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「Atomic-scale spin detection in metal-organic complexes on surfaces」

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Abstract : Manipulating the spin state of atoms in a molecular environment opens-up fascinating prospects in spintronics and quantum-technology. However, for many technological applications, it is necessary to connect these objects to metallic contacts and the interaction with the substrate, other molecules, and dopants, can alter their properties [1-5]. Here we will show how atomic-scale probes such as scanning tunneling microscopy/spectroscopy (STM/STS) can further our understanding of the spin properties of metal-organic complexes. On the example of MnPc we show how the single molecule Kondo spin state converges to a Kondo lattice for large domains of molecules on Ag(111), revealing a long-range antiferromagnetic order that can lead to 2D quantum criticality [1]. On the other hand, we show how dimers of such molecules, exhibit new properties, not anticipated from their monomeric counterpart, such as magnetic bi-stability leading to magnetic switches [2]. Lanthanide-based double-deckers have attracted great interest as qubits for data encoding [3], while controlled STM-manipulation of $TbPc_2$ allows tracking the entanglement process by means of the space-resolved detection of the Kondo resonance [4]. Finally, an original approach is presented where the valence state of a Ce atom is tuned by its controlled insertion into an appropriate molecular network.

References

[1] R. Tuerhong, F. Ngassam, S. Watanabe, J. Onoe, M. Alouani, J.P. Bucher, *J. Phys. Chem. C*. **2018**, 122, 20046-20054.
[2] R. Tuerhong, F. Ngassam, M. Alouani, J.P. Bucher, *Adv. Phys. Res.* **2023**, 2: 2200005.
[3] W. Wernsdorfer, M. Ruben. *Adv. Mater*. **2019**, 31, 1806687.
[4] A. Amokrane, S. Klyatskaya, M. Boero, M. Ruben, J.P. Bucher, *ACS Nano*, **2017**, *11,* 10750.
[5] R. Barhoumi, S. Klyatskaya, M. Boero, M. Ruben, J.P. Bucher, *Nanoscale* **2019**, 11, 21167-21179.

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