Université de Strasbourg	**Call for Post-doc**	

JOB DESCRIPTION

Job Title : Simulating atomically –resolved fluorescence images

Job Summary : The position consist in developing and applying theoretical procedures to simulate atomically-resolved fluorescence images obtained with scanning tunneling microscopie induced luminescence methods.
(English, max 1000 characters)

Job Description :
(*English, detailed information – max 3000 characters*)
WARNING: Pleases indicate the name of the research lab, group leader and supervisor.

Over the last few years an emerging field rose, where experimental approaches using scanning probe methods have demonstrated optical microscopies resolutions well beyond the diffraction limit. On one side, tip-enhanced photoluminescence and tip-enhanced Raman spectroscopy (TERS) require a laser excitation to generate the localized emission signal while, on the other side, STM-induced fluorescence, which is the topic of this proposal, uses tunneling electrons as an excitation sources.
In all those examples, the optical resolution is associated to electromagnetic modes, also known as localized plasmons, which amplify the emission signal. Indeed, the presence of a plasmonic structure in the vicinity of a molecular chromophore is known to affect its fluorescence rate. Recent theoretical works have demonstrated an extreme confinement of these plasmons in atomic-scale protrusions located at the apex of the STM tip, that were defined as "picocavity plasmons". In a first approximation, this picocavity plasmons can be understood as a point source of light having the size of a few atoms. With this, it becomes feasible to measure the impact of the nm-scale environment of a chromophore on its emitting properties and even to characterize the fluorescence of a molecule with sub-molecular precision!
The objective of this post-doctoral project is to better understand the origin of the extreme spatial resolution in our experiment. This requires to develop theoretical tools to address the respective role of the tunneling electrons, the molecular vibrations and of the picocavity plasmons confined at the tip apex that are all involved in the improved resolution.
Current theoretical approaches are unable to describe inelastic electron tunneling involved in the STM-induced excitation of the chromophore, do not account for the vibrational degree of freedom of the molecular structures, and are in general unable to capture the quantum atomistic nature of light-matter coupling in the tunneling junctions. These mechanisms need to be addressed in a unified theoretical framework to enable quantitatively accurate predictions.
The candidate will be in charge of combining atomistic semi-classical electrodynamic approach used to address light-matter interaction in sub-nanometric plasmonic gaps, first-principles methodology to fully account for the mechanism of electron tunneling in STM-LE, and methods based on cavity quantum electrodynamics (cQED) to correctly address the quantum nature of light-matter interactions.

The work will be performed within the STM team of the IPCMS under the supervision of Guillaume Schull

Main research field : WARNING: Please select, trying to be specific, using 'Other' or 'All' will decrease your Job Vacancy visibility Chemistry and Physics
Offer Requirements : NA
Eligibility criteria : The candidate must have a strong background in the quantum description of light-matter interaction in molecules, and be familiar with ab-initio tools.

JOB DETAIL

Type of contract : CDD
Status : Post-doc
Company / Institute : CNRS / IPCMS
Country : France
City : Strasbourg
Postal Code :67034
Street : 23 rue du Loess

APPLICATION DETAILS (mandatory)

Provisional start date : 01/11/2020
Application deadline : 21/07/2020
Application e-mail : schull@unistra.fr WARNING: This is the contact e-mail for applicants