Characterization of localized surface plasmon resonance sensing with anisotropic nanoparticles

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Detection of biomolecular binding, the adsorption of thin bio-films or conformational changes of macromolecules is of high interest in various fields of biology, medicine and pharmacy. One possible detection method is based on the optical spectroscopy of metallic structures exhibiting localized surface plasmon resonances (LSPR). It is a label-free approach with high sensitivity in comparison to other label-free techniques.

By an external incident light beam, density oscillations of the nanoparticle conduction electrons are induced at a specific wavelength. This occurring resonance band is sensitive to changes of the surrounding medium, which gives the opportunity to utilize them as label-free bioanalytical sensors [1]. Biomolecules bind directly on the nanoparticle surface which leads to a change of the local refractive index and results in a shift of the peak wavelength [2,3].

Due to the strong confinement of the electromagnetic field around the nanoparticles surface, high surface sensitivities for small biomolecules can be achieved. By exploiting anisotropic structures, e.g. nanoparticles with sharp edges, this effect is enhanced.

We investigated the influence of these anisotropy effects on the sensor performance for ensembles of nanoparticles which were immobilized with statistical orientation. In order to estimate the applicability for sensing of binding events, the bulk as well as the surface sensitivity were evaluated by measurements of glucose or *Bovine Serum Albumin* as model analytes, respectively.

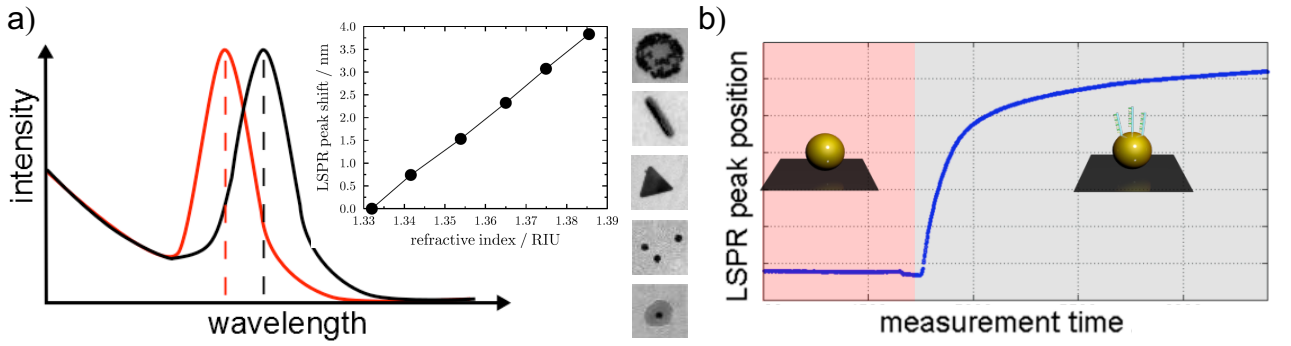

Fig 1: a) Measurement principle of LSPR biosensing. Sensitivity evaluation by calibration measurements for different shapes and sizes of nanoparticles. b) Real-time detection of the resonance wavelength shift caused by binding of the analyte (here DNA) on the particle surface.

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