

Nanomaterials based amplifications in electronic biosensors

Larysa Baraban^{1,2, †}

¹Helmholtz Center Dresden Rossendorf e.V. Bautzner Landstrasse 400, 01328 Dresden, Germany

²Faculty of Medicine Carl Gustav Carus, Technische Universität Dresden, Fiedlerstraße 27, Dresden, Germany

† corresponding author's email: l.baraban@hzdr.de

Novel strategies for on-chip integrated nanoelectronic devices inspired the development of a new generation of biosensors, employing inorganic and organic materials. The main element of such biosensors is the semiconductor (e.g. in field effect transistors) or metal (in electrochemical, chemiresistive or impedimetric sensors) transducer, with the radically miniaturized sensing area down to the several nanometers. Merging such nanodevices with the biological species, e.g. cells or molecules of similar nanosizes, offers the remarkable increase in the biosensor sensitivity.

We envision that hierarchical integration of the nanomaterials into the sensing devices will support further amplification of the sensing signal. Earlier we demonstrated that linear assembly of gold nanoparticles increases the sensitivity of the plasmonic resonance shift to the biomolecular binding, compared to the single particles. After successful fabrication of the silicon based nanoscopic FETs and template assisted arrays of the plasmonic nanoparticles for the biosensor applications, merging of these technologies for the realization of the clinically relevant use case is realized. Combining the optical and electronic components in the biosensing device requires to use the scenario, where each of them results in the maximal signal change. We demonstrate that the optoelectronic characterization of the Nanoparticles featured FET devices can support the signal modulation in the device upon binding the biomolecules.



Figure 1: Merging of the plasmonic nanoparticles with the FET biosensor for the amplified response.