surfaces using a quartz crystal microbalance with dissipation monitoring (QCM-D). The resulting arrays were imaged by scanning electron microscopy (SEM). Since the particles are exerted to a drying process after the arrangement from dispersion, the system is exposed to capillary forces. To prevent aggregation of the particles during this process, the surface roughness of the particles surface is increased. By exploiting frictional forces between both systems because of the surface roughness of the nanoparticles and the gold surface the formation of aggregates during the drying process is limited. When additionally, the chemistry of the linkage between the nanoparticles and the gold surface is optimized stable well-ordered systems result. This was achieved by replacing weak dispersive

interactions namely the amino-gold interaction with a covalent linkage of the amino-functionalized particles to a self-assembled monolayer of carboxylic acid on the gold surface. This concept can be extended to various other nanomaterials.

INV11
Influence of different pore-forming agents on wollastonite microstructures

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In this study, highly porous macro- and micro-cellular wollastonite-based ceramics was synthesized. Ceramic precursor, methylhydrocyclosiloxane, together with micro-sized $CaCO_3$, was used as starting material. After 20 min of ultrasound treatment, and calcination at 250 ^oC for 30 min, different pore-forming agents were added to the as-obtained powders. Differential thermal analysis was used to determine characteristic temperatures of processes occurring within powders during heating. Based on the obtained results, sintering regime was set up. Prepared mixtures were pressed into pallets and sintered at 900 ^oC. During the sintering regime, highly porous wollastonite-based ceramics was obtained. The phase composition of the sintered samples as well as microstructures was analyzed by the means of X-ray diffraction method and SEM. Two-phase system was detected in all samples, $CaSiO_3$ wollastonite and Ca_2SiO_4 larnite, and their ratio varied with each pore-forming agent. It was observed that addition of different pore-forming agent resulted in significantly different microstructures.

INV12
Education and Materials Science in Cultural Heritage Preservation

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Multidisciplinary scientific approach in the field of historical materials and holistic preservation of cultural heritage is facing the absence of appropriate specialized education and training, lack of available equipment and lack of interdisciplinary and intersectoral communications. There is insufficient investment in knowledge, equipping of modern laboratories and development of permanent communication networks among heritage managers, conservators, professionals and engineers of different backgrounds. Common language that would allow to provide information, but also to be understood by those who come from other scientific fields, has not been established yet.

The cooperation of the Faculty of Technology, University of Novi Sad, with the institutions of protection of cultural heritage and other relevant stakeholders in the field of characterization of historic materials, development of new advanced materials, their in-situ application and monitoring, represents a good example of multidisciplinary approach to implementation of national and international initiatives. As spin off outcomes of this cooperation the new teaching course *Materials in Cultural Heritage* was introduced on the master level of studies and a new *Laboratory for Materials in Cultural Heritage* established. This way it is given the multidisciplinary and intersectoral contribution to the protection of objects from degradation, while preserving the authenticity, functionality and aesthetic values, taking into account social and economic aspects. This approach serves as a good example of linking experts involved in cultural heritage that comes from variety of fields including education, research, culture, tourism and economy. It enables them to better understand each other, the needs of different disciplines and approaches, and brings shared responsibility in preservation of the cultural heritage in our country.

INV13

Characteristics of Mortar from fhe Archeolical Site Romuliana – Gamzigrad

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Felix Romuliana is a palace erected during the rain and after the design of the Emperor Gaius Valerius Galerius Maximianus. It belongs to the category of monuments of Roman court architecture which is associated with the time of Tetrarchy. During the archeological excavations, two fortification systems were discovered, they younger outer system with twenty polygonal massive towers, and an older inner system with sixteen towers of quadragonal and octagonal towers flanking the gates. The younger outer fortification is polygonal. The communication east-west connecting two gates divides interior space into two entities. Systemic archeological research last since 1953 by probing the northwest part of the inner space. Conservation works run simultaneously with the excavations. Mortar samples were taken from the towers XI and XII of the old fortification, as well as from the tower 15 and the part of the rampart between towers 1 and 3 of the younger fortification. Mortars were analyzed with the goal of obtaining information about morphological, mineralogical, chemical and basic physical properties of mortar. For analysis of these properties, optical microscopy and scanning electronic microscope were used. Depending on the location sampled mortars, there are differences of individual properties of mortar. The optical examination of macroscopic appearance of mortar samples indicated that those are limestone binder mortars. Aggregae grains are both river and stone aggregate. Mortar porsity differs depending on the location where samples were taken.

OR1

The Rare-Earths influences on doped $BaTiO_3$ - Ceramics Microstructure and Electric Characteristics

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The influence of rare-earth additive content on microstructure and electric properties of doped $BaTiO_3$ ceramics is investigated. The concentration of Er_2O_3 and Yb_2O_3 in the doped samples range from 0.01 to 1.0at % . The samples are prepared by the conventional solid state reaction, and sintered at 1320° and 1350°C in air atmosphere for 4 hours. SEM analysis shows that all samples are characterized by polygonal grains. The uniform and homogeneous microstructure with grain size ranged from 20 to 45μm is the main low doped samples characteristics. For the samples doped with the higher dopant concentration (0.5 and 1.0 at%) the average grains size is ranged from 5 to 10μm. Dielectric measurements are carried out as a function of temperature up to 180°C at different frequencies. The low doped samples display the high value of dielectric permittivity at room temperature. A nearly flat permittivity-temperature response is obtained in specimens with higher additive content. The Curie temperature of doped samples were ranged from 126 to 130°C. The Curie constant for all series of samples decrease with increment of dopant concentration and the lowest values is mesured from samples doped with 0.01 wt% of aditive. The obtained value of γ pointed out that the specimens have almost sharp phase transition. Also, the specific electrical resistance is measured in function of temperature at the different frequencies from 100Hz to 1MHz. With increasing additives concentration, the electrical resistance decreases to the concentration of 0.5 at% and then increases.

OR2

Implementation of Wide-Bandgap Materials in Power Electronics Components

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Wide-Bandgap (WBG) materials such as GaN and SiC are more and more frequently implemented in modern electronic components especially for switching in power electronic and electrical systems. A study of the properties of these materials and of the mapping of their properties into the performances of the electronic components built of them is of curtail importance for the design of modern power electrical systems based on renewable energy sources (with emphasis on micro-grids and smart-grids). Here, after studying the basic general and electrical properties of the materials, the fundamental behaviour of the power electronic components used for switching will be presented. The comparisons will encompass classical silicon (Si) power electronic components (MOS i IGBT) as well as components based on GaN (HEMT) and SiC

(MOS). Furthermore, the properties of these components used as switches will be analysed from the power consumption in stable states; switching times; and influence of parasitics point of view, for the first time. To achieve as realistic simulation results as possible the (SPICE) transistor models used here were obtained from the component producers.

OR3

The nonorthogonality effects on capacitive behaviour of quantum dot

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It is known that the overlap between atomic orbitals produce nontrivial effects on chemical bonds strength, resonance molecular energies, sensitivity of bond orders and charge densities in hetero-molecules. It is also strongly involved in population analysis problem. In quantum transport through a molecule/quantum dot attached between two electrodes, numerical codes rely on some predefined nonorthogonal basis sets. In steady state transport nonorthogonality has no influence on final results for transmission or current. The situation significantly changes when we have to deal with time dependent transport where charge starts to pile up in central region consisting of a molecule with additional neighboring parts of electrodes, chosen in such a way to provides complete screening of a molecule. The nonorthogonality introduces a problem due to nonunique definition of time dependent partial charges associated with electrodes and central region, which is a consequence of nonorthogonality between complementary subspaces, making the corresponding projectors non-Hermitian. The problem is solved in nonequilibrium Green's functions formalism within linear response theory and the derived current expression clearly indicates that the occurrences of additional contributions on interfaces, compared with orthogonal description, can be associated with the displacement current. In a simple comparative analysis it is demonstrated that there is a frequency range around resonances where capacitive response is only due to nonorthogonality.

OR4

Spectroscopy Characterization of $YFeO_3$ Obtained by the Mechanochemically Synthesis

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In the past few years, a renewed interest has grown in the study of rare-earth orthorhombic perovskites. An important example of this trend is the family of rare-earth orthoferrites, which a general formula $RFeO_3$, where R is the trivalent rare-earth metal ion. $YFeO_3$ has been prepared by a mechanochemical synthesis in a planetary ball mill. The mechanochemical reaction leading to formation of the $YFeO_3$ phase was followed by X-ray diffraction, Raman and infr-

arad spectroscopy. The ortoferrite phase formation was first observed after 1 h of milling and its formation was completed after 2.5 h. The synthesized $YFeO_3$ ferrite has a nanocrystalline structure with a crystallite size of about 12.4 nm. There are five Raman active modes. ^{57}Fe Mössbauer spectroscopy was performed in order to provide information on Fe compounds in the Y_2O_3 and α-Fe_2O_3 mixture.

OR5

Synthesis and structural characterization of some cathode materials for lithium-ion batteries

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Lithium-ion batteries are under intense scrutiny as alternative energy/power sources. Their electrochemistry is based on intercalation/deintercalation reactions of lithium ions within a crystal structure of an electrode material. Therefore, the structure itself determines both the electrode operating voltage and the transport pathways for lithium ions. Some oxide- and polyanion-based materials are synthesized and studied as positive electrodes. Several synthetic routes were investigated. The crystal structure refinement of an X-ray powder diffraction data was based on the Rietveld full profile method. All relevant structural and microstructural crystal parameters that could be significant for electrochemical intercalation/deintercalation processes were determined. Structural analysis revealed different dimensionality of lithium ion motion. It was also shown that the structural and microstructural properties are significantly dependent on the synthesis condition.

