CONTROLLED ENGINEERING OF GOLD NANODOTS DEPOSITION USING HOPPING ELECTRODEPOSITION

Eduard V. Monaico[1], Ion M. Tiginyanu[1,2], K. Nielsch[3]

[1] National Center for Materials Study and Testing, Technical University of Moldova, Bv. Stefan cel Mare 168, Chisinau 2004, Republic of Moldova; [2] Academy of Sciences of Moldova, Bv. Stefan cel Mare 1, Chisinau 2001, Republic of Moldova; [3] Institute for Metallic Materials (IMW), Leibniz Institute of Solid State and Materials Research (IFW Dresden), Helmholtzstrasse 20, 01069 Dresden, Germany

In this work, the applications of the previously elaborated „hopping electrodeposition" approach for the deposition of gold nanodots on semiconductor surfaces [1] is addressed. As was demonstrated [1], one monolayer of Au nanodots can be routinely deposited via pulsed electrochemical deposition regardless of the morphology of the porous structure. Hopping electrodeposition enabled one to estimate the conductivity of semiconductor nanostructures with different thicknesses [2]. Moreover, taking into account the site-selective deposition on semiconductor regions with higher conductivity, the technological approaches for the deposition of Au nanodots along definite lines were developed [3]. Precise control of the deposition process of gold nanodots opens new possibilities for the creation of highly complex 3D hybrid nanostructures, in which the gold nanodots play a crucial role as catalysts [4]. As a result, this controlled deposition approach offers a versatile tool to engineering nanostructures with tailored properties and enhanced performance for various applications. 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. TIGINYANU, I., MONAICO, E., NIELSCH, K. Self-Assembled Monolayer of Au Nanodots Deposited on Porous Semiconductor Structures. În: *ECS Electrochem. Lett.* 2015, Vol. 4, p. D8, doi:10.1149/2.0041504eel.

2. MONAICO, E.V., TIGINYANU, I.M., URSAKI, V.V., NIELSCH, K., BALAN, D., PRODANA, M., ENACHESCU, M. Gold Electroplating as a Tool for Assessing the Conductivity of InP Nanostructures Fabricated by Anodic Etching of Crystalline Substrates. În: *J. Electrochem. Soc.* 2017, Vol. 164, p. D179, doi:10.1149/2.1071704jes.

3. MONAICO, Ed., MONAICO, E.I., URSAKI, V.V., TIGINYANU, I.M., NIELSCH, K. Electrochemical Deposition by Design of Metal Nanostructures. În: *Surf. Engin. Appl.Electrochem.* 2019, Vol. 55, p. 367–372, doi:10.3103/S1068375519040070.

4. MONAICO, E.V., URSAKI, V.V., TIGINYANU, I.M. Gold Coated Microstructures as a Platform for the Preparation of Semiconductor-Based Hybrid 3D Micro-Nano-Architectures. În: *Eur. Phys. J. Plus* 2023, Vol. 138, p. 827, doi:10.1140/epjp/s13360-023-04462-8.

Corresponding author: Eduard Monaico, National Center for Materials Study and Testing, Technical University of Moldova, Bv. Stefan cel Mare 168, Chisinau 2004, Republic of Moldova, e-mail: eduard.monaico@cnstm.utm.md

ORCID: 0000-0003-3293-8645