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# Electron transport through individual all-organic polyradicals

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Organic radicals are neutral, purely organic molecules exhibiting an intrinsic magnetic moment due to the presence of an unpaired electron in the molecule in its ground state. This property, added to the low spin-orbit coupling makes organic radicals promising candidates for Molecular Spintronics provided that the radical character is stable in solid state electronic devices.

We measure electron transport through individual PTM organic radicals. We show that the radical centre and therefore the magnetism, is preserved in a variety of individual neutral radicals in single-molecule solid state devices, ranging from monoradicals [1] to polyradicals [2,3] (di- and tri-radicals). The magnetism, in the shape of a Kondo anomaly, is robust against mechanical and electrical perturbations.
In polyradicals (see Figure 1), where several unpaired spins are coupled via exchange coupling in a single high-spin purely organic molecule, we show that the local environment can induce a sign reversal of the exchange interaction, from ferro to antiferro, inducing a change in the magnetic ground state of the individual molecule [2]. In addition, diradicals can be reversibly and controllably charged preserving the radical character. The controlled access to different redox states of the molecule, allows to perform Inelastic Electron Tunnel Spectroscopy (IETS) of the spin spectra in both redox states and forms the basis of a SWAP quantum gate[3].

[1] R. Frisenda et al. Nano Lett. 15 (2015) 3109
[2] R. Gaudenzi et al. Nano Lett. 16 (2016) 2066
[3] R. Gaudenzi et al. ACS Nano (2017) DOI: 10.1021/acsnano.7b01578

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