OR6

Application of ceramic components in knee arthroplasties

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Total knee arthroplasty is considered as very reliable and efficient procedure with excellent good-therm results. Despite significant improvements in endoprosthesis design and materials for their fabrication, debris induced aseptic loosening of the endoprosthesis is, accompanied by the malpositioning of the components, most frequent cause of the need for revision surgery. Beside this problems, there is growing number of reports of metal allergy as possible causer of procedure failure. For above mentioned, ceramics with its properties attracts attention as a material for endoprosthesis manufacturing. After relatively bad results in the early years of use, followed by improvements in materials and design of endoprosthesis, ceramics look like a promising solution, especially for patients with allergies on metal.

OR7

In vivo degradation of Bio-Oss® in implants loaded with macrophages treated with lipopolysaccharide

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Degradation of biomaterials that are used for bone defect filling is an important step toward the final bone reparation. The first phase of bone reparation process involves inflammatory macrophages that largely influence the degradation of used biomaterial. The aim of our study was to examine the effect of macrophages treated with various concentrations of lipopolysaccharide (LPS) on degradation of commercial bovine bone mineral matrix Bio-Oss® *in vivo*. Implants were composed of Bio-Oss®, peritoneal macrophages treated with LPS (in concentration of 5 ng/ml or 500 ng/ml) and diluted blood, while control implants consisted of Bio-Oss® and diluted blood. Implantations were performed subcutaneously into Balb/c mice. Degradation of Bio-Oss® was analyzed in implants extracted two and eight weeks after implantation. Histochemical and histomorphometrical analysis were performed on tissue sections and particles of biomaterial were measured. Our results showed that treatment of macrophages with higher examined LPS concentration (500 ng/ml) led to greater degradation of Bio-Oss®. This can lead us to the conclusion that excessive activation of macrophages toward inflammatory state may have a negative impact on osteoreparatory process.

OR8

Mo-doped TiO_2 nanocomposite coatings: visible light photocatalytic activity and antifungal efficiency

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There is a need for an efficient biocide replacement with a friendly effective material in order to keep the environment safe, as well as toslow down building materials degradation.
It is well known that metals with higher oxidation states increase the photocatalytic activity. Therefore, in this study the use of molybdenum doping into TiO_2structure was proposed. The photocatalytic nanocomposite suspensions based on TiO_2 and molybdenum were synthesized by a wet impregnation technique. The prepared suspensions have had systematically different molybdenum content. The photocatalytic behaviour of the samples was investigated by moni-

toring model organic dye concentration changes under the UV-Vis irradiation (UV-Vis absorption spectroscopy). Antifungal efficiency assessment was performed by monitoring the fungal growth in artificial ageing conditions by quantification of its development in afungi growth media. Band gap values of the samples were determined based on UV-Vis absorption measurements confirming the visible light driven photocatalysis activation. The results of photocatalytic activity and antifungal efficiency of the developed molybdenum doped nanocomposites were compared to the pure TiO_2.It is evident that the obtained material can be used in order to enhance photocatalytic, and consequently, antifungal activity of the pure TiO_2 photocatalyst.

OR9

Characterisation of $Mn_{0.63}Zn_{0.37}Fe_2O_4$ powders after intensive milling and subsequent thermal treatment

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Commercial Mn-Zn powder ($Mn_{0.63}Zn_{0.37}Fe_2O_4$, 93 wt. % and Fe_2O_3 7 wt. %) was milled 0.5, 1, 2 and 4 hours in a planetary ball mill. Powders were characterized with XRD, SEM and particle seizer. Subsequent heating was monitored on TGA/DTA in air atmosphere. After compaction of the milled powders, sintering was also performed in a dilatometric device. Sintered specimens were characterized microstructurally with SEM on a fresh breakage. Ferrite powders changed with milling as well as with second run heating are characterised to approach the possible best ratio of the milling and heating that should be used to obtain desired micrstructure.

OR10

Radical Ions Scattering in n-Butanol

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n-Butanol (C_4H_9OH) is a primary alcohol with a 4-carbon structure. n-Butanol occurs naturally as a minor product of the fermentation of sugars and other carbohydrates and is present in many foods and beverages as well as in a wide range of consumer products. Although most volatile organic compounds can be detected by fast methods such as ion mobility spectroscopy, precise determination is possible only if reaction of specific ions with targeted compound is well known.

In this work we select most probable reactions of radical ions with n-butanol. Appropriate gas phase enthalpies of formation for the products were used to calculate scattering cross section as a function of kinetic energy with Denpoh-Nanbu theory. Calculated cross sections can be used to obtain transport parameters for radical ions in n-butanol gas.

OR11

Conservation and restauration of seven paintings by Veljko Zecevic on canvas

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The work is based on conservation and restauration of seven paintings by Veljo Zecevic on canvas. Existing state of all paintings was similar, almost indentical. The process of conservation and restauration has been sucessfully completed following predetermineted order : fixing of the painted layer, correction of deformed canvas, extension of the edge of the canvas, setting of the paintings on a new blind frame, reconstruction of painted layer and varnishing of paintings. In the process of conservation Beva usage was insisted on because of its good connective performance.

OR12

Detoxication of methanol from water solution using zeolite

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Methanol is the polar solvent, which is very often occurs as a unwanted side-product in different technologies. Most commonly can be found in water and ethyl alcohol. Zeolites as micropore aluminosilicate zeolites materials are used as industrial catalysts and there is a growing interest in analysing their adsorption catalytic behavior. In this work was examined the ability of adsorption of methanol using natural zeolite from three types of solution: A. 4% methanol in ethanol, B. 4% methanol in water, and C. 4% methanol, 50% ethanol in water. The ratio of solution to zeolite was 5: 1. Contact zeolite and the solution was achieved magnetnm mixer for 30 minutes. Adsorption temperature was 25 ° C. Standard and the resulting solutions were recorded on a gas chromatograph PYE UNICAM 4500, a certain quantity of methanol were determined by logarithmic chromatograph with the help SP9 computer. The largest decrease of concentration of 4.65%, was obtained in a three-component azeotropic mixture C (4% methanol, 50% ethanol in water).

OR13
Importance of the synergical application of the EU Regulation on Construction Products (EU CPR 305/2011) from the Fire Safety aspect

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EEC Directive on Construction Products CPD 89/106/EEC was suspended since July 1, 2013 by the newest European Parliament and EU Council Regulation on Construction Products CPR 305/2011, which was adopted on March 9, 2011. EU CPR 305/2011 additionally defines chapters related to the labor and work safety, energy efficiency during construction and sustainable application of the natural resources, while remaining chapters remain the same. Both documents consider the same first two requirements, mechanical resistance and stability, as well as fire safety of buildings and works. However, unlike to the requirement related to the mechanical resistance and stability, the unsatisfactory attention was paid to the fire resistance of buildings and works in FBiH practice. In the other hand, European and domestic legislation in this specific filed of interest, do not provide possibility for selection of requirements to be satisfied for the buildings and works, but considers imperatively application of all specified requirements simultaneously.

P1

Characteristics of Mortar from the Archeological site Caričin Grad

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The paper presents research of mortar from the archeological site Caričin Grad. Caričin Grad is an early Byzantine site located near Leskovac, Serbia. It is of extreme importance for the study of early Medieval architecture. The town covers the area of around 7 ha. In town planning terms, it consists of Acropolis, Middle, and Lower tow, each with its system of ramparts and the structures leaning on them. There is a large number of sacred buildings, Baths, public and private buildings, well developed water supply and sewerage system provide evidence of the town's importance. Mortar was sampled from the buildings surrounding the circular square of the Middle town, from the structures north of Acropolis, gate between the Middle and Lower town, east gate of the Lower city as well as the aqueduct structure. Mortars were analyzed with the goal of obtaining information about morphological, mineralogical, chemical and basic physical properties of mortar. For analysis of these properties, optical microscopy was used and scanning electronic microscope. Depending on the location sampled mortars, there are differences of individual properties of mortar. The optical examination of macroscopic appearance of mortar samples indicated that those are limestone mortars. The aggregate grains detected are river and crushed limestone aggregate and fine pieces of bricks.

P2

Complications of utilisation of ceramic components in orthopedic surgery

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There is variety of biomaterials used in orthopedic surgery nowadays, with its own advantages and imperfections. Ceramics has its own place in manufacturing of endoprosthesis components due to its properties: low friction coefficient, scratch resistance, excellent biocompatibility. Principle disadvantage of ceramics is brittleness and inability for plastic deformation. These features are mitigated to a certain extent but remains leading cause of ceramics components failure.

P3

Nuclear Forensic: The Physico-Chemical Methods for the characterization of nuclear materials

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In the last 50 years of the last century has been a rapid development of nuclear technology. This is reflected in a rapid development of weapons based on nuclear and radiochemical materials, the development of power plants to nuclear power, as well as the establishment of centers in which storage of spent nuclear fuel and nuclear waste. Is appears a real danger of theft and illegal trafficking of nuclear materials, from by various groups. Nuclear forensics is a complex system in which parallel following information submitted under the legislation of intelligence data and the data obtained based on the application of scientific methods in the process of identification of unknown nuclear material. Nuclear material confiscated in the various cases of illegal trade, are identified using different scientific methods. The different physical and chemical methods used to provide information on the origin of the nuclear materials, based on the composition, physical condition, age, chemical composition. The obtained data are compared with data from the existing database and thereby performs the determination of the possible origin of nuclear material. In this paper are presented the data on the methods used in the characterization of nuclear material.

