



Internship offered in M2 2018-2019

Responsible for internship

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Internship topic: Optical modelling and optimization of a perovskite solar cell

Hybrid organometal halide perovskites have recently emerged as a promising active medium for photovoltaic solar cells due to their favorable optical and electric properties and their versatile solution-process manipulation. By understanding the materials optoelectronic properties (band structure, charge generation and transport) and optimizing the chemical composition and deposition methods, very fast progress has been made and a power conversion efficiency as high as 23.3 % has been demonstrated recently. Further progress are expected by optimizing the optical properties of the solar cells : tuning the thickness of the different cell layers, introducing metallic nanoparticles with plasmonic resonances or patterning the layers with a nanophotonic structure are different ways that could help to trap light inside the solar cell and enhance the electromagnetic field so that it could be better absorbed and generate a higher photocurrent. This requires a precise experimental characterization and optical modelling of the different components of the solar cell, and an in-depth understanding of the different optical as well as electric mechanisms at play.

The internship will be a collaboration between the group of Thierry Pauporté at the Institut de recherche de Chimie Paris (UMR8247) ENSCP, who fabricates and characterizes perovskite solar cells, and the group Nanostructures and Optics at INSP which has a great expertise on the characterization and modelling of light propagation in nanostructured optical media. The intern will (i) deposit different stackings of the different layers of a perovskite solar cell, possibly introducing metallic nanoparticles, (ii) characterize the structural (AFM, SEM) and optical (transmission, reflection, goniometry, ellipsometry) properties of the deposited media and (iii) relate these properties to the photonic and plasmonic properties modelled by the analytic transfer-matrix method and by numerical simulations.



Techniques involved: Photoluminescence, reflectometry, spectroscopy

Type of internship: experimental and theoretical

Paid internship: Yes

Can this internship be continued for a PhD? Yes

If yes, type of PhD funding envisaged is: application to Ecole doctorale