

## **Manufacture, optical characterization and modelling of array of core shell particles**

### **Background**

A plasmonic core shell nanoparticle can have the absorption similar to both a much bigger particle and a much smaller particle, through the process of plasmon hybridization (similar to hybridization of wavefunctions in molecular bonding, leading to antibonding and bonding levels).

### **Student Project Description**

In this project we will attempt to manufacture arrays of plasmonic core shell particles using the NANOLAB facilities, followed by optical characterization and Electromagnetic modelling using GranFilm and COMSOL or FDTD full wave simulations. The student can also work with external collaborating institutes to investigate a combination of wet chemical synthesis and physical deposition.

### **Responsibilities**

The student, will develop a method to produce prototype arrays of core shell particles using standard top down manufacture procedures combining layer deposition, Electron Beam Lithography and Ion Beam Etching, or combining with the Focused Ion Beam milling. There is room for lots of innovation in the manufacture step. The student may also envisage

The student must learn to operate the spectroscopic ellipsometer and perform standard modelling tasks of multilayer systems, and in particular study modelling and theory of plasmonics.

The student must undertake all appropriate Nanolab training in order to access the required Nanolab equipment.

The student may perform simulations of the structure using the GranFilm software, COMSOL and/or FDTD simulations, depending on interest. The student must learn to use and interpret the results using the appropriate software.

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