P4

The determination of microstructural parameters by using the x-ray powder diffraction analysis

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In the process of the characterization of ceramic materials, very important part is the determination of microstructural parameters. For determination are used the different method: the powder X-ray diffraction on polycrystalline sample, the single crystal X-ray diffraction method, SEM (scanning electron microscope), TEM method-a (transmiosioni electron microscope). In this paper are presented the results of microstructural analysis, obtained by X-ray diffraction on polycrystalline sample and using the crystallographic software FullProf. The microstructural parameters are determined on the basis of refined structure of Pb-feldspar.

P5

Characterization of zeolitic tuff from deposit Toponica near Kosovska Kamenica

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In this paper are presented the results of mineralogical and crystallographic analysis of zeolitic tuff from deposits Toponica. Deposit of zeolitic tuff „Toponica", is located in the eastern part of Kosovo. The geological structure of the zeolite tuff deposits make up the footwall stratum of Miocene (M) clay sandstone, white zeolite tuff horizon and roof seam Miocene shales, clay and gravel. For mineralogical analysis was used the optical microscope and SEM/EDS method. The basic minerals composition are presented with clinoptilolite-Ca, clay minerals, mica and feldspar. The XRPD method was used for crystallographic analysis, based the semi-quantitative phase analysis, in the zeolitic tuff is present ~ 89% clinoptilolite. The cation exchange capacity of zeolitic tuff is 140 meq / 100g, which this mineral raw material classified as extremely high quality and suitable for use in various industries.

P6

Characterization of microstructural and thermal properties of the steatite powders applied as fillers in the ceramic coatings

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Steatite is a magnesium silicate multi-componential composite that can be synthesized from natural raw materials, and eventually produced via standard ceramic processing methods and readily machined or sintered into a variety of forms. Due to its excellent electrical properties, high mechanical resistance, low dielectric loss and high temperature resistance, steatite is widely utilized as a material for thermal insulation and heath protection. The raw materials used in steatite powder synthesis are: talc mixture for calcination, clay minerals as bonding agent, and feldspar or $BaCO_3$ as melting agents. The synthesis is usually conducted at approximately 1400°C, and its product is a crystalline phase of magnesium metasilicate ($MgSiO_3$) obtained from talc, while melting agent forms a vitreous phase which melts and surrounds the crystalline phase. Steatite ceramics' fillers were fabricated via combined method of high-energy ball milling, cold pressing and sintering. The powder blends containing same amounts of components in all 4 mixtures were dry-pulverized for 30 min a laboratory mill, with ceramic vial and ceramic balls. After milling, the powders were compacted to cylindrical tablets with a diameter of 25 mm by uniaxial compression at 4 tons/cm^2. The green compacts were sintered at 1000-1400°C

(10°C/min) for 2 h in an air atmosphere. The effect of dry grinding on phase, microstructural and thermal properties of the sintered tablets were carried out by using X-ray diffraction technique (XRD), thermogravimetry/differential thermal analyzer (TG/DTA) and scanning electron microscope (SEM). The effects of grinding on the change of the particle diameter, crystallinity and the phase transformations, and reactivity of the powders were studied. The powders that were pulverized for 30 min showed properties which positively influenced on the decrease of sintering temperature and the increase of the sintering rate of steatite fillers.

P7

Utilization of bentonite as partial replacement of cement in unshaped construction composites

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The development in construction sector requires constant increase in production of the concretes.To prevent depleting of natural resources it is necessary to use industrial byproducts and/or economical primary materials as a replacement of concrete's main components such as cement or fillers. The fly ash is one of the most commonly utilized additions to concrete design. However, the presence of toxic elements in the coal combustion products cannot be ignored even though their abundance is minor. Pollution induced by heavy metals is a huge problem since they are non-degradable and accumulative. Owing to their sorption properties, certain clays can develop the ability to immobilize heavy metals and other toxic or hazardous substances within the concrete microstructure. Bentonites, as natural clay mineral mixtures mainly composed of smectite, i.e. montmorillonite clay (≥70 wt. %), have expanding type sheet silicates composed of one octahedral layer situated between two tetrahedral layers. They are characterized by a high cationic exchange capacity (Na, K, Ca, Mg), high specific surface area and ability to absorb interlayer water molecules by increasing the basal length. Therefore, besides being a natural pozzolana, bentonite is applied in concrete as adsorbent of toxic heavy metals and/or radionuclides due to high cation exchange capacity and high specific surface area. In this paper, the compatibility of fly ash and bentonite in construction composites (concretes) was investigated. The main variable is the proportion of bentonite (10%, 15%, 20%, 25%, and 30% by weight of cement) in replacement mode while the amount of cementitious material, water to cementitious material ratio, fine and coarse aggregate content were kept constant. The mineralogical phase composition of concretes was analyzed by X-ray diffraction method and scanning electron microscopy was applied in the analysis of the microstructure. The thermal behavior was observed via DTA method. Test results substantiate the feasibility to develop low cost concrete using bentonite. It will reduce energy consumption and greenhouse gases related to cement production as well as prevent leaching of the toxic elements into the environment.

P8

Influence of alternations in ultra-centrifugal milling parameters on the coal ash quality for the construction composites design

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The coal ash mechano-chemical treatment conducted by means of the high energy mill was optimized using mathematical and statistical tools. The merits of the alternations in ash processing schemes with a referral regarding the improvement of its reactivity were highlighted. This will eventually lead to higher volume utilization of the fly ash as a cement replacement in concrete design. In order to obtain the most favorable output, the impact of the sets of processing parameters (number of rotor revolutions, current intensity, activation period, circumferential rotor speed, mill capacity) on the on the product's quality factors (grain size distribution, average grain size, micronization level, agglomeration tendency, specific surface area) was assessed via Response surface method, Standard score analysis and Principal component analysis. Quality parameters in an extensive range of processing parameters were accurately predicted with developed models. The calculated r^2 values were in the range of 0.84-0.99. The optimal ash sample, characterized by 0.93 Standard Score, was produced using a set of processing parameters appropriate to experimental sequence with applied 120 μm sieve mesh. The microstructural characteristics were assessed using image-processing values and histogram plots of the activated fly ash SEM images. Multiple comparison tests revealed that the optimal variations in the activation parameters could improve the technology of cement replacement material production and its transfer into an economically attractive sustainable solution which is a new step in the design of high-volume fly ash based composites.

P9

Fractal tools in terrorist and financial crime prevention

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Information society imposes globalization and universality of values. In these circumstances, terrorism, institutional political violence which targets trying to achieve the morbid fear of provoking a spectacular way, inappropriately given conditions, becomes a real threat not only to the nations but also to politics on the global level. In 1996, the International Monetary Fund estimated that 2–5% of the worldwide global economy involved laundered money.Today, intelligence activities in preventing and combatting terrorism include financial investigations and money laundering for the purpose of financing terrorism, resulting in broadening of the

scope of data to the level which makes it impossible for human logical evaluation.Technologies development that enables increasing capacity of speed and the amount of data processing has enabled defining, analysing and exploring more and more models. This led to the idea of computer experiments and simulations trying to get to more complex planning and forecasting for the purpose of countering terrorism and "dirty" money transaction, as highly dangerous, complex and variable phenomena. This presentation aims at quotation the wide spectrum of mathematicallyfounded fractal conceptssuited togenerate computer models of anti-terrorist activities. In this sense, the logistic behind the items connected with detecting and recognizing degree of terroristic threat by comparing fractal structure of people's faces, fast search through the databases of faces and fingerprints. The speed of searching processes is of vital importancewhich promotes the crucial importance of compression and data reduction with preservation of regularity. Especiallyimportant are analytic forecasting of missing visual data and forms, to supplement the empirical evidences and records. All these operations are possible with higher degree of knowledge utilization and adaptation of virtual reality in the fight against terrorism and different forms of money laundering. The results indicate that the achievements implementation of the concept of fractals depends on substantial prior knowledge, environmental influences, subsystem integration, decentralization and synchronization, and allows us to come up with similar high information technology models, but not necessarily to enable identification of the authentic features of the various anomalies that result in objectively asocial consequences. In this sense, we conclude that the application of information technology in the fight against terrorism, based on the concept of fractals has its place in the arsenalof anti-terroristic prevention.

