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A Nano Approach of
Electron Delocalization and Polymerization in Metallorganic Sheets

Organometallic molecules and their 2D networks are of utmost interest for organic electronics devices and for the development of new materials. Recent publications, among which our own results, show that it is possible to control the growth of monolayer networks of magnetic atoms, from either assemblies of single organometallic molecules or from the reaction of organic molecules with magnetic atoms on metallic surfaces leading to the synthesis of both, coordination and covalent networks [1,2]. Furthermore, our team has recently demonstrated that the lateral interaction in self-assembled films of double decker-$TbPc_2$ molecular magnets [3] plays a key role in the manifestation of its electronic and magnetic properties.

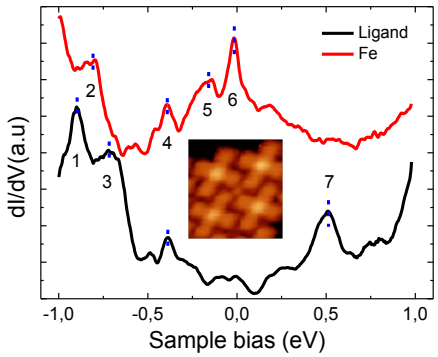

Figure 1. STS spectra of a FePc network (inset) obtained by temperature induced on-surface polymerization of 1,2,4,5-tetracyanobenzene and Fe atoms. Peak No. 6 is attributed to magnetic Kondo screening while other peaks belong to specific molecular orbitals.

The ultimate step is the polymerization of the metallorganic synthons, leading to monolayer organometallic sheets with delolalized π-electrons. In this context we want to understand to which extent the property of the metal atoms are modified by the chemical environment. Therefore, the aim of the experimental internship is to study the 2D organometallic coordination and π-conjugated networks containing magnetic atoms. Low temperature scanning tunneling microscopy/spectroscopy (STM/STS) under magnetic field and in ultrahigh vacuum will be used. Beyond the tremendous challenge of direct on-surface synthesis for 2D molecular electronics, the stepwise transformation toward the final compound then offers a way to study metal atoms involved in various types bonds and their interaction with the substrate.

1. S. Kezilebieke, A. Amokrane, M. Abel, J.P. Bucher, *J. Phys. Chem. Lett.* **2014**, *5*, 3175.
2. S. Kezilebieke et al. *Nano Research* **2014**, *7*, 888.
3. Synthesis, Ruben group (KIT), collaboration within the collège doctoral franco-allemand.

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