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Optical control of spin-crossover molecules adsorbed on metallic substrates

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Since several years, the domain of molecular spintronics focuses on the insertion of molecules in spin valve devices. Different studies underlined the crucial role of the interfaces in such kind of devices. To go towards controllable interfaces with external stimuli, spin-crossover molecules are particularly promising as they present two spin states (a high spin state and a low spin state) that can be addressed by temperature or light.
In this context, we investigated the spin-crossover properties of FeII-based adsorbed on metallic substrates. The molecules are self-assembling on Au(111) and Cu(111) to form dense 2D network of monolayer height [1]. In this contribution, we will discuss how the spin state of the molecules can be controlled under light excitation at low temperature. We will demonstrate that the proximity of the metallic substrates leads to a reverse spin-state transition compared to the molecular crystal [2]. Finally, we will show that this effect is limited to the molecule/metal interface [3].
[1] K. Bairagi et al., Nat. Comm. 2016, 7, 12212.
[2] L. Zhang et al., Angewand. Chem. Int. Ed. 2020, 59, 13341-13346.
[3] M. Kelai et al., J. Phys. Chem. Lett. 2023, 14, 1949 - 1954.

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