Institut Langevin
ONDES ET IMAGES

Post-doc position in nano-optics to study strong coupling and non-local phenomena

Workplace Institut Langevin Ondes et Images. 1, rue Jussieu 75005 Paris (France)
Contract period 2 years
Expected date of employment Flexible starting date, ideally between January and May 2020
Desired level of education PhD in Physics

Missions

A post-doctoral position is available to perform experimental studies of strong coupling between organic molecules and plasmonic materials. The research will be performed in the team of V. Krachmalnicoff at Institut Langevin (Paris) within the framework of a collaboration with the team of J. Bellessa (ILM, Lyon) and the team of T. Ebbesen (ISIS, Strasbourg).
Strong coupling between excitons and surface plasmons occurs when the plasmon/emitters interaction overcomes the damping in the system. In plasmonic strong coupling, surface plasmon modes hybridize with molecular excited states to form polariton states. Due to its spatial extension, a delocalized plasmon strongly coupled to a set of localized molecules generates a spatial coherence which can extend on several microns, drastically affecting the optical characteristics of otherwise independent emitters. We will exploit the extended interaction to study the coupling of an individual emitter or patch of emitters to a remote set of molecules. We plan to exploit the extended coherence length to perform all optical, non-local switching and to study statistics on single-photon emitters interacting with a strongly coupled system.

Activities

The post-doctoral fellow will be in charge of the experiments devoted to the study of single molecular patches or single emitters by means of scanning probe microscopy techniques combined with nanomanipulation and optical microscopy. His/her work will essentially consist in developing and performing experiments of spectroscopy and fluorescence lifetime measurements on single nano-objects in a controllable strong coupling regime. He/She will analyze the experimental data using theoretical models developed by the team.

Skills

- Candidates must hold a PhD in experimental nano-optics, quantum optics or atomic physics since less than two years and a relevant track record of publications. Candidates planning to submit their PhD thesis in the following months will also be considered.
- Practical experience of strongly coupled systems (cavity QED, polaritons, …) and/or scanning probe microscopy (AFM, SNOM, …) would be appreciated, but motivated candidates with different background will also be considered.
- Knowledge in theoretical modelling and numerical simulation would be a valuable asset
- English language proficiency is of highest significance

Context of work

Institut Langevin is a joint research unit between ESPCI Paris and CNRS located in the center of Paris, France. The research conducted at Institut Langevin aims at understanding the propagation mechanisms of all kinds of waves in the most complex environments. Areas of interest are multi-wave imaging (elastography, acousto-optic and photo-elastic imaging), ultrasound/laser methods, Full-Field Optical Imaging (Optical Coherent Tomography, Digital Holography), nanophotonics (near-field microscopy in the infrared and THz ranges, optical nano-antennas, plasmonics) and metamaterials.

Please contact Dr Valentina Krachmalnicoff (valentina.krachmalnicoff@espci.fr) for inquiries