

Engineering Plasmonic Biointerfaces for Point-of-Use Environmental and Health Sensing

Francesca Petronella

Institute of Crystallography, National Research Council, Montelibretti, Italy

francesca.petronella@cnr.it

Human, animal, and environmental health are closely interconnected, therefore the availability of information on the status of these ecosystem is essential for their rational and sustainable management.

One key-point to this purpose is gathering data to control the spread of infectious diseases in terms of diagnostics and surveillance, requiring high-performing diagnostic platforms rapid, reliable, and intuitive. Optical transducers based on plasmonic nanomaterials represent a promising technological tool for realizing next-generation biosensors.

Plasmonic nanomaterials and in particular metallic plasmonic nanoparticles (NPs), been characterized by the localized surface plasmon resonance phenomenon (LSPR) are excellent efficient optical transducers Due to the LSPR any variation of refractive index due to the alteration of the local chemical environment, produces measurable shifts in the NP absorption spectrum. It follows that engineering the NPs surface with biorecognition elements enable the detection and quantification of a specific target by measuring an absorption signal.

This contribution presents the fabrication of NP arrays with finely controlled optical and morphological characteristics, and their interfacial engineering with biological compounds to realize optical transducers for pathogen detection. The arrays are produced via the electrostatic Layer-by-Layer assembly technique and are functionalized with selected biorecognition elements, such as antibodies or aptamers to provide specificity toward selected biological targets. This approach enables the correlation of the optical response with the presence and concentration of the analyte. The resulting devices allow multiplexed and multi-readout detection, make them strong candidates for scalable integration in point of care or point of use devices.