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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Branko Matović
Zorica Branković
Aleksandra Dapčević
Vladimir V. Srdić

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5th Conference of The Serbian Society for Ceramic Materials

June 11-13, 2019
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5CSCS-2019

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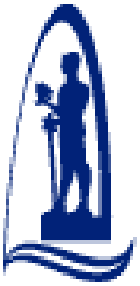

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SYNTHESIS, CHARACTERIZATION AND PHOTOCATALYTIC PROPERTIES OF $LaNiO_3$-BASED POWDERS

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Lanthanum nickelate ($LaNiO_3$, LNO) belongs to the group of materials with perovskite-type structure and it crystallizes in rhombohedrally distorted perovskite lattice. This material exhibits interesting electrical, magnetic, optical and catalytic properties and it is suitable for various applications. Still, the preparation of single phase LNO is difficult, because at temperatures above 850 °C it decomposes into the lower oxides with formula $La_{n+1}Ni_nO_{3n+1}$ (n = 3, 2, 1) and NiO.

In this work we present the synthesis of pure and Nb doped LNO powders, $LaNi_{1-x}Nb_xO_3$ (x = 0.000, 0.005, 0.010) prepared from mechanochemically activated oxide precursors – La_2O_3, NiO and Nb_2O_5. For this experiment, precursor powders homogenized in isopropyl alcohol were dried and mechanochemically activated in the planetary ball mill for 3 h. As-prepared powders were calcined at 700 °C for 3 h in air and further analyzed by X-ray diffraction analysis (XRD), Transmission electron microscopy (TEM), Scanning electron microscopy (SEM) and UV-Vis spectroscopy. Photocatalytic activity in visible light was investigated.

The XRD analysis of undoped LNO revealed the existence of rhombohedral $LaNiO_3$ and small amount of NiO phase. The doped samples, apart from LNO, contained products of thermal decomposition – layered oxides and NiO. TEM and HRTEM analyses of undoped LNO revealed the presence of agglomerated particles with single particle size being in the range of 20–40 nm. Doping with Nb led to decrease of agglomeration process and allowed better dispersion between particles of LNO based powders. Calculated band gaps were 1.12 eV, 0.89 eV and 0.87 eV for x = 0.00, 0.005, 0.010. The absorption spectra indicated photocatalytic degradation of Reactive Orange 16, textile dye used as a model in these experiments.