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Controlling electronic access to the spin excitations of a single molecule in a tunnel junction CYRUS F. HIRJIBEHEDIN, BEN WARNER, FADI EL HALLAK, HENNING PRUESER, AFOLABI AJIBADE, TOBIAS G. GILL, ANDREW J. FISHER, UCL, MATS PERSSON, U. Liverpool and Chalmers University of Technology — Spintronic phenomena can be utilized to create new devices with applications in data storage and sensing. Scaling these down to the single molecule level requires controlling the properties of the current-carrying orbitals to enable access to spin states through phenomena such as inelastic electron tunneling. Here we show that the spintronic properties of a tunnel junction containing a single molecule can be controlled by their coupling to the local environment. For tunneling through iron phthalocyanine (FePc) on an insulating copper nitride (Cu_2N) monolayer above Cu(001), we find that spin transitions may be strongly excited depending on the binding site of the central Fe atom. Different interactions between the Fe and the underlying Cu or N atoms shift the Fe d-orbitals with respect to the Fermi energy, and control the relative strength of the spin excitations, an effect that can described in a simple co-tunneling model. This work demonstrates the importance of the atomic-scale environment in the development of single molecule spintronic devices.

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