Electronic transport in single-molecule junctions of organic radical molecules

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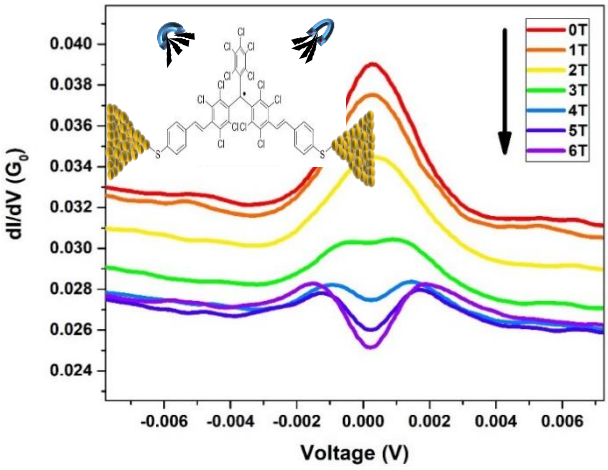
The possibility to fabricate electronic devices with molecules as functional building blocks is a central goal of molecular electronics. Tuning the electronic transport properties by magnetic fields opens the route to use them as functional elements in molecular spintronic devices. Of particular interest are organic radical molecules. The presence of an unpaired electron may give rise to intrinsic magnetic properties that are preserved even when coupled to nonmagnetic electrodes. In this talk I will report on single-molecule transport experiments using the mechanically controlled break junction technique carried out at low temperatures down to 1.5K. I will discuss recent observations of magnetic-field tunable transport in three different classes of organic radical molecules. We have observed very high positive [1,3] and negative magnetoresistance [2,3] up to 200% for a magnetic field of a few Tesla applied perpendicular to the current direction. We furthermore observe an interplay between Kondo peaks and magnetoresistance in perchlorotrityl [2] and Blatter [3] radicals, the origin of which is still unknown and open for further investigation.



References:

[1] R. Hayakawa et al., Nano Letters 16, 4960 (2016)

[2] G. Mitra et al., Nano Letters 22, 5773 (2022)

[3] G. Mitra et al., in preparation. (Calibri, 10)