

2nd Young Scientists Days - Conference

BOOK OF ABSTRACTS

23rd - 24th May 2019

Department of Biology Osijek
Department of Chemistry Osijek



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Photography by Laura Lončar



**If you truly love nature,
you will find beauty everywhere.**

- Vincent Van Gogh



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**The best view comes after
the hardest climb.**

- Anonymous

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The Optimization of Hydrothermal Method for the Synthesis of Triple Perovskites with a $\text{Sr}_3\text{Mn}_2(\text{W}/\text{Te})\text{O}_9$ Structure Type

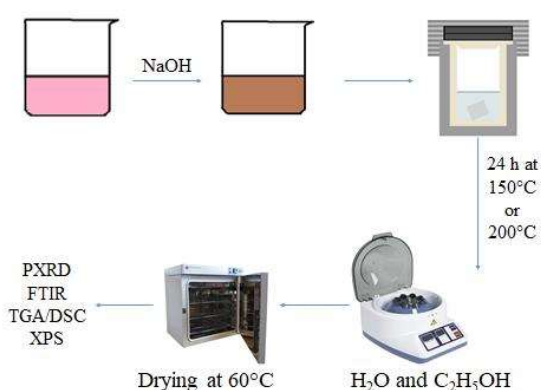
Optimizacija hidrotermalne metode za sintezu trostrukih perovskita tipa $\text{Sr}_3\text{Mn}_2(\text{W}/\text{Te})\text{O}_9$

D. Goman^{1,*}, J. Bijelić¹, A. Stanković¹, M. Medvidović-Kosanović¹, P. Cop², B. Smarsly², I. Đerd¹

¹Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Ulica cara Hadrijana 8/A, HR-31000 Osijek, Croatia

²Justus Liebig University of Giessen, Institute for Physical Chemistry, Heinrich- Buff- Ring 17, D- 35392 Giessen, Germany

*corresponding author: gomandominik@gmail.com



Abstract: This study presents an optimization of hydrothermal synthesis of triple perovskites $\text{Sr}_3\text{Mn}_2\text{WO}_9$ and $\text{Sr}_3\text{Mn}_2\text{TeO}_9$, from an aqueous solution of metal salt precursors. Usually, a synthesis of perovskite materials demands a controlled and long-term annealing. In this research, milder conditions (a relatively low temperature, 150 °C and 200 °C) and shorter reaction time (24 h) were created, which are environmentally friendly and low-cost. A continuous development contributes to the new and more advanced nanosized materials. It is important for a design of perovskite materials to stabilize the metal cations in certain oxidation states. For that

purpose, electrochemical measurements were carried out to determine an oxidation state of manganese cation in the given reaction conditions. The electrochemical results indicate that manganese is in the +3 oxidation state while being transformed into a desired compound. This oxidation state is stabilized by the usage of a strong base (sodium hydroxide). An interesting fact is that Mn^{3+} (coordination number 6, a high spin state) has an ionic radius of 0.645 Å, which corresponds to the ionic radius of Fe^{3+} (also coordination number 6, a high spin state). Hence, a structural similarity to $\text{Sr}_3\text{Fe}_2\text{WO}_9$ and $\text{Sr}_3\text{Fe}_2\text{TeO}_9$, is expected. In conclusion, the composition, morphology, and stability of prepared compounds were investigated by means of the powder X-ray diffraction (PXRD), Fourier-transform infrared spectroscopy (FT-IR), thermogravimetric analysis coupled with the differential scanning calorimetry (TGA/DSC) and the X-ray photoelectron spectroscopy (XPS).

This research is a part of the Croatian Science Foundation project entitled *Investigation of Complex Multiferroic Materials Prepared by the Solution Chemistry Methods* under the supervision of Prof. Igor Đerd, Ph.D.

Keywords: perovskite, hydrothermal synthesis, nanomaterials

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**The earth has music for those
who listen.**

- George Santayana



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