P10
Effects of SA surface treatment on the properties of $CaCO_3$ used as filler in construction composites

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Calcium carbonate ($CaCO_3$) is mineral filler that has been most extensively used in the construction composites as well as in the polymer industry. Coarse $CaCO_3$ grains can be easily incorporated into the composite material, but the smaller-sized particles tend to agglomerate due to the enhanced particle-to-particle interactions, which leads to serious performance problems. The most efficient way of surpassing this problem is to enhance the final composite properties by surface treatment of the filler with a surfactant. Following such procedure a water-repellent construction composites are obtained (i.e. reparation mortars, mortars for the exterior works, thin coatings for concrete walls, etc.). The stearic acid is a universal and economical surfactant which is often used to improve $CaCO_3$ hydrophobic properties. This study investigates and subsequently compares the surface and mechanical properties of untreated ground calcium carbonate powder and treated powder with stearic acid using a dry process coating system. The $CaCO_3$ powder (grain size class: -200 + 63 μm) was pulverized in a laboratory Retsch-ZM-1 mill with a 250 μm mesh size sieve and a peripheral comminuting path. The surface of $CaCO_3$ powder is

generally hydrophilic, but it was changed to a hydrophobic surface when coated with SA. The coating procedure was conducted in following manner: 1% of SA was added to the $CaCO_3$ powder which was previously thermally treated at 120°C for 2 hours, and the mixture was stirred in a laboratory mixer with 1500 rpm. The surface treatment decreases the intensity of particle-to-particle interaction and increase adhesion of filler. There has been extensive research reporting about the effects of stearic acid surface treatment on the physical properties and thermal behavior as well as mechanical properties of $CaCO_3$ composites. The contact angle of water on the coated calcium carbonate powder surface and hydrophobicity are increased with increasing concentration of SA. As a result, thermal stability and mechanical properties of the composite were increased compared to untreated $CaCO_3$ composites. The influence of surface treatment of the particles, with and without stearic acid on the mechanical, thermal and structural properties was studied. The experiments included mechanical and physical testing; differential thermal analysis, scanning electron microscopy (SEM), X-ray diffraction (XRD) and Fourier transform infrared spectroscopy. The composite systems containing coated $CaCO_3$ were found to exhibit better mechanical properties as compared to composite systems containing uncoated $CaCO_3$.

P11

Dielectric properties of precision woven polymer mesh fabrics

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Polyamides (PA) and polyethylene terephthalate (PET) are semi-crystalline polymers used for a wide range of applications in different forms. For their application as the substrates in electronics, it is important to know their dielectric properties. This investigation was performed on three precision woven mesh fabrics made of PA 6.6, PET and PA 6.6 with carbon fibre. Relative dielectric permeability of samples was examined as functions of frequency (20 Hz - 80 kHz) at room conditions. At lower frequency it can be seen that values of dielectric permeability slightly decrease with increasing frequency, while above 800 Hz there is no changes in the values for all three samples. Dielectric loss tangent was examined as functions of frequency (20 Hz - 2 kHz) in the temperature range from 150 K to 380 K for precision woven mesh fabrics made of PA 6.6 and PET. The analysis of dielectric spectra has shown existence of γ, β and α - relaxation in the range of measurements.

P12

Application of hydroxyapatite granules in mastoid obliteration

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The primary goal of surgical intervention for chronic middle ear disease is to development of a safe, dry, and low-maintenance ear. Persistent moisture, infection, and drainage is problematic in about one-third of patients, but also requiring revision surgery as canal-wall-down mastoidectomy. Despite best practice and continuous care , an open mastoid cavity is a handicap for the patients. The patients usually requires regular cleaning and life-long protection of the ear against water. During life, it could be a source of ear discharge due to irritation mucosal lining.

The principle of mastoid obliteration was introduce as early as 1911. Over the years different biological tissues have been used to obliterate mastoid cavities including fat tissue, cartilage, musculo-periostal flap and autogenous bone. However, these tissue all suffer from atrophy or resorption with time. While all the intial reports were on the use of biological tissues, there has been an increasing interest in synthetic materials.Hydrxyaopatite is a well-known biocompatible ceramic with a long history of success in middle ear surgery. Experimental studies have demonstrated that hydroxyapate granulae do not undergo morphological changes after long term inplanatation in the temporal bulae.

The purpose of our work is to present an importance of hydroxyapatite granule for mastoid obliteration of open radical mastoid cavities and to point out a new concept as application of nanocrystalline calcium phosphate in otosurgery. In our retrospective review, we found that the majority of individuals undergoing mastoid surgery with obliteration achieved a dry ear and there was a reduction of clinic visits during fellow-up period between 1 to 5 years.

P13

Characteristics of mortar from the archeolical site Romuliana – Gamzigrad

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Felix Romuliana is a palace erected during the rain and after the design of the Emperor Gaius Valerius Galerius Maximianus. It belongs to the category of monuments of Roman court architecture which is associated with the time of Tetrarchy. During the archeological excavations, two fortification systems were discovered, they younger outer system with twenty polygonal massive towers, and an older inner system with sixteen towers of quadragonal and octagonal

towers flanking the gates. The younger outer fortification is polygonal. The communication east-west connecting two gates divides interior space into two entities. Systemic archeological research last since 1953 by probing the northwest part of the inner space. Conservation works run simultaneously with the excavations. Mortar samples were taken from the towers XI and XII of the old fortification, as well as from the tower 15 and the part of the rampart between towers 1 and 3 of the younger fortification. Mortars were analyzed with the goal of obtaining information about morphological, mineralogical, chemical and basic physical properties of mortar. For analysis of these properties, optical microscopy and scanning electronic microscope were used. Depending on the location sampled mortars, there are differences of individual properties of mortar. The optical examination of macroscopic appearance of mortar samples indicated that those are limestone binder mortars. Aggregae grains are both river and stone aggregate. Mortar porsity differs depending on the location where samples were taken.

P14

Dependence of thermal insulation properties on the texture characteristic of inorganic foams

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The procedure for synthesis of a novel class of foam thermal insulation composite materials based on Kaolin clay and Portland cement was developed.
The effects of weight ratio of: Kaolin clay, Portland cement, foam stabilizer, pore forming agent on the texture characteristic (density, porosity, pore size distribution) and thermal insulation properties (heat capacity and thermal conductivity) of the synthesized materials were investigated
The porosity and the pore size distribution of the synthesized materials were measured by standard low temperature nitrogen adsorption method. The heat capacity was measured with DSC method, and thermal conductivity was measured with transient hot bridge (THB) method.
Based on the results obtained it was concluded that the increase of the weight ratio of:

a) Portland cement leads to the increase in density, heat capacity and narrower pore size distribution of the synthesized materials;
b) foam stabilizer leads to the increase in the porosity and narrower pore size distribution of the synthesized materials;
c) pore forming agent leads to the increase in the porosity of the synthesized materials.

The thermal insulation mechanism of the composite inorganic foams is discussed.

P15

Novel procedure for rutile preparation by in situ microwave transformation of titania slag

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Owing to its extraordinary phisico-chemical properties (high refractive index, whiteness, brightness, thermal stability and chemical inertness) rutile TiO_2 finds wide range of applications, among which the manufacture of white pigment is most abundant. Rutile is nowadays manufactured either using the sulfate process or the chloride process, both of which are environmentally hazardous processes. On the contrary, however, titania slag present a cheaper source of raw material. A novel procedure for rutile preparation by in situ microwave transformation of titania slag is developed. This procedure is based on fast heating of titania slag to desired temperature which is achieved by slag dopping with a microwave susceptor. The effects of type of microwave susceptor, their concentrations, microwave power, type of subsector and slag mixing, temperature and time on the degree of transformation to rutile. It was found that at temperatures higher than 600^{o}C happens fast transformation from anatas to rutile in less than 0.5 minutes. Further increase in temperature leads to the increase in the rate and the degree of transformation to rutile. At temperatures higher than 950^{o}C transformation of anatas to rutile is complete.

P16

Prepared synthetic rutile from sulphate titanium slag using microwave heating

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Because of the shortage of natural rutile, synthetic rutile is widely used a substitute raw materials for natural rutile owing to its excellent mechanical and thermal properties. In the present study, sulphate titanium slags were prepared from ilmenite ore by carbonthermal reduction,

and were chosen as the research objects. Study on the characteristics and structure of sulphate titanium slag, and combine with the traditional features of microwave energy transmission and selective microwave heating, and mechanism research and regulatory mechanism of preparing synthetic rutile under microwave heating were investigated. The titanium dioxide content of 90 % of synthetic rutile was obtained, and the results of analysis indicated that the synthetic rutile products was prepared with Sulphur content of 0.022 %, Carbon content of 0.024% and Phosphorus content of 0.008%, which the parameter of products better than that of natural rutile.

P17

New trends in the development of battery

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Among civilized priorities and challenges for humanity, energy occupies the most important and certainly the most attractive place in terms of research as well as in scientific and technological developments. The question of energy, in relation trinity energy-materials-information (EMI) is directly correlated with the triad of the synthesis (the technological process of obtaining materials)- structure of- material properties (srb. sinteza-struktura-svojstva materijala (SSS)). Storage of energy (electricity, heat, cooling energy ...) is an important issue and a weak point in the energy sector. Fossil fuels provide the internal storage of energy which is not the case for wind, solar, etc. The nanostructure of materials can be a useful for the storage of heat or for the isolation of heat storage. Storing electrochemical energy is widely applied, especially in portable devices, which are mainly related to the battery. Li, as the material is the most used because it is the lightest metal and has a very high energy density. Due to the lack of lithium in the United States, and the world, new research substitute lithium for magnesium ions, for already listed battery system. These studies are done at the Illinois State University, in Chicago. After the commercialization of lithium-ion battery research for the cathode active material concentrates on lithium that contains at the forefront the transition-metal oxides with a 4V class high electromotive force because it can serve as a lithium of carbonic negative electrode. Unfortunately all classes 4V rechargeable cathode: $LiCoO_2$, $LiNiO_2$, $LiMn_2O_4$, have a core problem of costs and environmental impact, because their cathodes include the use of rare metals such as redox center. The problems become more serious, especially for the most expensive $LiCoO_2$, with further expansions of the market for electric vehicles, which are expected in the near future.

