The Serbian Society for Ceramic Materials
Institute for Multidisciplinary Research (IMSI), University of Belgrade
Institute of Physics, University of Belgrade
Center of Excellence for the Synthesis, Processing and Characterization of Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of Nuclear Sciences "Vinča", University of Belgrade
Faculty of Mechanical Engineering, University of Belgrade
Center of Excellence for Green Technologies, Institute for Multidisciplinary Research, University of Belgrade
Faculty of Technology and Metallurgy, University of Belgrade

PROGRAMME and the BOOK of ABSTRACTS

6CSCS-2022

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June 28-29. 2022. Belgrade Serbia

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Branko Matović
Aleksandra Dapčević
Vladimir V. Srdić

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P-14

STABILITY AND FUNCTIONALITY OF $BaCe_{1-x}In_xO_{3-\delta}$ AS A HIGH TEMPERATURE PROTON CONDUCTING ELECTROLYTE FOR SOLID OXIDE FUEL CELLS

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Mixed oxides with the perovskite structure are known for their proton conducting ability at the temperatures above 500 °C. This characteristic makes them suitable for application as an electrolyte for intermediate-temperature solid oxide fuel cells. Doping of $BaCeO_3$ with In^{3+} in place of Ce^{4+} leads to emergence of oxygen vacancies which take part in creation of proton defects.

The characteristics of the $BaCe_{1-x}In_xO_{3-\delta}$ were investigated in a wide range of In dopant concentrations (x = 0.05; 0.10; 0.15; 0.20; 0.25; 0.30; 0.35 and 0.40). All the samples were synthesized by a citric-nitric autocombustion method. The dense electrolytes were formed after sintering at 1300 °C for 5 h in air. X-ray powder diffraction analysis showed that powders with In content greater than 25 mol% contained In_2O_3 as a secondary phase. The highest total conductivity around 5×10^{-3} $S\cdot cm^{-1}$ was measured for the sample $BaCe_{0.75}In_{0.25}O_{3-\delta}$ in the wet hydrogen atmosphere at 700 °C. After exposure to pure CO_2 atmosphere at 700 °C for 5 h, the samples were investigated by X-ray diffraction analysis. It was found that even 15 mol% In could completely suppress degradation of the electrolyte. Ni-$BaCe_{0.75}In_{0.25}O_{3-\delta}$/$BaCe_{0.75}In_{0.25}O_{3-\delta}$/LSCF-$BaCe_{0.75}In_{0.25}O_{3-\delta}$ fuel cell was tested in wet hydrogen atmosphere and power density output of 264 $mW\cdot cm^{-2}$ was measured at 700 °C. This result is an indication of stability and functionality of this electrolyte and its versatility in respect to type of fuel and performing environment.