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Using the binding site to control the magnetic and spintronic properties of a single magnetic molecule in a tunnel junction BEN WARNER, FADI EL HALLAK, HENNING PRUESER, TOBIAS G. GILL, UCL, UK, JOHN SHARP, University of Liverpool, UK, ANDREW J. FISHER, UCL, UK, MATS PERSSON, University of Liverpool, UK, CYRUS F. HIRJIBEHEDIN, UCL, UK — Many proposals outline the use of single magnetic molecules in new applications in information technology and spintronics, with the intention of creating new devices based on phenomena that only manifest at the atomic scale. To create these devices it will be necessary to engineer the required properties, whether through controlling the molecule's chemical makeup or its interaction with the external surroundings. The latter may involve using interactions with the supporting substrate surface, which have been shown to not only modify the molecule properties [1] but also create effects such as chirality [2]. Here we utilize the surface interaction to modify the properties of FePc on copper nitride, a thin insulator, above bulk Cu(001). Using scanning tunneling microscopy we show that the interaction with the surface is defined by the binding site of the central Fe atom in the molecule. By performing elastic and inelastic tunneling spectroscopy and comparing the results to DFT modeling, we explore how coupling to the surface can be used to control the molecular orbitals and the accessibility of the spin excitations. This demonstrates the importance of controlling molecule-substrate coupling down to the atomic scale for the development of single molecule devices.

[1] N. Tsukahara et al., Phys. Rev. Lett. 102, 167203 (2009)
[2] A. Mugarza et al. Phys. Rev. Lett, 105, 115702 (2010).

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