P18

Photocatalytic degradation of substituted arylazo pyridone dyes

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Heterogeneous photocatalysis has gained increasing interest in the last four decades, especially in the field of solar water splitting and purification of air and water. TiO_2 as the most universal used photocatalyst has been widely studied owing to its nontoxicity, chemical stability, low cost and high photocatalytic activity. In this study, commercial TiO_2 (Degussa P25) has been applied in photodegradation of substituted arylazo pyridone dye, with orto-, meta- and para- substituents in benzene ring. The results showed that the type and the position of substituents influence photoreactivity of investigated dye in a profound mater. Reactivity of investigated dyes were correlated with Hammett substituent constants, in order to gain insights into the mechanism of photocatalytic dye degradation.

P19

Adsorption capacity of wollastonite based adsorbents with porous structure controlled with different progeny agents

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Porous wollastonite (WL) based adsorbents were fabricated by a pressureless sintering process by using low molecular weight poly(methyl methacrylate) (PMMA), nanocellulose (NC) and yeast as the pore forming agents. WL based adsorbents were synthesized in two step process. In the first step, calcium carbonate and methylhidrogen cyclosiloxane were mixed with isopropyl alcohol, dried and calcined at 250 °C. Second step included WL mixing with porogen, followed by controlled calcination and on that way the sintered materials with randomly distributed pores were obtained. The effectiveness of the synthesis steps as well as material properties, i.e., the pore morphology were determined by FTIR analysis and scanning electron microscopy (SEM), respectively. The pore morphology and adsorption capacity was changed dramatically by changing the pore forming agent. The highest adsorption capacity was obtained when NC was used as the pore forming agent. Obtained materials showed moderate adsorption capacities of 10.56, 8.42 and 11.33 mg/g with respect to As^{5+}, Cr^{6+} and phosphate, respectively. The con-

centrations of heavy metal ions were determined by using Ion chromatography coupled with mass spectrometry (ICP-MS).

P20
Novel amino modified GMA-EGDMA-m-PMMA monolith for efficient cationic pollutant removal

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Novel macro/micro-porous monolith material containing surface amino functional groups was developed for efficient cationic pollutant removal. The monolith was prepared by copolymerization process of monomers glycidyl methacrylate (GMA), ethylene glycol dimethacrylate (EGDMA) and modified low molar mass poly(methyl methacrylate) (PMMA). In order to improve mechanical stability of GMA-EGDMA monolith, surface of PMMA was modified with ethanol amine in first step, and introduction of methacryloyl chloride in a second step produced m-PMMA. Synthesized GMA-EGDMA-m-PMMA monolith was modified with poly(ethylene imine) (PEI). The effectiveness of copolymerization, as well as introduction of amino groups *via* PEI modification were confirmed by FTIR and Raman analyses. The morphological appearance of the synthesized monolith, examined by scanning electron microscopy (SEM), clearly indicates porous structure. The results of textural parameters, *i.e.* monolith porosity, determined by using liquid saturating method, indicate high degree of porosity. Cationic pollutant removal capacity, cadmium and lead, of 32.0 and 42.5 mg g^{-1} at 25 °C indicates that this monolith is high efficient. This macro/micro-porous monolith could be a promising adsorbent because of its low-cost synthesis process and excellent performance.

P21
Influence of mechanical activation on mechanical properties of PVDF-nanoparticle composites

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The influence of mechanically activated fillers (ZnO, $BaTiO_3$ and $SrTiO_3$ ultra-fine powders) on mechanical properties of poly(vinylidene) fluoride (PVDF) and oxide nanoparticle composite was investigated using molecular simulations. Mechanical activation leads to the creation of new surfaces and the comminution of the initial powder particles, which affects the crystallization of PVDF matrix. In addition, prolonged mechanical activation leads to agglomeration of

nanoparticles into “soft” and “hard” agglomerates of different sizes. All of this has a significant effect on mechanical properties of PVDF-nanoparticle composites. Microstructural changes due to mechanical activation in ZnO, $BaTiO_3$ and $SrTiO_3$ powders were investigated using SEM and XRD, while dependence of mechanical properties on nanoparticle size was investigated using molecular simulation. These show that smaller nanoparticles significantly enhance the mechanical properties of PVDF-nanoparticle composite and allow use of mechanical activation as a means of reducing the amount of nanoparticle filler in the composite, while achieving the same of superior mechanical properties.

P22

Simulation of channeling EBS/RBS spectra – a new code

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Newly developed C++ code – CSIM – allows for successful simulation and quantification of channeling EBS/RBS spectra, which is a long standing problem in material analysis with ion beams (IBA).It opens new possibilities for using these IBA techniques in determination of light ions concentration profiles in heavier matrix, or for heavier ones located at the greater depths whose backscattered yield overlaps with the matrix induced background. The advantage of these techniques over the usuallyused NRA in these situations arefollowing: EBS/RBS cross-sections are commonly several orders of magnitude higher than NRA ones, thus significantly reducing the experimental time and proton and alpha particles as probing beams avoid the hazardous neutron emission commonlyassociated with NRA.
CSIM assumes the phenomenological approach to the channeling process described by three parameters: the dechanneling rate and range, and , being characteristic parameters of a Gompertz type sigmoidal dechanneling function and the parameter, , being the channeling to random energy loss ratio. These three parameters can either be manually set or obtained via the χ^2 minimization routine. CSIM has been successfully tested in reproducing 1-2 MeV protons virgin EBS/C spectra of a diamond crystal.More importantly, CSIM was used for determination of the amorphization profile induced by 4 MeV carbon ions implanted in the diamond crystal. The maxima of amorphization profile coincides with the carbon end of the range in the diamond.

P23

Optical and structural characterization of Se – $CuSe_2$ thin films

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Thin films of Se-$CuSe_2$ of three different thicknesses have been prepared by vacuum evaporation method on a glass substrate at room temperature. Surface morphology was investigated by scanning electron microscopy (SEM) and atomic force microscopy (AFM). The structural characterization of thin film was investigated using Xray diffraction pattern (XRD). The presence of twophase system is observed. One is the solid solution of Cu in Se and the other is lowpressure modification of $CuSe_2$. The optical properties of the films were investigated by photoluminescence spectroscopy and UV-VIS spectroscopy. $CuSe_2$ exhibits both direct and indirect transitions. According to UV-VIS measurements, the band gap for direct transition is found to be in the range of 2.72–2.75 eV and that for indirect transition is in the range of 1.71–1.75 eV. On the other hand, selenium exhibits direct band gap in the range 2.33-2.36 eV. All estimated band gaps slightly decrease with the increase of the film thickness. Photoluminescence spectra of thin films show emission peaks at about 1.6 and 2.3 eV nm at room temperature, with no observed shift with decreasing temperature. A model is proposed for explaining such anomaly.

P24

Polyphase system in the technologies of preparation and flotation concentration mineral resources

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Polyphase systems have at least two phases. Inland, dispersed, open, discontinuous,and external, dispersed, closed, continuous. In the technology of preparation and concentration of mineral raw materials, we often have polyphase systems: solid / liquid suspensions; liquid / liquid emulsions and gas / liquid foams. Theoretical explanations of the flotation technologies found in DLVO theory. Figure 1 shows the physical meaning of this theory, apropos on the very short distances and long distances - attractive forces are dominant. Among these values govern the repulsive forces between the particles. Flotation is carried out in the repulsive force that could be used additional force that disrupts the dynamic equilibrium and perform selective separation of minerals such as air bubbles which increase the distance between the particles. If the energy barrier is high (~> 25 kT) compared to the thermal energy, kT, colloidal systems are stable. De-

crease the potential in Stern's model within the diffuse electric bilayer goes from Ψ_δ to 0. Drop the potential within the diffuse layer is defined by Deby distance 1 / κ. This is the distance at which the potential drop from Ψ to the n part of the value Ψ_0 (1 / 2.718 = 0.37). An important value of the zeta potential (ζ), or electro kinetics potential, which we can measure. If the ratio of the particle size and the power of the bilayer is $A / (1 / \kappa) >> 1$, this is a secondary energy minimum. For particles> 1μm , flocculation occurs on the secondary minimum, Figure 1.In the construction of the flotation technologies emulsion is formed from the suspension when the surface of selected minerals takes a selective adsorption process by liquid reagent. Such a system, which maintains a dynamic balance with steady flow of energy in the flotation cell, we add a new gaseous phase. Emulsion layers are usually separated by standing as this, and then occurs the thermodynamically stable state. Gas phase helps to separate the layers at a higher speed.

P25

Thermal storage energy by combining minerals and phase change materials

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The continuous increase in the level of consumption and exploitation of energy resources today have led to serious energy and environmental problems. Research Administration for information about energy show that fossil fuels, which cause environmental problems such as air pollution and climate change, still play a dominant role in the energy resources worldwide (EIA, 2011). These studies have shown that in addition to the CO_2 emissions increased from 20.9 Gt in 1990 to 28.8 Gt in 2007, are considered to reach 34.5 Gt in 2020 and 40.2 Gt in 2030. years with an average growth rate of 1.5% throughout the projection period.
This projection of energy consumption required to develop and expand the advanced technology in order to reduce energy demand, increase energy supplies while effectively using renewable energy sources. In this context the proposed technology of storing thermal energy (TES). TES is defined as the temporary storage of thermal energy in the form of hot or cold substances for later use. It is particularly important use of cheap, available minerals that provide sufficient thermal energy storage. In our work, we examined ten samples and typical for thermal energy storage: sand, zeolite, salt, stearic acid, paraffin, bentonite clay, Glauber's salt, and combinations thereof. The best results for the storage of heat are achieved with stearic acid, paraffin and clay combination with stearic acid and paraffin. This indicates that phase change materials provide higher storage capacity of thermal energy. Clay allows continuous transition phase change without rapid phase change. While stearic acid and paraffin have a jump due to melting, bentonite clay gel with water makes continuous phase transition because of the micro- and nanoparticles, which in itself contains.

