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Addressing Electronic and Spin Transitions of Switchable Molecules in the Monolayer Range

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Switchable molecules exhibiting tunable physical properties as a function of external stimuli (electric or magnetic fields, temperature, light or pressure) have drawn a considerable interest for their useful functionalities [1,2]. Nevertheless, with the considerable attraction for those systems, some fundamental and practical challenges arise in view of their integration in molecule-based electronic devices such as molecular switches, sensors or qubits. An example of a present day challenge is the preservation of the switchable functionalities of the molecules while being adsorbed on surfaces [3,4]. Promising bistable properties have emerged from the so-called Fe spin-crossover group of compounds and Fe/Co molecular complexes exhibiting concomitant changes in their optical and magnetic properties (see Fig.1) induced by spin transition and charge transfer respectively [5,6]. In order to address the switchable properties of those systems on surfaces, we have explored different solutions to prepare monolayers of these complexes consisting of ultra-high vacuum compatible techniques and deposition in solutions. By means of X-ray Absorption Spectroscopy and X-ray Magnetic Circular Dichroism, we follow the oxidation state changes of the transition metals upon application of laser light and temperature and investigate whether the molecules keep their switchable properties when adsorbed on a suitable surface. The results obtained on the monolayers show results different from the bulk phases of the same complexes depending on *i)*the technique used to prepare the monolayer, *ii)* the nature of the substrate and/or *iii)* the intrinsic properties of the molecules.

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