HIGH PERFORMANCE ZnSe-BASED ULTRAVIOLET PHOTODETECTORS WITH Cr/Au, Ni/Au AND HYBRID Ag-NANOWIRE CONTACTS

Vadim Sirkeli[1], Oktay Yilmazoglu[2], Ahid Hajo[2], Natalia Nedeoglo[1], Dmitrii Nedeoglo[1], Sascha Preu[2], Franko Küppers[2], Hans Hartnagel[2]
[1]Moldova State University, Faculty of Physics and Engineering,
A. Mateevici str., 60, Chisinau, Moldova
[2]Technical University of Darmstadt, Institute of Microwave Engineering and Photonics,
Merckstr. 25, Darmstadt, Germany

Zinc selenide is attractive wide bandgap semiconductor for fabrication of many optoelectronic devices, including the ultraviolet (UV) photodetectors, due to its large bandgap energy (2.67 eV at 300 K) and high resistance to intense UV and X-ray radiation [1, 2]. Most commercial UV-photodetectors are based on Si or GaAs and the intense UV radiation induces aging effects that leads to their degradation. To solve this issue, the bulk high-resistivity ZnSe could be used for fabrication of UV photodetectors with metal-semiconductor-metal structure, as we shown recently [2]. Among different metals, the metals with high work functions, like Ni, Cr, Ag or Au, are required to achieve a large Schottky barrier height on ZnSe [2, 3]. A large barrier height would lead to a small leakage current and high breakdown voltage. In this work, we report on fabrication and characterization of high-performance ZnSe-based UV photodetectors with Cr/Au, Ni/Au and hybrid Ag-nanowire contacts.

V.S. grateful acknowledges the support from the Alexander von Humboldt Foundation. V.S, N.N. and D.N. also acknowledge the support from the projects no. 011208 and no. 011207.

References

1. V.P. Sirkeli, O. Yilmazoglu, D.S. Ong, S. Preu, F. Küppers, H.L. Hartnagel, Resonant Tunneling and Quantum Cascading for Optimum Room-Temperature Generation of THz Signals, IEEE Trans. Electron Devices 64 (2017) 3482-3488. https://doi.org/10.1109/TED.2017.2718541
2. V.P. Sirkeli, O. Yilmazoglu, A.S. Hajo, N.D. Nedeoglo, D.D. Nedeoglo, S. Preu, F. Küppers, H.L. Hartnagel, Enhanced Responsivity of ZnSe-Based Metal–Semiconductor–Metal Near-Ultraviolet Photodetector via Impact Ionization, Phys. Status Solidi RRL 12 (2018) 1700418. https://doi.org/10.1002/pssr.201700418
3. V. Sirkeli, I. Radevici, K. Sushkevich, H. Huhtinen, N. Nedeoglo, D. Nedeoglo, P. Paturi, Magnetic and luminescent properties of nickel-doped ZnSe crystals, Solid State Sciences 50 (2015) 74-80. https://doi.org/10.1016/j.solidstatesciences.2015.10.018

Corresponding author: Prof. Dr. Vadim Sirkeli
Moldova State University, Faculty of Physics and Engineering
A. Mateevici str., 60, Chisinau MD-2009, Moldova
e-mail: vadim.sirkeli@gmail.com
ORCID: 0000-0002-2479-4218