PHOTOCATALYTIC GROWTH AND CHEMICAL DISSOLUTION OF GOLD NANOPARTICLES ON TIO_2 PATTERNS

Fatemeh Abshari[1], Alexander Vahl[2], Moritz Paulsen[1], Salih Veziroglu[2], Martina Gerken[1]

[1] Chair for Integrated Systems and Photonics, Department of Electrical and Information Engineering, Faculty of Engineering, Kiel University, [2]Chair for Multicomponent Materials, Department of Materials Science, Faculty of Engineering, Kiel University,

e-mail of presenting author: fa@tf.uni-kiel.de

Our research targets the stimulus-driven formation of gold connections and the loss of connections for longer stimulus absence. We aim to extend the toolbox of neuromorphic computing by a method for growing and pruning of axon-like connections. This work is part of CRC 1461 - Neurotronics (DFG, Project-ID 434434223) on bio-inspired computation.

We investigate the rates of UV-stimulated photocatalytic growth in $HAuCl_4$ solution and chemical dissolution in KI solution of gold nanoparticles. Photolithographically patterned 70-nm TiO_2 lines on glass are used as substrates [1]. For irradiation with a 365-nm LED rather slow growth is observed and attributed to the low absorption. The rate of chemical dissolution is adapted by changing the KI concentration in order to achieve a balance resembling the biological situation.

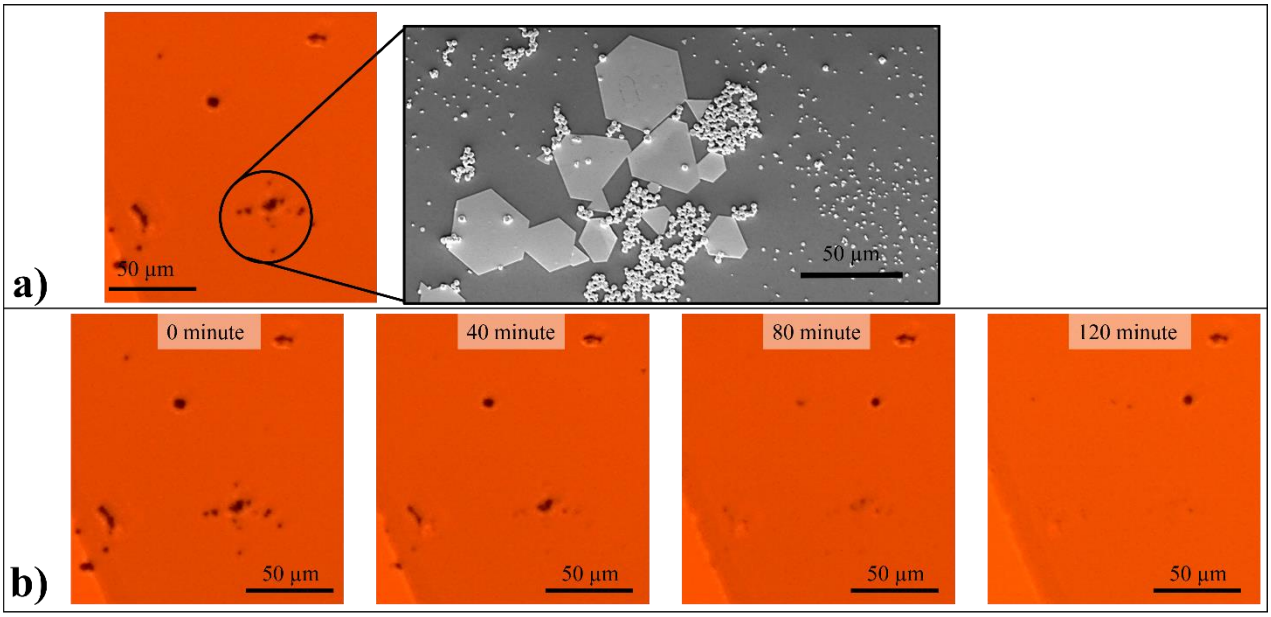

Figure 1. a) Optical and SEM images of the template with photocatalytically grown gold, b) Optical microscope images during dissolution in KI solution.

References

1. Veziroglu, S., Paulsen, M., Schardt, J., Adejube, B., Aktas, C., Vahl, A., & Gerken, M. (2023). Photocatalytic Deposition for Metal Line Formation. In Bio-Inspired Information Pathways: From Neuroscience to Neurotronics (pp. 241-263). Cham: Springer International Publishing.