15TH ECerS CONFERENCE FOR YOUNG SCIENTISTS IN CERAMICS

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BOOK OF ABSTRACTS

October 11-14, 2023
Faculty of Technology Novi Sad
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and
BOOK OF ABSTRACTS

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MAGNESIUM SUBSTITUTION WITH NICKEL AND ITS INFLUENCE ON THE SENSING PROPERTIES OF $MgFe_2O_4$

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Mixed spinel ferrites $Mg_xNi_{1-x}Fe_2O_4$ were synthesized via sol-gel combustion synthesis with citric acid as fuel, followed by calcination at 700 °C for 3 hours. Obtained powders were characterized via X-ray diffraction analysis (XRD), X-ray photoelectron (XPS), FTIR and Raman spectroscopy and FESEM microscopy. Elemental composition was examined via energy dispersive spectroscopy (EDS). Humidity sensing properties were tested by measuring AC impedance in a climactic chamber at 25 °C and in the relative humidity range of 40–90%. Temperature sensing properties were tested by measuring DC resistance at 40% RH in the temperature range 40–90 °C.

Synthesized powders were proven to be pure spinel $Fd\bar{3}m$ phase with spherical, slightly agglomerated particles. Substitution of Mg with Ni results in structural changes such as a change in inversion parameter and particle agglomeration, which influences sensing properties of the material. Results show that the sensing properties of magnesium ferrite, which is already a well-established NTC sensor, can be improved by incorporating 10% of nickel in the spinel lattice structure. $Mg_{0.9}Ni_{0.1}Fe_2O_4$ exhibited higher temperature sensitivity and higher sensitivity towards humidity compared to $MgFe_2O_4$, while further substitution of Mg with Ni resulted in the decline of sensing properties, increase in particle size and agglomeration degree.