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

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6CSCS-2022

6th Conference of the Serbian Society for Ceramic Materials
June 28-29. 2022. Belgrade Serbia

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Branko Matović
Aleksandra Dapčević
Vladimir V. Srdić

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P-14. Aleksandar Malešević, *STABILITY AND FUNCTIONALITY OF $BaCe_{1-x}In_xO_{3-\delta}$ AS A HIGH TEMPERATURE PROTON CONDUCTING ELECTROLYTE FOR SOLID OXIDE FUEL CELLS*

P-15. Marija Egerić, *ENHANCED PHOTOCATALYTIC REMOVAL OF CONGO RED BY MOF-ACTIVATED CARBON COMPOSITE*

P-16. Marija Egerić, *COMPETITIVE REMOVAL OF DIVALENT HEAVY METAL IONS FROM SYNTHETIC AND REAL WASTEWATER BY ARAGONITE SEASHELL WASTE*

P-17. Lidija Radovanović, *THE USE OF MANGANESE(II)–PYROMELLITATE COMPLEX PRECURSOR FOR THE SYNTHESIS OF NANOSIZED MANGANESE OXIDES*

P-18. Tijana Stamenković, *SURFACE CHARACTERIZATION AND PHOTOCATALYTIC ACTIVITY OF NEWLY SYNTHESIZED DY DOPED $SrGd_2O_4$ PHOSPHORUS*

P-19. Zuzana Melichová, *THE EFFECT OF TEMPERATURE ON THE SORPTION OF LEAD ON NATURAL BENTONITES*

P-20. Milica Počuča-Nešić, *THE CATALYTIC DEGRADATION OF RO16 DYE UNDER DARK AMBIENT CONDITIONS USING La-Ni-Nb-O-BASED POWDERS*

P-21. Stefan T. Jelić, *ULTRASONIC SYNTHESIS AND CHARACTERIZATION OF MESOPOROUS MONOCLINIC $BiVO_4$ NANOPOWDER*

P-22. Uroš Čakar, *BLUEBERRY WINE BIOLOGICALLY ACTIVE COMPOUNDS PROTECT AGAINST OXIDATIVE STRESS*

P-23. Sanja Krstić, *HYDROTHERMAL SYNTHESIS, CHARACTERIZATION AND APPLICATION OF ACTIVATED CARBON MATERIALS OBTAINED FROM SACCHARIDES*

P-24. Maja Pagnacco, *WHAT COULD BE THE REASON FOR DIFFERENT BEHAVIOR OF PHOSPHATE TUNGSTEN AND PHOSPHATE MOLYBDENUM BRONZES IN BRIGGS-RAUSCHER REACTION: NEW INSIGHT*

P-25. Milena Rosić, *DILATOMETRIC STUDY OF NANOSTRUCTURED $Ca_{1-x}Gd_xMnO_3$ (X=0.05; 0.1; 0.15; 0.2)*

Poster session 2: Ceramic composites, membranes and multimaterials

P-26. Marjan Randjelović, *PALLADIUM DISPERSED IN AMORPHOUS CARBON MATRIX AS THE ELECTROCATALYST FOR HYDROGEN PEROXIDE REDUCTION IN AN ALKALINE MEDIUM*

P-20

THE CATALYTIC DEGRADATION OF RO16 DYE UNDER DARK AMBIENT CONDITIONS USING La-Ni-Nb-O-BASED POWDERS

Milica Počuča-Nešić[1], Jelena Vukašinović[1], Aleksandra Dapčević[2], Vesna Ribić[3], Zorica Branković[1], Katarina Vojisavljević[1], Zorica Marinković Stanojević[1], Goran Branković[1]

[1]*Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia*
[2]*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia*
[3]*Jožef Stefan Institute, Ljubljana, Slovenia*

Dyes released from textile industries present a big threat to the environment, and remediation of wastewaters became one of the major scientific challenges. In recent years, there has been a great need for catalysts that would oxidize pollutants under dark ambient conditions without the use of external stimulants like light, temperature, or additional chemicals such as O_3, H_2O_2. Efficient work of these catalysts would significantly reduce the energy consumption. Among other materials, perovskite-type oxides with general formula ABO_3 emerged as possible catalysts for dye degradation in the dark conditions. Lanthanum nickelates with single ($LaNiO_3$) and layered perovskite structure ($La_4Ni_3O_{10}$, $La_3Ni_2O_7$, La_2NiO_4) showed good catalytic properties, due to the existence of nickel in two oxidation states (Ni^{2+} and Ni^{3+}) and the oxygen non-stoichiometry in these materials [1].

This study presents structural, microstructural and catalytic properties of the $LaNi_{1-x}Nb_xO_3$-based (*x*Nb = 0.000, 0,005 and 0,010; La-Ni-Nb-O) powders prepared by mechanical activation method. The XRD (X-Ray Diffraction) analysis revealed the existence of a multiphase oxide system, including layered structures of nickelates $La_{n+1}Ni_nO_{3n+1}$ (n = 3, 2, 1, 0) and NiO phase in all La-Ni-Nb-O-based powders. Also, the HRTEM (High Resolution Transmission Electron Microscopy) analysis confirmed the presence of structural polytypes in these powders. The catalytic properties of La-Ni-Nb-O-based powders were investigated by degradation of the anionic azo dye, Reactive Orange 16 (RO16), under dark ambient conditions at different pH values (3, 6.5, 9.5 and 11) and temperature of 20 °C. The best catalytic efficiency in the degradation of RO16 dye showed the sample with *x*(Nb) = 0.010 in acidic solution, where the residual of RO16 dye was about 4.5 % after 330 minutes. The reusability test for this powder in degradation process of RO16 dye showed that the sample with x(Nb) = 0.010 retained its catalytic activity during three cycles.

1. W. Zhong *et al., Appl. Catal. A, Gen.*, **549** (2018) 302.