Proposition d'un Projet de Recherche en Laboratoire

Titre : Active plasmonics with hybrid metallic nanostructures

Laboratoire d'accueil : Laboratoire des Solides Irradiés (LSI, Ecole Polytechnique)

Résumé : Active plasmonics with surface plasmon polaritons (SPP) is a vibrant research area where the optical properties of surface plasmons can be controlled through their interaction with optically active materials. Quantum-optical [D.Pacifici et al., Nature Phot. (2007)] and magneto-optical [V.Temnov et al, Nature Phot. (2010)] materials are good candidates to enable active SPP control via the external magnetic field and optical excitation, respectively.
The student will be asked to perform quantum plasmonic and magneto-plasmonic using thin plasmonic layers functionalized with colloidal nanostructures using a recently developed scanning experimental goniometer setup for plasmonic measurements in Kretschmann configuration. Proof-of-principle measurements will be focused to record photoluminescence from nanometer-sized gold nanoparticles excited with plasmon-mediated optical excitation in the optical range. Magneto-plasmonic experiments will be conducted using semiconducting nanoplatelets provided by our collaboration partners from Duisburg-Essen University (Germany), which should combine magneto-optical and quantum-optical properties. The ultimate long-term goal of this project would be to find a pathway to control quantum light emission with (elliptically polarized, chiral) plasmonic excitations and the external magnetic field simultaneously.

In the first stage of this PRL the student will get familiar with basics of Labview-automated nanooptical measurements and perform calibration measurements. In the second step he or she will prepare active samples by covering plasmonic multilayers with active colloidal nanostructures (produced in the PC-NANO group at the LSI) and upgrade the setup to perform angular-resolved photoluminescence measurements. This PRL project is ideally suited for a student with a strong affinity to experimental science and extensive data analysis.

Mots clés : photoluminescence, quantum plasmonics, magneto-plasmonics, Kretschmann configuration, scanning nanooptical measurements

Nature : experimental

Accueil d'un binôme possible : Non

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