

Semiconducting oxide nanostructures for wideband optical detectors

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Abstract. The aim of the research in this work was the determination of selective nanostructures at different wavelengths in the ultraviolet spectrum, used as broadband detectors. The ultraviolet spectrum is used in the industrial field to manufacture integrated circuits, in food to pasteurize food products, in agriculture to enhance plant growth and in the medical field to decontaminate surfaces and in tooth restoration procedures [1, 2].

At the same time, excessive exposure to ultraviolet radiation can cause adverse effects ranging from skin burns to skin cancer [3]. The study allowed to conclude nanostructures based on semiconducting metal oxides that respond to different wavelengths at room temperature. Room-temperature functional wideband detectors allow their integration into low power consumption devices, increasing the lifetime of the device during use.

One principle of using radiation from the UV spectrum is to replace the wireless communication technology widely used today. The advantage of

using this technology consists in the type of omnidirectional communication and the low noise of the emitted signal [4].

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References

- [1] L. Dinu, C. Maxim, L. Oleg. Sensors based on metal oxides for medical applications. In: NANO: - 2024: “Quo Vadis – Ethics of the Scientific Research”, Ed. 3, 15-18 aprilie 2024, Chişinău. Chişinău, Republica Moldova: 2024, p. 36. ISBN 978-9975-64-422-8.
- [2] N. Rajat, C. Maxim, S. Alexandr, B. Adrian, A. Nicolai, L. Cristian, B. Artur, S. Leonard, P. Thierry, L. Oleg. Annealing effect on UV detection properties of ZnO: AL structures. In: Journal of Engineering Sciences, 2023, vol. 30, nr. 4, pp. 45-62. ISSN 2587-3474. DOI: [https://doi.org/10.52326/jes.utm.2023.30\(4\).04](https://doi.org/10.52326/jes.utm.2023.30(4).04)
- [3] U. Leiter, U. Keim, C. Garbe, Epidemiology of Skin Cancer: Update 2019. In: Reichrath, J. (eds) Sunlight, Vitamin D and Skin Cancer. Advances in Experimental Medicine and Biology, vol 1268. Springer, Cham. https://doi.org/10.1007/978-3-030-46227-7_6 (2020).
- [4] Guo, Liang & Guo, Yanan & Wang, Junxi & Wei, Tongbo. (2021). Ultraviolet communication technique and its application. In: Journal of Semiconductors. 42. 081801. 10.1088/1674-4926/42/8/081801.