Study on Al₂O₃/ZnO Heterostructure Based UV Detection for Biomedical Applications

Rajat Nagpal[1,2(✉)] , Cristian Lupan[1] , Philipp Schadte[2] , Adrian Birnaz[1] ,
Mihai Brinza[1] , Leonard Siebert[2(✉)] , and Oleg Lupan[1,2(✉)]

[1] Center of Nanosensors and Nanotechnolgies, Technical University of Moldova, Chisinau, Republic of Moldova
{rajat,cristian.lupan}@doctorat.utm.md, {adrian.birnaz, mihai.brinza,oleg.lupan}@mib.utm.md, ollu@tf.uni-kiel.de
[2] Department of Materials Science, Functional Nano materials, Faculty of Engineering, Christian-Albrechts Universität Zu Kiel, Kiel, Germany
{phs,lesi}@tf.uni-kiel.de

Abstract. Ultraviolet detectors are vital in key technologies for a lot of biomedical applications. In this study, a device based on 3-D printed Al₂O₃/ZnO heterostructure shows UV sensing performance. Al₂O₃/ZnO heterostructures were obtained by firstly synthesizing ZnO by flame transport synthesis and 3-D printing, then adding top layers of Al₂O₃ using Atomic Layer Deposition (ALD) method. In this study of Al₂O₃/ZnO heterostructure, the sensor performs dual function and acts like a 2 in 1 sensor as it elucidates UV sensing performance and its current variation has also been analyzed with respect to temperature i.e., temperature sensor. ZnO microparticles are 3-D printed on glass substrate to make sensor circuitry. This study exhibits Al₂O₃/ZnO heterostructure's UV detection performance at four different wavelengths of 400 nm, 394 nm, 385 nm, and 370 nm in the UV-A region of UV spectrum. This study covers analysis of Al₂O₃/ZnO heterostructure at four different wavelengths of UV-A region at four different temperatures starting from 25 °C to 100 °C with the interval of 25 °C. This type of studied sensors with state-of-art technology can be used in wearable devices for continuous monitoring of penetrating UV radiations. The UV detection mechanism is explained in detail.

Keywords: Heterostructure · UV Sensing · Response · Temperature

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