

Morphological, chemical and structural characterization of ZnO/ZnAl₂O₄ micro-nanostructures

Cristian Lupan¹

¹Center for Nanotechnology and Nanosensors, Department of Microelectronics and Biomedical Engineering, Technical University of Moldova, 168, Stefan cel Mare Av., MD-2004, Chisinau, Republic of Moldova, cristian.lupan@mib.utm.md, ORCID: 0000-0003-2268-6181, www.utm.md

Keywords: ZnO; ZnAl₂O₄; ternary; spinel type; micro-nanostructures.

Abstract. In this work we present a method of obtaining ZnO/ZnAl₂O₄ micro-nanostructures and their properties. ZnAl₂O₄ (bandgap ~3.8 eV) is a promising material for use in different applications, as catalyst, optoelectronic, etc., due to its thermal stability, electronic and chemical properties [1–3]. ZnO micro-nanostructures obtained using flame transport synthesis were covered with ZnAl₂O₄ nanodots using chemical method. At the end the nanostructures were thermal annealed at 1000°C for 3 hours. Morphological, chemical and structural properties have been investigated using SEM, EDX and XRD, respectively. SEM investigation shows the formation of micro-nanostructures with different morphology, namely tetrapods and nanowires, covered with small nanodots (Fig. 1). EDX study presented the chemical composition of the micro-nanostructures, confirming the presence of Al (Fig. 1). XRD pattern of the investigated micro-nanostructures shows presence of ZnO and ZnAl₂O₄ in the material. Further integration and investigation of sensing properties of devices based on this material is necessary and will be presented in future work.

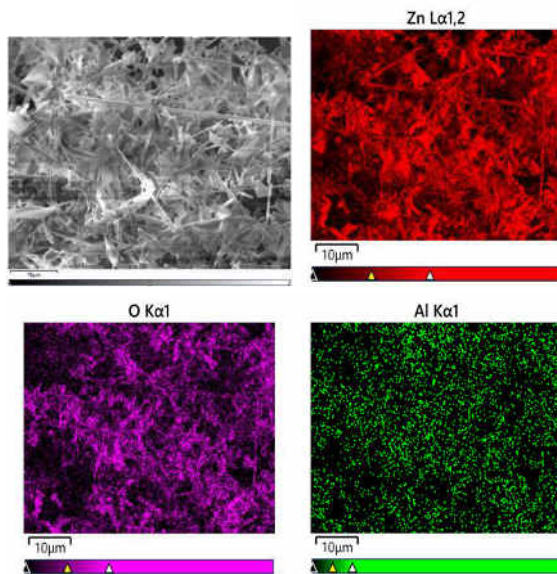


Fig.1. EDX mapping of ZnO/ZnAl₂O₄ micro-nanostructures annealed at 1000 °C for 3h

Acknowledgment. This paper was supported by project code 24.80012.5007.15TC by National Agency for Research and Development of Moldova at Technical University of Moldova.

References

- [1] M. Hoppe, O. Lupan, V. Postica, N. Wolff, V. Duppel, L. Kienle, I. Tiginyanu, R. Adelung, ZnAl₂O₄-Functionalized Zinc Oxide Microstructures for Highly Selective Hydrogen Gas Sensing Applications, *Phys. Status Solidi Appl. Mater. Sci.* 215 (2018) 1–13. <https://doi.org/10.1002/pssa.201700772>.
- [2] D. Zhang, C. Du, J. Chen, Q. Shi, Q. Wang, S. Li, W. Wang, X. Yan, Q. Fan, Improvement of structural and optical properties of ZnAl₂O₄:Cr³⁺ ceramics with surface modification by using various concentrations of zinc acetate, *J. Sol-Gel Sci. Technol.* 88 (2018) 422–429. <https://doi.org/10.1007/s10971-018-4820-x>.
- [3] G. Padmapriya, M. Amudhavalli, Synthesis and characterization studies of spinel ZnAl₂O₄ nanoparticles prepared by Aloe vera plant extracted combustion method, (2020) 2089–2091.