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 for Green Technologies, Institute for Multidisciplinary Research, University of Belgrade
Faculty of Technology and Metallurgy, University of Belgrade
Faculty of Technology, University of Novi Sad

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5CSCS-2019

5th Conference of the Serbian Society for Ceramic Materials
June 11-13.2019. Belgrade Serbia

Edited by:
Branko Matović
Zorica Branković
Aleksandra Dapčević
Vladimir V. Srdić

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SPECIAL THANKS TO

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doctor blade technique, and their sensing properties were tested in wide range of temperatures (25, 50, 75 °C) and relative humidities (40–90%), resulting with strong response and promising response/recovery times.

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CHEMICAL STABILITY OF DOPED δ-Bi_2O_3 AS AN ELECTROLYTE FOR SOLID OXIDE FUEL CELLS

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The high temperature phase of bismuth oxide (δ-Bi_2O_3) is a promising material for application as an electrolyte for solid oxide fuel cells (SOFCs), due to its high oxygen ion conductivity. Doping with rare earth cations stabilizes δ-Bi_2O_3 phase down to room temperature. According to literature [1], the ionic conductivity of such δ-Bi_2O_3 is not significantly decreased even at 600 °C. This opens the possibility to lower SOFC operating temperature from 1000 °C to intermediate temperatures. The main drawbacks of this material are the instability in reducing atmosphere and reactivity toward electrode materials. Bismuth ruthenate ($Bi_2Ru_2O_7$) was chosen as a potential electrode material because of its chemical stability, compatibility with δ-Bi_2O_3 and metal-like electronic conductivity.

Stoichiometric mixtures of Bi_2O_3 with Tm_2O_3 or Lu_2O_3 were dry homogenized and heat treated at 750 °C for 3 h in order to obtain δ-Bi_2O_3 with following compositions: $(Bi_{0.8}Tm_{0.2})_2O_3$ and $(Bi_{0.75}Lu_{0.25})_2O_3$, respectively. $Bi_2Ru_2O_7$ was synthesized similarly, i.e. homogenized mixture of Bi_2O_3 and $RuO_2{\cdot}xH_2O$ was heated at 900 °C for 3 h. The obtained powders were pressed into disc-shaped pellets and sintered at 920 °C in case of δ-Bi_2O_3 and 880 °C in case of $Bi_2Ru_2O_7$. Chemical stability of these materials was investigated by exposing the pellets to the hydrogen and butane atmospheres. Compatibility of electrode and electrolyte materials was tested by heating a homogenized mixture of $Bi_2Ru_2O_7$ and $(Bi_{0.8}Tm_{0.2})_2O_3$ (mass ratio 50:50) at 600 °C. Moreover, a mixture of $(Bi_{0.75}Lu_{0.25})_2O_3$ and $Bi_2Ru_2O_7$ (mass ratio 30:70) was pressed into pellet, sintered at 880 °C, and exposed to hydrogen atmosphere in order to evaluate chemical stability of the mixture under reducing conditions. Both electrolyte- and electrode-supported configurations were considered with the aim to form a functional fuel cell.

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