Light-matter interaction at the nanoscale studied with STM

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Nanoscale light-matter interactions are critical for energy conversion during the photosynthesis process and constitute the basis of quantum optics experiments. Ideally, these phenomena are probed and manipulated on a single entity scale such as an isolated molecule. However, such nanoscale systems cannot be addressed at the atomic scale by purely optical means due to the diffraction limit. Scanning tunneling microscopy overcomes this limitation and enables imaging with atomic resolution. By additionally profiting from the local field enhancement provided by the presence of a metallic tip, light emission from an individual chromophore molecule can be probed [1,2]. The goal of the thesis is to employ this approach to study the fundamentals light–matter interactions at the atomic-scale. This task will be achieved by developing novel time-resolved techniques based on optical or electrical excitation of individual molecules addressed by the STM tip.

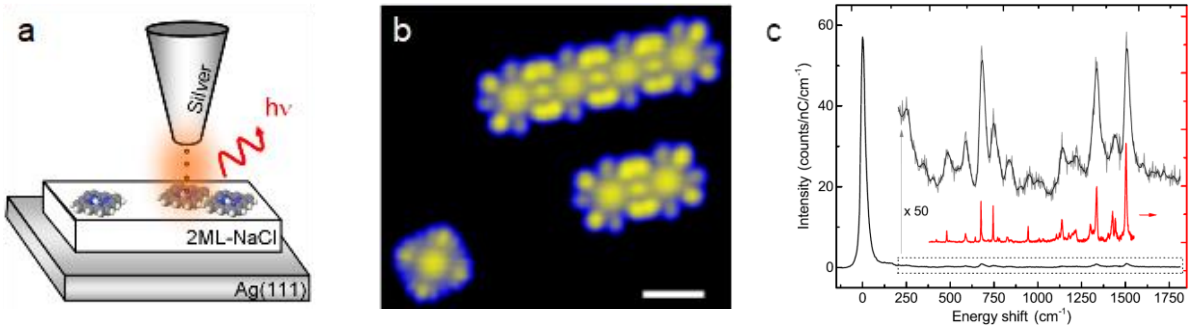

Figure : STM-induced fluorescence experiment of individuale molecules. (a) skecth of the experiment. (b) STM images of individuals and linear assemblies of Zn-Phthalocyanine molecules. (c) STM- induced fluorescence spectra a single molecule.

We are looking for a highly motivated candidate who is eager to participate in the research of our international group. The candidate should have an excellent scientific background in physics science, good communication skills and proficiency in English. Previous experience with scanning tunneling microscopy, ultra-high vacuum techniques or optical spectroscopy will be additionally valued. In your application please include a CV, cover letter and contacts to two references. A PhD grant from the European commission is secured.

[1] Doppagne *et al.*, Science, **361**, 6399 (2018)
[2] Kuhnke *et al.*, Chem. Rev., **117**, 7 (2017)