

Hierarchical Au-CdS electrodes based on self-assembly polystyrene spheres crystals as nanocatalytic sensors for biomedical applications

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Biosensors play a critical role in improving our lives. Due to their ability to precisely detect a huge variety of chemicals and biomolecules they find applications in healthcare and environmental monitoring, among others. We present a gold-semiconductor electrode based on periodic self-assemble crystals of polystyrene spheres [1] with electrochemically deposited semiconductor nanoparticles for efficient photo-nanocatalytic biomedical sensing [2]. The nanosphere lithography was performed with PS nanospheres crystal deposited on the water surface, which was subsequently etched with argon plasma. After gold sputtering and PS removal, cadmium and sulfur were deposited electrochemically and chemically, respectively. The improved photo-nanocatalytic activity, which determines the efficiency of the designed metal-semiconductor electrode in electrochemical sensing, was presented. The impact of the morphology and stoichiometry of semiconductor layers on the electrode properties was evaluated.

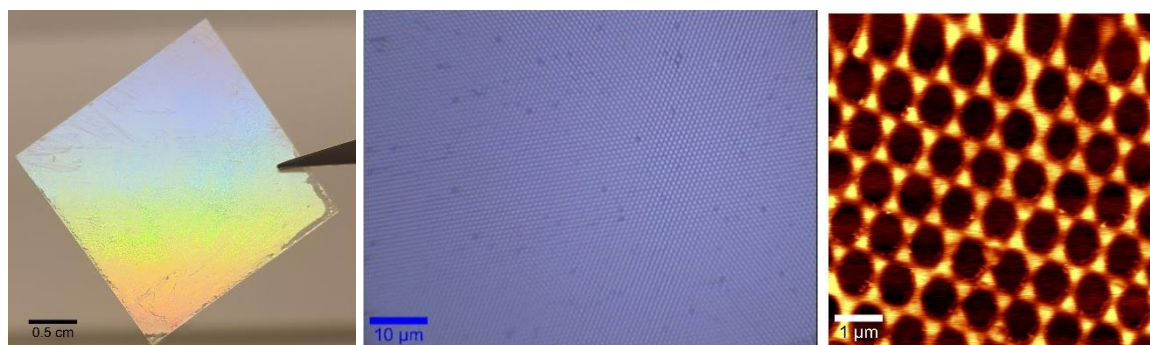


Figure 1. Gallery on the images on preparation of the nanostructures made using nanosphere lithography, a) electrode modified with gold, b) substrate with 2D monolayer of latex particles, and c) periodical Au structures after etching.

References

- [1] P. Patoka, M. Giersig, "Self-assembly of latex particles for the creation of nanostructures with tunable plasmonic properties" *Journal of Materials Chemistry*, Vol. 21, pp. 16783-16796, 2011.
- [2] Z. Qiu, D. Tang, "Nanostructure-based photoelectrochemical sensing platforms for biomedical applications" *Journal of Materials Chemistry B*, Vol. 8, pp. 2541-2561, 2020.