Modeling photonic nanostructures for organic electronic devices

Postdoctoral contract

12 to 24 month , beginning from September 2014

Scientific context

Nanophotonics aims at studying structured metallo-dielectric systems – Photonic crystal membranes, devices bearing localized or surface plasmon resonances – that help in controlling light propagation at sub-wavelength scale. A growing community, in which the host team is active, uses such tools to improve organic solar cells, as well as organic light emitting diodes (OLED). The main open challenges are related to the coupling between free space and a thin organic material (efficiency of the extraction layer for OLEDs, tradeoff between light absorption and charge recombination in solar cells), as well as the control of the emitted light in OLEDs.

Main goals

– **Modeling photonic crystal membranes for optimized organic solar cells.**

– **Modeling the spectrum of organic light sources coupled to plasmons resonances.**

The recruited fellow will join a team which focuses on electronic devices, from numerical simulation to fabrication and measurement. He/she will take in charge the modeling part, working with finite elements solver (COMSOL) and possibly Finite Difference Time Domain simulations (commercial software).
Those tools already helped us to design photonic crystal layers that improved a canonical organic solar cell [1,2]. The postdoc will further develop this work, previously done by a pH-D student, and extend it to OLEDs.
Finally, more theoretical studies will be done on the coupling of polymers and metallic nanoparticles, based on a new modal method to describe localized plasmonic resonances [3].

The candidate should have used COMSOL and MATLAB in his/her previous research activities

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[1] L. Peres, V. Vigneras, and S. Fasquel, Sol. Energy Mat. & Solar Cells 117, 239–245 (2013).

[2] L. Peres, V. Vigneras, and S. Fasquel, Opt. Express **22**, pp. A1229-A1236 (2014).

[3] Q. Bai, M. Perrin, C. Sauvan, J.Hugonin, P. Lalanne, Opt. Express. **21**, 27371-27382 (2013).