P26

The influence of synthesis parameters on textural properties of modified Ni-based catalysts supported on magnesia for production of reducing atmosphere

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Reducing gas atmosphere containing CO and H_2 as processing gasses is commonly used in the metal processing industry for heat treatment of special metals. For the production of reducing atmosphere conventionally are employed nickel catalysts on various ceramic supports. Since the process takes place at high temperature, thermal stability and textural properties of catalysts are of particular interest. In this work magnesia supported nickel catalysts were synthesized. The catalyst synthesis consisted of single or successive impregnations with nitrate precursor salts of nickel and modifiers (Al, Ca and Mg), followed by thermal catalyst activation. Nickel:-modifier molar ratio was 10:1.The solid to liquid mass ratio was 1:3. The concentration of Ni in impregnation solution varied from 1.0 to 3.0 moldm^{-3}. Mercury intrusion porosimetry was used for textural characterization since the synthesized catalysts were predominantly macroporous. The impregnation led to decrease of total pore volume, broadening and shifting of pore size distribution curve towards smaller pores. These changes were enhanced with the increase of initial concentration of Ni solution and number of successive impregnations as well as the nature of modifier. The Ni-catalyst modified with Al showed the best textural properties.

P27

Annealed nanopowder $GdVO_4:Sm^{3+}$ prepared by solution combustion synthesis

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The gadolinium vanadate doped with samarium ($GdVO_4:Sm^{3+}$) nanopowder was prepared by the solution combustion synthesis (SCS) method. After synthesis, in order to achieve the full crystallinity, the material was annealed in air atmosphere at 1300 °C. Phase identification in the post-annealed powder samples were performed by X-ray diffraction, and morphology was investigated by high resolution scanning electron microscope (SEM). Photoluminescence characterization including excitation and emission spectra and lifetime analysis has been done using tunable laser optical parametric oscillator excitation and streak camera. Several strong emission

bands in Sm^{3+} emission spectrum were observed, located at 563 nm ($^4G_{5/2} - {}^6H_{5/2}$), 600 nm ($^4G_{5/2} - {}^6H_{7/2}$,), and 644 (653) nm ($^4G_{5/2} - {}^6H_{9/2}$,), respectively. The weak emission at 700-710 nm ($^4G_{5/2} - {}^6H_{11/2}$) was also observed by detection system.

P28
Chitosan-montmorillonite bionanocomposite as textile dyes adsorbent

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The removal of color dyes from wastewater before they are released in natural waters is important since some dyes are highly toxic for environment. Although several traditional chemical and biological processes exist for dye removal, application of these techniques has been restricted due to the essentially non-biodegradable nature of dyes. Some modified clays, may play a role of low cost adsorbents suitable for dye removal. Since natural clays are ineffective as adsorbents for organic compounds it is necessary to modify their surface. Chitosan-clay nanocomposites are promising materials with organic-inorganic hybrid interfaces. These materials contain a biopolymer chitosan and they represent a green alternative to conventional organoclays in their applications, i.e. as adsorbents. The intercalation of chitosan into smectite clay can result in monolayer and/or bilayer arrangements. When bilayer structures are formed some free $–NH_3^+$ groups present in the interlamellar region are making these materials suitable for adsorption of anionic species, i.e. anionic textile dyes. In this work chitosan-clay nanocomposite was synthesized using Na^+-enriched smecite clay and characterized using physical-chemical methods. In this manner the bionanocomposite with bilayered intercalation of chitosan chain was obtained and tested as adsorbent. The adsorption of anionic dyes Acid Orange 10 (AO10), Acid Yellow 99 (AY99) and Reactive Black 5 (RB5) has been studied by varying the different adsorbate concentrations, temperature and shaking time. The concentration of commercial textile dyes was analyzed before and after adsorption test using Thermo Electron Nicolet Evolution 500 UV-VIS spectrophotometer in wavelength range from 250 – 800 nm.

P29
MAGNETOIMPEDANCE EFFECT IN FINEMET MICROWIRES FOR SENSOR APPLICATION

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In this study magnetoimpedance (MI) effect of FINEMET alloy microwires for magnetic sensor application is presented. Amorphous magnetic wires were produced from arc-melted ingots of master prealloys of nominal composition $Fe_{73}Cu_1Nb_3Si_{13.5}B_{9.5}$ by in-rotating water spinning

technique. The MI measurements were performed in the longitudinal direction of a 35 mm long and 150 mm of diameter of wire samples. The impedance was measured by four-point method by LCR HiTester in a magnetic field produced by 1D-Helmholtz coils.
MI ratio defined as $DZ / Z = [Z(H_{ex}) - Z(H_{max})] / Z(H_{max})$ was explored in dc axial magnetic field H_{ex}, up to the maximum value of $H_{max} = 17.5$ kA/m. The frequency of electrical properties measurements as well as MI-effect measurements ranged from 50 Hz to 5 MHz and sinusoidal current amplitude was ranged from 5 mA to 20 mA.
Correlations between MI effect, real and imaginary part of impedance with electromagnetic skin effect i.e. penetration depth were performed. Possible applications as a magnetic sensor were discussed.

P30

General principles conservation and restoration of painting on canvas holder

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Many of the images are part of the historical, artistic and cultural heritage of a people. Treating them is a kind of indicator of reachedstage of development of a community, and knowledge of self-consciousness of an entire nation. Therefore, the images should be kept and provided them optimal conditions for their display and presentation.
Paintings on canvas holder are very sensitive layered structure, a first step in the comprehensive protection lies in identifying and understanding the causes that contribute to their devastation, then the preventive action in order to preserve them, and as a last resort in order to protect, imposes himself conservation treatment and restoration.
Conservation and restoration of paintings on canvas, is the most delicate and the most problematic area in the protection of works of art. The development of new technologies and new materials the approach to protect pictures on canvas holder is predominantly based on the conservation treatments, and the treatments that aim to free reconstructive methods and supplements revitalize the structure of the following original image. In contrast to the conservation, restoration falls into the category of "aesthetic discipline" that has a role to methods of partial or full integration of new materials, complete the work and return it disturbed the original appearance. In the context of the duration of a work of art, segment restoration is considered a short-term and variable, so that conservation methods are the primary protection in the preservation work. However, restoration methods, despite the contentious contradictions constitute the most important part in the presentation of the artwork and the effort to preserve the integrity of the author's ideas, aesthetics and historical distance, in which the work was created.
Unlike traditional ideas, which were to the fore emphasized the visual aspect of the work, ignoring the historicity of the original integrity, in the modern context, the principles and methods of conservation and restoration in particular, are based on strict adherence to the original structure of the work and its historicity.

P31

New materials and technologies in aero and space research

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Space technology plays an integral and indispensable role in our daily lives. Whether we are talking about live broadcasts of World Cup matches, satellite-assisted emergency management efforts, or the nightly weather forecast, one thing is true: our lives would be very different without satellite images or satellite-based communication and navigation systems. Space technology is key to our modern, knowledge-based society. Today space makes a vital contribution when it comes to promoting research and development, education and innovation, economic growth, providing highly qualified jobs, improving our quality of life, protecting the Earth, ensuring our security and defence and furthering international cooperation. Military platforms—such as ships, aircraft, and ground vehicles— rely on advanced materials to make them lighter, stronger, and more resistant to harsh environmental conditions. Currently, the process for developing new materials frequently takes longer than a decade. This lengthy process often means that developers of new military platforms are forced to rely on decades-old, mature materials, because potentially more advanced materials are still being developed and tested and are considered too large a risk to be implemented into platform designs. Al alloys have been the primary material for the structural parts of aircraft because of their well known performance, well established design methods, manufacturing and reliable inspection techniques. Fiber reinforced polymer composites have been increasingly used in aerospace. Fiber Metal Laminate (FML) is a new kind of hybrid composite. Materials used to construct spacecraft and protective gear—including the International Space Station and space suits for astronauts—must be lightweight yet strong enough to guard against cosmic dust that travels at hypervelocity.

P32

On the use of ceramic materials for the degradation of chemical warfare agents and their simulants

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Chemical warfare agents (CWA) are present in everyday life regardless to their war related usage. There are large amounts of non-neutralized leftovers of CWA dumped into the sea waters and, after the prohibition of such a disposal, there are various stockpiles of CWA on the ground. Additionally, the use of CWA for the cancer cell treatment and high interest in research on mechanisms behind reactions between CWA and different materials make them present in everyday laboratory life also. This contribution presents a literature survey of the use of ce-

ramic materials for the degradation of CWA and their simulants. Sulfur mustard (IUPAC name bis(2-chloroethyl) sulfide, military code HD), vesicant used in the development of the first chemotherapy drug mustine (IUPAC name bis(2-chloroethyl)methylamine) and 2-CEES (2-cloroethyl methyl sulfide), a simulant for HD, were analyzed. Comparative analysis has been performed for MgO, Al_2O_3, TiO_2 and SiO_2. Results imply that the use of nanostructured materials is favorable for good decontamination efficiency.

