POST-DOCTORAL POSITION

"Tuning electrOnic ProPerties In Nanoparticles of Gold – TOPPING"

General information

Localisation : Sorbonne Université (INSP/LRS) Contract duration: 12 months

Starting date: January 2023 Application deadline: 30/09/2022

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Scientific context

This project aims at evaluating the potential of laser-produced PLAL (pulsed laser ablation in liquids) nanoparticles (NPs) as plasmonic photosensitizers. Even if photovoltaic devices have reached high efficiencies, some limitations remain for some practical applications. To increase the light absorption range of semiconductors, heterojunctions including plasmonic materials are considered thanks to their ability to efficiently absorb visible light by excitation of plasmon waves. The present project aims to increase the heterojunction efficiency by optimizing the NP/semiconductor interface through (i) a precise control and understanding of the influence of a halide interlayer between the metallic NP and semiconductor substrate and, (ii) the ability to produce high quality heterojunctions from colloidal solutions of PLAL NPs and TiO_2 substrates. These two scientific and technical aspects will be addressed in the context of this postdoctoral fellowship.

Environment

The post-doctoral position is based on the collaboration of two partners of Sorbonne Université. The Institut des Nanosciences de Paris (INSP) and Laboratoire de Réactivité de Surface (LRS), where all experiments will take place, gather the expertise of x-ray photoemission spectroscopy (XPS), NP electrospray deposition and surface science required for the success of this study. The candidate will be in charge of both aspects of this project which will be developed gradually on the equipment of both laboratories. This specific study is included in a long term experimental development based on an international consortium of researchers from different laboratories (INSP, LRS, ILM, CELIA in France and Oulu University in Finland).

Missions

The mission of this post-doctoral position is two-fold. The first one is to acquire a precise understanding of the influence of a halide layer on the electronic properties of a metallic substrate. The candidate will be in charge of this fundamental scientific aspect which relies on XPS characterization of this system for various configurations and will be carried out using the in-house XPS setup at INSP. The data analysis and interpretation will be conducted by the candidate. The second objective is to explore a technological approach to produce high quality heterojunctions of gold NPs on TiO2 substrates based on electrospray deposition thanks to an existing setup at the LRS. Its quality will be optimized and evaluated by the candidate through XPS and AFM (atomic force microscopy) measurements. In parallel, the candidate will take part in the NP synthesis performed at ILM laboratory (Lyon) with our partner of this project.

Qualification and expertise

The candidate must have a PhD in physics or material science or any related discipline. We are looking for a candidate with an experimentalist profile. An expertise in XPS, AFM, ultra-high vacuum or a scientific background in nanosciences will be appreciated. The candidate must be comfortable in working as part of an international group of researchers and fluent in English.