Julien Granet, Muriel Sicot, Simon Lamare, Frédéric Chérioux, Iann C. Gerber, Bertrand Kierren, Yannick Fagot-Revurat and Daniel Malterre.

Kondo effect in molecular self-assemblies studied by scanning tunneling spectroscopy

Molecules at surfaces are ideal building blocks to investigate many-body quantum phenomena at the atomic scale such as the so-called Kondo effect. One and two-dimensional arrays of spins can be created through molecular self-assembly in order to investigate the largely unexplored Kondo physics in low-dimensional structures. In this work, we use single and double-decker macrocyles (phthalocyanine and/or porphyrin) molecules adsorbed on noble metals (111) surfaces to investigate the Kondo effect by means of scanning tunneling spectroscopy. These two systems were specially chosen based on the origin of their single unpaired spin. In the first case, it comes from charge transfer upon adsorption on the surface whereas it comes from the lanthanide ion center sandwiched between the two macrocycles, in the other case. For each molecular compound, we study the influence of molecule-molecule and molecule-substrate interactions on the occurence of a Kondo spectroscopic signature. We show that the many-body properties are preserved upon self-assembly for the charge-transfer induced Kondo system although they are strongly affected by the chemical environment for the cerium-based double decker molecules. This work provides insight into the design of molecular devices.