P33

Solvothermal synthesis of zinc-copper-ferrite nanoparticles

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Spinel ferrites nanoparticles have been attracting considerable attention due to their potential for application in a variety of fields that include data storage, catalysis, energy, environment, and in particular, biomedicine. However, for each application the magnetic nanoparticles with specific size, shape andmagnetic response are required. Therefore, fine tuning of the particle size, shape and crystallinity is essential for production of magnetic nanoparticles capable to meet application-specific requirements.
In the present work, physicochemical properties of $Zn_{1-x}Cu_xFe_2O_4$ nanoparticles (x = 0; 0.2; 0.4; 0.6; 0.8; 1.0)were investigated.In order to obtain particles uniform in size and shape, thesolvothermal synthesis method and oleic acid, acting as a capping agent,were used. The obtained powders were characterized by X-ray powder diffraction (XRD), transmission electron microscope (TEM), Fourier transform infrared spectroscopy (FT-IR) and vibrating sample magnetometer (VSM).The XRD results show that all diffraction maxima correspond to the cubic spinel structure, indicating the high purity of samples, while the TEM analysis showedsphere-like particles,5-7 nm in size. The presence of oleic acid on the surface of magnetic nanoparticles was confirmed by FT-IR analysis. VSM measurements revealed superparamagnetic behavior of themagnetic nanoparticles.

P34

QUANTITATIVE METALLOGRAPHY MODERN METODS

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This paper has been concerned with the classical Stereological targets V, S, L, and N only, namely with so-called first-order properties. Stereology is now drifting rapidly toward second-order methods, aimed at quantifying spatial pattern for the elements of a structure (e.g. clustering, repulsion, etc., between the elements) as well as the nature and degree of association

between different structures. Second-order statistical methods are widely available for point patterns. Important devices for the second-order analysis of cells and organelles when regarded as points in space have recently been devised. Analogous methods extend to higherdimensional quantities such as surface areas and volumes.

P35
Changes of High Purity $Bi_{12}GeO_{20}$ Single Crystal Properties Induced by Femtosecond Pulsed Laser Irradiation

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It had been shown that a femtosecond pulsed laser irradiation can improve optical properties of $Bi_{12}GeO_{20}$ single crystals. We investigate if the effect occurs if the crystals are grown from high purity components. The samples were irradiated by a femtosecond pulsed laser beam of increasing power. After irradiation, intensity of Raman spectra peaks increased, except for the peak at 203 cm^{-1}, whose intensity decreased. The irradiation also changed the sample color. The induced changes were less intense than was the case when the crystal was grown from components of lesser purity.

P36
MATERIAL CHARACTERIZATION SEM MODERN METODS

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Detailed analysis was carried out and systematization of methods used in the characterization of materials using SEM. We analyzed its operation. Attention was paid to its major parts.Specially to ehe electron gun and lens. Also, comparisons of forming character oprickim microscope and SEM. In further analysis we have studied differences between EDS and WDS.. The EDS features measurement with a small probe current, short-time acquisition of spectra, etc. WDS features a high energy (wavelength) resolution, detection of trace elements. Most SEMs are equipped with an EDS, whereas a WDS is generally used as an Electron Probe Microanalyzer (EPMA) that mainly performs elemental analysis.

P37

Highly efficient macroporous silica/iron oxide based adsorbent for arsenic removal

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Synthesis of macroporous silica based adsorbent impregnated with hydrous iron oxide (goethite -GT) applicable for efficient arsenic removal is presented in this work. The synthesis procedure was conducted in two successive steps: first step includes introduction of amino active sites by silica surface modification with (3-aminopropyl)trimethoxysilane, while the second step includes precipitation of GT on the surface of the modified silica (SiO_2/GT). The effectiveness of introduction of amino groups on silica surface, as well as structures of synthesized adsorbent were confirmed by FTIR analysis. The crystal structure of GT was determined by X-ray diffraction (XRD). The results of textural parameters and surface properties (specific surface area and adsorbent porosity), determined by Brunauer–Emmett–Teller analysis, indicate higher surface area and moderate pore diameter for the adsorbent with GT, comparing to amino modified silica. Morphology parameters, such as shape and adsorbent particle size, were examined by scanning electron microscopy (SEM). The SiO_2/GT adsorbent has spherical shape with the mean diameter of 1–2 mm and highly porous surface. High arsenic removal capacity of 35.9 mg g^{-1} at 25 °C and optimal pH values of 6.6-7.4 indicates that this adsorbent is efficient and reusable for arsenic removal from natural water in the batch mode.

P38

The Bridgman method growth, spectroscopic characterization and photoluminescence of calcium fluoride single crystals

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Calcium fluoride - CaF_2 single crystals were grown using the Bridgman technique. By optimizing growth conditions, <111>-oriented CaF_2, crystals up to 20 mm in diameter were grown. Number of dislocations in CaF_2 crystals was 5×10^4 - 2×10^5 per cm^2. Selected CaF_2 single crystals is cut into several tile diamond saw. The plates were polished, first with the silicon carbide, then the paraffin oil, and finally with a diamond paste. The obtained crystals were studied by X-ray diffraction, Raman spectroscopy, far-IR reflectivity and by the measurement of trans-

mission in the mid IR-range. The crystal structure is confirmed by XRD. One Raman and two IR optical modes predicted by group theory are observed. In the transmission spectra, except modes originated from vibration of -CH_2 groups, hydroxyl groups -OH and KBr, is visible a peak at 671 cm^{-1} assigned to the Ca-F stretching vibrations. A low photoluminescence testifies that the concentration of oxygen defects within the host of CaF_2 is small. All performed investigations show that the obtained CaF_2 single crystal has good optical quality.

P39
Long-term monitoring of photocatalytic coating functional properties inreal environmental conditions

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The work studies functional properties of a photocatalytic coating (TiO_2/Zn-Al) applied on the experimental wall inreal environmental conditions. It is possible to find several methods for photocatalytic activity assessment in laboratory conditions, but the methods for *insitu* measurements of photocatalytic activity can hardly be found in any publication.
Our study was conducted by using modern surface analysis (FTIR spectroscopy, DRIFT mode) and traditional microbiological techniques, in order to understand fungal colonization on the façades covered with a photocatalytic coating (previously developed and proved in laboratory as a good antifungal material). For this purpose, an experimental wall was build and covered with a commercial façade paint and (TiO2/Zn-Al) photocatalytic coating. In order to induce fungal growth, the autochthonous microorganisms (*Aspergillus niger* and *Cladosporium*sp.) were isolated from the vicinity of a wall and applied by spray technique on the experimental wall. The monitoring of the fungal growth and surface analysis was done during the period of 3 years.
The obtained results show good functional properties of the applied photocatalyticTiO2/Zn-Al coating. Furthermore, the results provedthe need for a long term monitoring of the coating functional properties in real environmental conditions in order to obtain measurable and valid values.

P40

Self-cleaning/photocatalytic properties of the novel protective facade paint coating

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The long-term exploitation of building materials with façade paint and constant exposure to outdoor conditions lead to inevitable degradation of their aesthetic and functional properties. The use of self-cleaning photocatalytic active coatings could prolong the exploitation be reducing or eliminating negative effects derived from organic, inorganic and microbial pollutants. The aim of this study was the application and examination of protective coating on commercial façade paint. The coatingbased on TiO_2 and Zn-Al layered double hydroxideswas studied. The influence of the coating on façade paints visual appearance was evaluated by diffuse reflectance spectrophotometry.Surface properties such as roughness, micro-hardness, surface energy (initial contact angle) were measured for the referent façade paint without photocatalytic coating and for the façade paint with deposited coating.The photocatalytic activity was assessed by spectroscopic measurements of rhodamine B dye degradation under UV light irradiation. The results revealed that the deposition of the protective coating does not influence the aesthetic appearance, surface roughness and microhardness of the façade paints, initiating at the same time photocatalytic activity and photo-induced surface hydrophilicity. The study showed that developed coatings presents a promising material for the design of protective, self-cleaning coatings on façade paints.

P41

Modified bentonite based electrodes in the electrooxidaton of phenol: hydroquinone/catechol current ratio

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Bentonite from locality Mečji Do (MD) was modified. One sample was obtained by treating MD with acid solution at 70 °C for 30 minutes (MD_A). Other sample was obtained by impregnation of MD_A with nickel acetylacetonate followed by thermal degradation of salt (MD_A/$Ni(acac)_2$). The obtained materials were characterized using X-ray diffraction, EPR spectroscopy and low temperature N_2 physisorption. The glassy carbon electrode (GCE) was modified using obtained materials and denoted according to these materials. The modified GCE was tested using cyclic voltammetry in 0.1 M H_2SO_4 aqueous solution containing 10 mM of phenol. A mixture of the hydroquinone and catechol was formed during electrooxidation of phenol. The hydroquinone/catechol ratio is significant for further application. The goal of this work was to investigate the

influence of bentonite modification on current response of GCE modified with these materials, particularly hydroquinone/catechol current ratio. The deconvolution method was used to analyze peaks corresponding to hydroquinone and catechol formation during cycling. The chosen deconvolution model excellently fitted experimental data (R^2=0.9997). Using this model it was found that hydroquinone/catechol current ratio during electrooxidation of phenol increased on GC modified electrodes in the following order MD<MD_A<MD_A/$Ni(acac)_2$.

