EuroSciCon

3rd Edition of International Conference and Exhibition on

Polymer Chemistry

March 26-28, 2018
Vienna, Austria

Joanna Niedziółka–Jönsson et al., Polym Sci, Volume 4
DOI: 10.4172/2471-9935-C1-008

SILVER NANOWIRES AS A PLATFORM FOR PLASMON ENGINEERING

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Metallic nanowires, due to their plasmonic character combined with the ability to efficiently transport excitations, are highly suitable for controlling the optical properties of other nanostructures, such as polymers, nanocrystals or biomolecules. Importantly, while diameters of such nanowires, in the range of 100 nm, are small enough to exhibit plasmonic effects in the broad spectral range, their lengths exceeding tens of micrometers make them visible using standard microscopy. In addition, by functionalizing their surface, it is possible to tailor their biochemical function, for instance as sensors. In the talk, we will discuss selected experiments carried out using silver nanowires as building blocks of hybrid nanostructures. The first result was obtained by attaching photosynthetic pigment-protein complexes to the nanowires, where we demonstrate strong enhancement of fluorescence of these complexes due to plasmonic interactions. Additional effects associated with controlled geometry of this assembly will be discussed. Next, we describe the application of silver nanowires for enhancing absorption of organic polymers and macromolecular systems used in organic electronics. In this case, optical spectroscopy allows elucidating the processes responsible for the observed effects and enables for further optimization of actual devices. The final part of the presentation will focus on applying silver nanowires as a sensing platform for various species. Particular emphasis will be placed on methods of spatial positioning of such nanowires in a controlled manner on the surface, as this seems to be the key for any possible application.

Recent Publications:

1. **T Klemens, A Świtlicka-Olszewska, B Machura, M Grucela, E Schab-Balcerzak, *et al.* (2016) Rhenium(I) terpyridine complexes – synthesis, photophysical properties and application in organic light emitting devices. Dalton Transactions 45:1746–1762.**
2. **P Kannan, M Los, J M Los and J Niedziolka-Jonsson (2014) T7 bacteriophage induced change of gold nanoparticle morphology: Biopolymer capped gold nanoparticles as a versatile probe for sensitive plasmonic biosensor. Analyst 139:3563–3571.**
3. **M Twardowska, I Kamińska, K Wiwatowski, K U Ashraf, R J Cogdell, *et al.* (2014) Fluorescence enhancement of photosynthetic complexes separated from nanoparticles by reduced graphene oxide layer. Applied Physics Letters 104:093–103.**
4. **K Smolarek, B Ebenhoch, N Czechowski, A Prymaczek, M Twardowska, *et al.* (2013) Silver nanowires enhance absorption of poly(3-hexylthiophene). Applied Physics Letters 103(203302):1–4.**
5. **M Olejnik, B Krajnik, D Kowalska, M Twardowska, N Czechowski, *et al.* (2013) Imaging of fluorescence enhancement in photosynthetic complexes coupled to silver nanowires. Applied Physics Letters 102(083703):1–5**

Biography

Joanna Niedziółka-Jönsson is a professor at the Institute of Physical Chemistry Polish Academy of Sciences in Warsaw, Poland. She received PhD degree in chemistry in 2006 and habilitation in physical chemistry in 2015. Her research group focuses on surface modification of various substrates in the context of applying plasmonic nanostructures for sensing and optoelectronics. She is a co-author of 77 publications cited over 1100 times. Her Hirsch index is equal to 20. Presently she leads two research projects funded by the National Science Centre Poland.

Sebastian Mackowski is a professor of Physics in the Institute of Physics Nicolaus Copernicus University in Torun, Poland, as well as president of the Baltic Institute of Technology in Gdynia, Poland. He obtained PhD degree in 2003, habilitation in 2008, and the title of professor in 2016. He authored over 170 papers in international journals.

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