Control of molecule/metallic interfaces by light

Post doc position open in the STM group of MPQ

Spin crossover molecules (SCO) are promising building blocks for the development of molecular spintronics as they present two spin states that can be switched from one to the other thanks to external stimuli such as light, temperature or pressure. But, the incorporation of such materials in actual devices needs a deep understanding of the molecular spin crossover property on metallic and ferromagnetic surfaces down to the single molecular level. The ultimate goal would be the control of the molecule/ferromagnetic interface properties by external means such as light. Indeed molecular layers on a ferromagnetic metal can strongly modify the magnetic anisotropy of the material due to interface effects [BAI15]. Moreover, we have recently demonstrated, by scanning tunneling microscopy measurements (STM), the possibility to induce by light the switching of SCO molecules assembled on a gold surface [BAI16]. Surprisingly, the molecules arrange in a long-range ordered structure with molecules in high and low spin states at low temperature. This work, probing the dynamics of the photoinduced switch at the molecular level, was the first proof that SCO is possible for molecules in direct contact with a metallic surface.

The aim of this project is to create reliable SCO/ferromagnetic interfaces which can be controlled by light and to investigate their structural, electronic and magnetic properties. To perform this study, we will combine STM, Magneto-optical Kerr effect measurements and X-ray measurements such as absorption spectroscopy or grazing incidence diffraction. The possibility to illuminate the tunnel junction will be implemented on the new low temperature STM that will arrive in the team at the end of 2017.

The position will be initially for one year, with the possibility of renewal for a second year. The work will be realized in the context of a multi-partner European project starting in November 2017.

[BAI15] K. Bairagi et al., Phys. Rev. Lett., 114, 247203 (2015)
[BAI16] K. Bairagi et al., Nat. Commun., 7, 12212 (2016)

Experimental techniques: Scanning tunneling microscopy (ultra-high vacuum, low temperature), Kerr effect magnetometry, synchrotron measurements (surface diffraction and X-Ray absorption).

Required skills: Strong background in surface science and condensed matter, taste for experimental research, teamwork attitude.

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