



**Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION VI
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**

PROGRAM AND THE BOOK OF ABSTRACTS

**Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 18-20. September 2017.**

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Dear Colleagues,

We have great pleasure to welcome you to the Advanced Ceramic and Application Conference VI 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 and Institute for Technology of Nuclear and Other Raw Mineral Materials.

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 emphasize the key achievements which will enable the wide spread 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.

For the first time Advanced Ceramic and Application Conference hosting delegations from Republics of Ghana, Nigeria, Niger and Cameroon with the idea to connect, share and provide positive influence to the scientific and industrial communities all around world.



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

Conference Topics

- Basic Science & Sintering of Ceramics
- Nano, Bio- & Opto Ceramic
- Electro & Multifunctional Ceramics
- Magnetic, Catalytic & Composite Materials
- Renewable Energy, Heritage & Archeology
- Industrial Talks

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INV-EM1

Granular material transport and mixing - DEM/CFD numerical approach

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The quality mixing of powders, particles and/or granules obtain an engineering, energy, economic and ecological importance of various industries. The mixing efficiency, the design of equipment and mixing parameters exert a strong impact on the quality and the price of the intermediate or final product. The use of Discrete Element Method (DEM) is demonstrated in various applications, such as: modelling of granular flow in static mixer, revolving static mixer and modified screw conveyor. Computational Fluid Dynamics (CFD) is used for modelling of fluid flow through the Eulerian multiphase model. The coupling of DEM and CFD method could be used to predict the behaviour of particles during the transport / mixing process. If it is applicable, the model should undergo the verification step, during which the experimental results are compared to numerical data. Application of this modelling approach provides the possibility for optimization of the geometry and parameters of mixing systems and the improvements in granular material handling, taking into account the quality of the mixing process and the cost of the final product.

INV-EM2

Assessing electrical properties of ceramic samples

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We present an overview of electromagnetic numerical techniques and measurement apparatus that have been used for assessing electrical properties of ceramic samples. The complex permittivity of the ceramics is typically the first electromagnetic property of interest. In the measurement approach that we use, ceramic samples, in the shape of pills with metalized faces, are placed in either a proprietary coaxial chamber or in an open fixture. The scattering parameter (reflection coefficient) is measured using a network analyzer. For the deembedding of the complex permittivity of a sample one needs precise electromagnetic simulations, including detailed models of the chamber or the open fixture. For lower and intermediate frequencies we use a numerical technique for electrostatic analysis, based on the method of moments with Galerkin testing. We create a database that is used afterwards for evaluation of the complex permittivity practically in real time. For higher frequencies, a full electrodynamic model of the chamber is developed with WIPL-D software. For all our deembedding techniques, we have also developed a detailed model of losses in the SMA coaxial connectors, which is essential for a precise evaluation of the imaginary part of the

complex permittivity for low-loss dielectrics. We present results of several measurements in order to illustrate the used techniques.

INV-EM3

Electrocatalytic hydrogen production on a nickel electrode modified with V₂O₅+Co co-deposit: The synergetic electronic effect

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Considering a world wide need for renewable energy sources, much attention has been given to the hydrogen economy. Currently the production of hydrogen by alkaline water electrolysis is facing a problem concerning high and ineffective energy consumption. Therefore, designing of new cathodic materials, based on the concept of electrocatalytic synergism toward hydrogen production, are particularly of great importance. Accurately defined, electrocatalysis represents the effect of an electrode material on the rate of electrode reaction. This effect can be real (intrinsic), or apparent. Among various electrocatalytic systems, oxide electrodes have been shown to possess high catalytic activity for the hydrogen evolution reaction (HER). In this study, the galvanostatic co-deposition of V₂O₅ and Co particles onto the smooth Ni support has been carried out in an alkaline bath. Presence of V and Co species on the surface of Ni support was qualitatively confirmed by XRF spectroscopy. Electrocatalytic parameters of investigated electrodes toward HER, such as: the exchange current density, the current density at fixed overpotential (-250 mV), the overpotential at fixed current density (300 mA cm⁻²) have been evaluated. Comparative analysis of the electrocatalytic activities of: the V₂O₅+Co cathode (V₂O₅+Co/Ni), the Ni smooth electrode, the electrode obtained by electrodeposition of Co onto Ni smooth electrode (Co/Ni) and the *in situ* activated Ni smooth electrode with V₂O₅ (V₂O₅/Ni), has been carried out. Results are presented to show, that the enhanced electrocatalytic activity of the V₂O₅+Co/Ni electrode toward HER can be attributed to the existence of a pronounced synergetic electronic effect.

INV-EM4

Kinetic investigation of various thermally-induced processes in ceramic materials

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In ceramic materials, various processes – physical or chemical – undergo; these are investigated through several thermoanalytical methods, thus by multiple techniques. Some of them, partially due to subtle changes that may not be monitored by all or most popular thermal techniques, have the disadvantage of being not completely studied or even wrongly understood. The kinetic studies of these transformations shall bring more insights to the overall understanding of these materials and point eventually to specific application deriving.