Integration of spin crossover molecules into electronic devices

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Molecular spin crossover compounds present a special technological interest for their room-temperature bistability leading to a sizeable variation of different physical properties (HOMO-LUMO gap, dielectric permittivity, magnetic moment, heat capacity, elastic modulus, …) [1]. As a result, when integrated into electronic devices, a potentially huge impact of the spin-state switching on the device properties can be foreseen. In this talk, I will present a review of research conducted in our team on electrical and charge transport properties of molecule-based spin crossover complexes. The presentation covers different size scales from bulk materials to thin films and nanoparticles, including their device integration, and embraces the topic of hybrid materials/systems with coupled (electrical and spin crossover) properties as well.

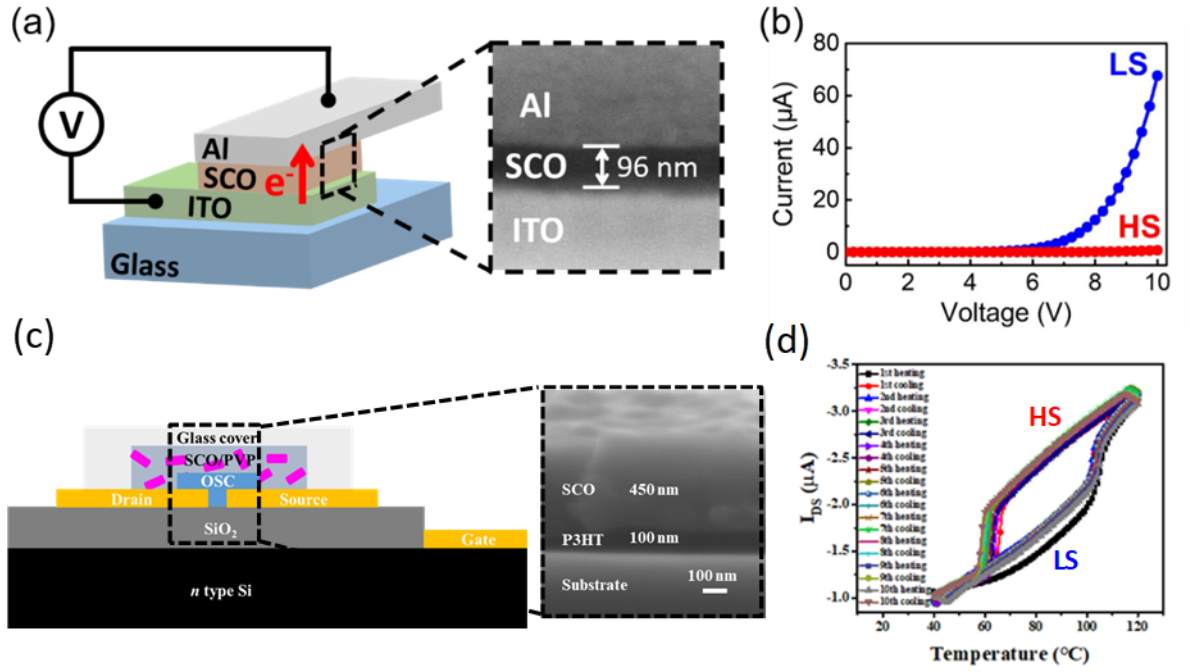

Figure 1. (a) Scheme and SEM image of the cross-section of an ITO/[Fe(HB(tz)$_3$)$_2$]/Al junction [2]. (b) I - V curves of the junction acquired in the low-spin (low resistance) and high-spin (high resistance) states. (c) Scheme and SEM image of the cross-section of a [Fe(Htrz)$_2$(trz)]BF$_4$@PVP/P3HT bilayer inside an OFET [3]. (d) Drain-source current of the transistor recorded for ten successive thermal cycles through the spin transition.

References:

[1] G. Molnar et al. Adv. Mater. 30 (2018) 1703862.

[2] V. Shalabaeva et al. Appl. Phys. Lett. 112 (2018) 013301.

[3] Y. Zhang et al. (2024) submitted.