Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION VIII
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, 23-25. September 2019.

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Dear Colleagues,

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

This year the conference is supported by the Serbian Chapter of American Ceramic Society and European Academy of Sciences and Arts.

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
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Conference Topics

- Basic Ceramic Science & Sintering
- Nano-, Opto- & Bio-ceramics
- Modeling & Simulation
- Glass & Electro Ceramics
- Electrochemistry & Catalysis
- Magnetic & Refractory Ceramic
- Renewable Energy, Composites & Amorphous Ceramics
- Heritage, Art & Design

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Conference Program and Abstracts

ORL-EC 2

Bimetallic CuNi/BCY15 cermet anode for proton conducting solid oxide fuel cell

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Nowadays, the ceramic–metal composites (cermets) containing Y-doped barium cerate, $BaCe_{0.85}Y_{0.15}O_{2.925}$ (BCY15) as anode ceramic matrix and metal nickel are utilized as proton conducting solid oxide fuel cell (pSOFC) anodes. An efficient mode to improve the electrocatalytic activity of Ni-cermets is to combine it with other transition metal.

A low-temperature wet chemical approach for simultaneously impregnation of BCY15 with Ni and Cu metallic particles was presented aiming to avoid the traditional ceramic high-temperature processes. The bimetallic (CuNi/BCY15) and monometallic (Ni/BCY15) powders were studied by XRD, TPR and SEM techniques. The electrochemical characterization of the produced anode cermets was performed by electrochemical impedance spectroscopy after high-temperature sintering followed by H_2-reduction.

The comparative study disclosed the positive effect of Cu presence in the bimetallic CuNi/BCY15 anode cermet that is related to (i) appearance of electronic conductivity still at the beginning of reduction under N_2 treatment followed by gradually increasing portions of H_2 and (ii) earlier start of the reduction as opposed to the monometallic Ni/BCY15.

Acknowledgment: This work was supported by the Bulgarian Ministry of Education and Science under the National Research Programme E+: Low Carbon Energy for the Transport and Households, grant agreement D01-214/2018.

ORL-EC 3

Cobalt impregnated natural and acid modified montmorilloniteas catalysts in heterogeneous catalytic oxidation of nicotine in the presence of Oxone®

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Nicotine i.e. (S)-3-(1-methylpyrrolidin-2-yl) pyridine is an alkaloid present in significant quantities in tobacco leaves and can be found in wastewaters as an aftermath of tobacco manufacturing. Natural Wyoming originated montmorillonite (Wy-M) and acid modified montmorillonite (Wy-M_A) were impregnated by wetness capillary method using $Co(NO_3)_2$ solution. The amount of introduced cobalt corresponded to cation exchange capacity of each sample. The samples were calcinated at 450°C during 6 hours and denoted as Co/Wy-M and Co/Wy-M_A. These catalysts were used for nicotine degradation in the presence of Oxone® ($2KHSO_5 \cdot KHSO_4 \cdot K_2SO_4$). The changes in the chemical and phasecomposition ofWy-M, Wy-M_A,Co/Wy-M and Co/Wy-$M_A$were monitored using X-ray fluorescence (XRF) and X-ray diffraction (XRD), respectively.The powerful sulfate radicals for nicotine oxidation were generated by activation of Oxone®in the presence of transition metal cation (Co^{2+}) incorporated into the catalysts structure. The process of nicotine oxidation was investigated at 30° C and 50 °C, while thenicotine concentration was monitored

using a UV-Vis spectrophotometer at λ_{max}=261 nm. The obtained results showed efficient degradation of stable nicotine molecule in heterogeneous Fenton-like reaction using cobalt impregnated natural and acid modified montmorillonite as catalysts.

Acknowledgement: This work was supported by the Ministry of Education science and technological development of the Republic of Serbia (Project III 45001).

ORL-EC 4

Calcium oxide on coal fly ash cancrinite-type zeolite as a catalyst for biodiesel production

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This paper discloses the synthesis of new supported catalyst in which the main components of the catalyst, catalyst support and active component, derived from waste material, and its catalytic properties tested in the reaction of the production of biodiesel. Cancrinite-type zeolite catalyst support was synthesized from coal fly ash using hydrothermal technique with NaOH as the activation reagent in a rotating PTFE autoclave reactor. The active component, CaO, was derived from waste chicken eggshells by calcination at 900 °C. Supported catalytic material was synthesized by impregnation. The content of CaO in the prepared catalysts was varied from 5 to 20 wt%. The catalysts were characterized using XRD, FT-IR, SEM, N_2-physisorption, and Hg-porosimetry. The methanolysis of sunflower oil was carried out in a batch reactor at 60 °C, with methanol to oil molar ratio of 12:1, and catalyst concentration of 4 wt.%. The fatty acid methyl ester content (% FAME) was analyzed using HPLC method. Structural information related to phase identification and vibration of chemical bonds in molecular units indicates that a multiphase zeolitic structure was obtained. The structure of cancrinite-type zeolite was found to be dominantly present. It was found that the catalyst impregnated with 20% of CaO gave the highest FAME percentage of 96.46 for the reaction time of 2 h.

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ORL-ERC 1

Amidoxime-based Polymers for Extraction of Uranium from Seawater

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The goal of the project was to design and manufacture a polymer that would extract uranyl, UO_2^{+2}, from seawater in three years. I will present publicly available results from my 6 publications that show how the goal was accomplished. Focus will be on the computational design of a receptor for uranyl, simulation of a polymer caring the receptor, and the experimental verification of the successful design.