

Master in Sciences Internships 2013-2014

Host Laboratory: ICube (D-ESSP), MaCEPV and IPP groups

icube.unistra.fr

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Plasmon resonance in a bed of metallic nanoparticles: application to solar cells

Description

Enhancement of the efficiency of solar cells is a hot topic. Novel techniques use the inclusion of conducting nanoparticles in dielectrics to increase the absorption of solar cells. Solar light excites plasmons, i.e. electromagnetic waves at the surface of these particles, that can confine the electromagnetic field inside the solar cell. Thus solar cell efficiency could possibly be increased. These plasmons can also enhance photon converters for solar cells, that are another advanced concept for photovoltaics (PV).

The aim of the internship is to investigate the influence of plasmonics on PV.

A first part will be dedicated to the **modélisation** of plasmonic phenomena applied to PV in order to select the most promising systems, that will be developed in the second part. The modeling study will be based on rigorous vectorial electromagnetic simulations in collaboration with the IPP team of ICube in order to study the transmission, reflection and absorption of a single layer of nanoparticles, of silver for instance, of size 5-200 nm. Their shape will be varied. The **experimental** part consists in the fabrication of nanoparticles embedded in an antireflective coating for solar cells, using the ICube ion implanter and/or chemical route thanks to several collaborations.

Tools:

Modeling part: Comsol Multiphysics, T-matrix algorithm

Experimental part: PECVD, ion implantation, spectroscopy (UV-visible, ellipsometry, Raman,...), microscopy.

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Possible collaborations: Fraunhofer ISE in Germany, laboratories in Paris and Troyes in France.