Title: Gold-based plasmonic nanosensing of biomolecules

Keywords: nanoparticles, gold, plasmon, sensor, biomolecules, optics, reactivity

Scientific description: Gold nanoparticles (AuNP) display localized surface plasmon resonances, which are collective oscillations of the conduction electrons confined within the AuNP. It gives a red or purple color to Au instead of the usual yellow color. This resonance is very sensitive to the immediate environment of the AuNP and is strongly affected when the particles interact with molecules or ions. Thanks to this very high sensitivity, biological sensors based on nanoparticles of gold [1] are being developed. (Fig. 1)

We have developed an original optical technique, the reflectance anisotropy spectroscopy, which allows us to achieve a higher sensitivity than conventional plasmonic sensors [2,3], making it possible to probe very small quantities of biomolecules in a liquid. For this purpose, specific samples are prepared by oblique evaporation of gold on a glass substrate (Fig.2), leading to a strong dichroism (Fig 3).

The aim of the internship is to investigate the detection of protein layers at ultimate concentrations, by monitoring the change of the plasmon resonance due to the biomolecular bindings on the AuNPs. The internship will combine physical evaporation and simple chemistry for the preparation of the samples, scanning electron microscopy studies and optical measurements. The modeling of the optical results will be also conducted.


Techniques/methods in use: scanning electron microscopy, optical spectroscopies, numerical modelling

Industrial partnership: N

Internship supervisor(s) Yves Borensztein, yves.borensztein@insp.jussieu.fr, 01 44 27 61 55, http://www.insp.jussieu.fr/-Borensztein-Yves-.html

Internship location: Campus P et M Curie, 4 place Jussieu, Tour 22-12, 4e

Possibility for a Doctoral thesis: N