# Serbian Ceramic Society Conference
# ADVANCED CERAMICS AND APPLICATION XI
## 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 2023.**

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## INV22

## Possibilities of integrating alkaline electrolyzer with ionic activators in micro combined heat and power systems

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The utilization of renewable energy sources such as wind and solar increases the available options for a decentralized electricity grid. Water electrolysis is among the most perspective methods of technical development. Cost reduction in electrolyzers is possible only through the development of electrocatalysts and cathode materials. The primary outcomes of the research were the characterization and testing of ionic activators added in a standard solution of 6M KOH in alkaline electrolyzers and integrated into combined heat and power systems. We found that ionic activators based on d-metals such as Ni, Cu, Co or Cr and Mo salt in a standard solution of 6M KOH improve the reduction in energy consumption by about 18%, compared to a non-activated system. The energy efficiencies of the electrolyzer with an activated system were about 70% on the different applied current densities. Increasing the energy efficiency of the electrolytic process is achieved by thermal integration, that is, by connecting the heat exchanger with the electrolyzer and the fuel cell. By establishing the connection of the heat exchanger with the alkaline electrolyzer with ionic activators and the fuel cell, it is possible to increase energy efficiency by thermal integration of the electrolytic process.

## INV23

## Structural integrity analysis of a hip implant with a ceramic-ceramic sliding surface

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In this paper an analysis of a structural integrity of a hip implant with a ceramic-ceramic sliding surface is presented. The primary reason for introducing this alternative sliding surface is the superior wear resistance of ceramics compared to metal-to-metal or metal-to-polymer sliding surfaces. These and other improved properties, such as resistance to further oxidation (resulting in inertness within the body), high strength and low friction, require the use of controlled, small and uniform grain size (typically less than 5μm) ceramic materials. Cavities within the ceramic materials increase stress and degrade mechanical properties. In ceramics, stresses from thermal contractions are critical because plastic deformation cannot occur, as in the case of ductile materials. Since fracture behavior is one of the critical implant design parameters, it is necessary to understand fracture initiation and its subsequent growth, in order to prevent the catastrophic failure of the implant. Therefore, this paper is focused on