P.7. Electrochemical Impedance Spectroscopy for Non-Enzymatic Glucose Detection Using ZnO Nanowire Arrays: Substrate Impact Analysis

Simon Busuioc*, Eduard V. Monaico

National Center for Materials Study and Testing, Technical University of Moldova, Chisinau, Republic of Moldova

E-mail: simon.busuioc@cnstm.utm.md
eduard.monaico@cnstm.utm.md

The goal of this work is to develop a cost-effective, highly selective, and sensitive non-enzymatic glucose sensor utilizing zinc oxide (ZnO) nanowire arrays for biomedical applications. ZnO nanostructures have attracted significant attention due to their excellent chemical stability, biocompatibility, and unique electrochemical properties. This work explores the glucose sensing performance of ZnO nanowires grown on different substrates, such as Zn-based seed layer and gold-covered seed layer, with a detailed analysis of their electrochemical behavior via Electrochemical Impedance Spectroscopy (EIS). The investigation focuses on understanding how nanowire morphology, determined by substrate properties and growth conditions, impacts their electrochemical performance, building upon previous studies in related porous semiconductor compounds [1,2].

Distinct impedance shifts were observed with each 100 μM increment in glucose concentration, reaching a maximum tested concentration of 500 μM. The Nyquist and Bode plots demonstrated a relationship between glucose concentration and the sensor's electrochemical response, indicating high sensitivity and repeatability of the ZnO nanowire-based sensor.

Acknowledgments: The work was supported by the institutional subprogram 02.04.02 no. 4/FI «Development of technologies and investigation of the properties of layered semiconductor compounds, hybrid nanostructures and laser sources».

References:

1. Monaico, E.; Tiginyanu, I.; Ursaki, V. Porous Semiconductor Compounds. *Semicond. Sci. Technol.* **2020**, *35*, 103001, doi:10.1088/1361-6641/ab9477.
2. Monaico, E.I.; Monaico, E.V.; Ursaki, V.V.; Honnali, S.; Postolache, V.; Leistner, K.; Nielsch, K.; Tiginyanu, I.M. Electrochemical Nanostructuring of (111) Oriented GaAs Crystals: From Porous Structures to Nanowires. *Beilstein J. Nanotechnol.* **2020**, *11*, 966–975, doi:10.3762/bjnano.11.81.