P42
Calculation of sintering activation energies of various ceramic materials via different models

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Alumina and zirconia ceramic compacts made from nanometric particles were shaped by cold isostatic pressing (300MPa) and then sintered in high temperature dilatometer in order to evaluate the sintering kinetics and to calculate the activation energies of sintering. Namely, method of Master Sintering Curve and method of Wang & Raj were used. A practical methods for evaluation of activation energy of sintering were developed. The results of sintering activation energies for both materials exhibits similar decrease throughout densification process. Drop of sintering activation energy in final sintering stage is probably connected with the change of the sintering mechanisms during sintering.

P43
Aspects of sintering kinetics of magnesium titanate

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Obtaining new materials including sintered electronic materials using different procedures is the consequence of long complex and expensive experimental work. However, the dynamics of expansive development of electronic devices requires fast development of new materials, especially sintered oxide materials. The recent rapid development of electronics is among other things due to development and improvement of new components based on titanate ceramics. Research in this work has included an experimental study of the synthesis of dielectric ceramics in the system $MgCO_3$ – TiO_2. Starting powders were mechanically activated by milling in a high energy planetary mill for different times. Samples were prepared for isothermal sintering at 1100^{o}C by dual pressing of powders into cylindrical samples in a hydraulic press.

P44

Synthesis and propetrties of the $MgTiO_3$ system

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Important role among ceramic materials have those that are applied in electronics. Most common way of obtaining those materials is by using the process of sintering. During mechanical activation of the inorganic materials, they are subjected to grinding and the grain size is being reduced. Crystal structure is distorted and changed, which, in some systems, leads to chemical reaction and formation of new compound. In this paper we explain mechanical activation influence on sintering kinetics in systems $MgTiO_3$.
Mechanical activation of the starting powder mixture was performed by milling during different time intervals within 120 minutes in a planetary ball mill device with ZrO balls and vessels and ball to powder mass ratio 40:1. Powders were compacted and sintered non-isothermally up to 1000°C. Differential thermal analysis was performed with the purpose of determining characteristic temperatures where a solid state reaction occurs. X-ray powder diffraction is used for observing the evolution of magnesium-titanate phases during milling. For specimens synthesized in such manner, microwave dielectric properties were measured, namely dielectric losses (tg δ), specific electric resistance (ρ) and dielectric constant (εr).

P45

Electrochemical response of hemoglobin

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Electron transfer between heme protein and electrode surface can be enhanced by electrode modifiers such as clays. Using hemoglobin as sensor relays on its possibility to retain native structure that enables hemoglobin to shift conformation. Therefore, electrochemical investigation of hemoglobin response at extreme pH did not take attention. At extreme pH values protein denaturation occurs resulting in conformation loss. The aim of this paper was to investigate electrochemical behavior of hemoglobin supported on smectite in alkaline media. Hemoglobin was immobilized on acid activated clay, bare and modified by SDS. The adsorption of hemoglobin was slightly increased by the presence of SDS on the electrode surface. All samples showed peak at -0.45 V ascribed to reduction pair of heme Fe(III)/Fe(II). Denaturation of hemoglobin imparted chemically by SDS or electrochemically by cycling in cathodic potential range, led to development of new peak at potential around -0.7 V in alkaline media. This feature might be useful for studying and determination of different hemoglobin types.

P46

Pipe

Zvonko Petković
Artist

Pipe is a passion. Pipe is the same as a stick for golfers. He feels, it enjoys free admires her. Fans of a pipe like to point out that a pipe is not merely a means of tobacco consumption. No, they see it as an escape from our dimension of chaos and distress in the aromatic world of harmony, tranquility and a kind of meditative state. Today is a kind of status symbol pipes, pipe because today is not at all cheap. Price range is from twenty to several thousand dollars, and pieces with platinum and diamonds and reach five figures. Despite this fact, in many countries pipe is experiencing a renaissance. Along with the UK, Germany and the Scandinavian countries, which are considered tobacco pipe superpowers, smoking his pipe once again becoming popular in Russia, Poland, China and Japan. When was the last time you saw someone with a pipe in his mouth? Behind the stench of cigarette smokers remains a smoker's pipe remains a pleasant smell. A pipe is a fashion accessory, a sign of dependence on cigarettes. Women before observed a man with a pipe (bait for women eyes) than a man with a cigarette. A pipe is the invention of North American Indians, who have always been tobacco pipes and placed the divine character and magical power. They considered it a gift of the Great Spirit that brings peace, protecting warriors, brings good luck for hunters and fishermen and tranquility of the soul. Many tribes still foster the cult of the pipe. Clay pipes to Europe brought the first settlers who returned to their homeland.
Thanks to the sailors, students and soldiers, pipe spread throughout Europe. The person responsible for the social acceptance of the pipe is considered to be Sir Walter Raleigh.
Passion for pipes not only characterized by imaginary characters, but also many well-known names from the world of science, art, show business, politics ... Among the most famous pipe smokers are Einstein, Darwin, Freud, Jung, Van Gogh, Bach, Alexander Graham Bell, Tolkien, Arthur Conan Doyle, general MacArthur, Greta Garbo, Gerald Ford, Queen Victoria, Stalin, Orson Welles, Clark Gable, Yul Brynner, Neil Armstrong and many others.
Pipes to say mainly from olive wood, old hundredth year, and from specially selected exotic species, which in its composition have no tannin. Mouthpieces made of plexiglass. What is perhaps the most important and I'm restoring pipe. Restoration pipes is a special form of restoration, because without a sense of complete pipe as articles of personal nature it is difficult to do this work cylinder. Maybe I was honestly compare the restoration of pipe with restoration of musical instruments. If the instrument does not feel you can not properly restore. So it is with a pipe.

P47

Ceramics and politics: tale as old as time

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Aim of this paper is to show how ceramic was always closely tied to politics in human societies, even if this relationship was not explicit and self-evident.
Technologies have always been political – or at least used, although never directly, to enhance

and multiply political power. Mediated through economy and military progress, technology was frequently the mean to impress the masses or rivals, as well as a vehicle of economic and military domination. Sometimes, however, rulers have actively opposed introduction of new technologies. Newly developed materials were no exception: it was recorded that Roman emperor had banned the production of "unbreakable glass", in order to avoid economic collapse.
Ceramics has been the tool of political power ever since the beginning of civilization. From the first empires whose order was dependent on cuneiform, via depictions of political events and alliances on pottery, to royal monopolies on porcelain production, ceramics was tightly intertwined with the political sphere.
Today, ceramic components are still woven into everyday life as well as into politically important technologies – from "space race" to computer revolution, ceramics is still used to enhance, albeit indirectly, political power.

P48

The influence of biogenic and nano silica on the properties of elastomeric composites based on chorosulfonated polyethylene

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Hybrid materials consist of both organic and inorganic parts. They may offer a superior characteristics compared to their building blocks or other, simpler materials if the components are well chosen. The control over the preparation of multicomponent systems by a mild reaction method also led to industrial interest for metal-elastomer joints reinforced by fillers and the use of rubber blends to produce advanced high performance adhesive systems. The interest in elastomeric composites has expanded in recent years as these multi-phase mixtures often provide an advantageous blend of properties of the individual materials. **In this work two types of silica filler was used to increase the adhesion strength between steel and elastomeric materials based on** polar chlorosulfonated polyethylene (CSM) and polychloroprene rubber (CR) as **network precursors**. Precipitated silica (the average size of primary particles 15 nm) and biogenic silica (the average size of primary particles 28 mm) were used in order to assess the differences in metal-elastomer joints adhesion strength. The ratio of precursors in CSM/CR blends was 50:50 (w/w). The filler content was in the range from 0 to 35 phr. Characteristics of the composites were undertaken by combining the cure kinetics, the dynamic mechanical properties, and adhesion strength. The viscoelasticity of prepared materials were assessed by mechanical spectrometer in a single cantilever bending mode (in the temperature range from 50 °C to 150 °C).

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Micro-rods of oxidized pentacene obtained by thermal annealing in air of pentacene thin films

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The influence of thermal annealing (in air and nitrogen at ambient pressure) on optical properties of pentacene films, well-known material widely used in organic electronic devices, was studied. Pentacene films, whose thickness varies an order of magnitude (30 – 300 nm) depending on the position on the substrate, were polycrystalline at all thicknesses. Raman and UV-vis absorption spectra depend on the position on film implies changes of the film structure with the thickness. These spectra are not largely affected by annealing if it is not performed in air at temperatures higher than 100°C. Prolonged annealing in air, at temperatures higher than 100°C, leads to formation of nano- and micro-scale rod-shaped structures on film surface. Based on scanning electron microscopy measurements, it is supposed that these structures are crystalline. Their UV-vis absorbance indicates that they are composed of more than one species of oxidized pentacene molecules, including 6,13-pentacenequinone. Further study is necessary to precisely determine composition and structure of micro-rods, as well as the mechanism of their formation.

P50

Chemical Analysis of Mortars of Archeological Samples form Mediana

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The aim of this study was mineralogical and chemical analysis of mortar from the floor, ceiling and wall of Stibadium B, from the archaeological site of Mediana. ICP-OES and FTIR-spectroscopy were used to determine chemical composition and some major mineralogical species. The obtained results show that lime mortar is probably used. Large contribution of silicon- and aluminum-oxides, indicate the presence of quartz and clay minerals derived from the aggregate, river sand and crushed bricks. The obtained results also show large amount of iron, manganese and copper. The determinated metals in samples from floor and wall of Stibadium B, are mostly present in oxide fraction, while in sample from ceiling, they are mostly found in silicate fraction

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