



Spin-dependent transport through photoswitchable Self Assembled Monolayers

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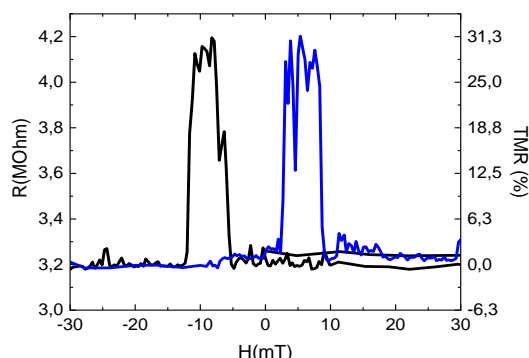
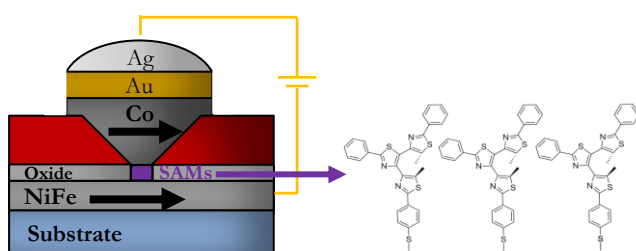
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Abstract:

Magnetic tunnel junctions (MTJs) are known to be one of the main building blocks of spintronics. In these devices, the integration of molecular layers as tunnel barrier is envisioned as an opportunity to allow the engineering of spintronics at the molecular scale. Actually, thanks to the spin-dependent hybridization at ferromagnet/molecule interfaces, it was shown that one could now expect to tailor spin polarization and thus tunnel magnetoresistance (TMR) with molecules (a.k.a. spinterface) [1]. In this direction, among the wealth of molecular systems, self-assembled monolayers (SAMs) appear as one of the most promising tool to tailor the MTJs tunnel barrier. Indeed, as shown in molecular electronics, their properties could be finely tuned at the molecular level. Pioneer experiments have shown that “passive” molecules such as alkane chain could be integrated into MTJs [2].

In this talk we will present the first work integrating “active” diarylethene molecules in NiFe/diarylethene/Co MTJs molecular MTJs. As the electron delocalization, energy gap and coupling strength to the electrodes depend on the molecule state, the tunnel resistance and tunnel magnetoresistance (TMR) is expected to be tuned upon switching. We will first present our optimized fabrication process that enables to work with ferromagnets in solution and fabricate working molecular MTJs. We will then discuss the electronic and TMR properties obtained in both open and closed forms of the diarylethene molecules. Finally, we will show that this work demonstrates that switchable “active” molecules can be successfully integrated into MTJs towards multifunctional molecular spintronic devices electrically and/or optically controllable.



REFERENCES

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[2] J. R. Petta et al., Phys. Rev. Lett., 93, 136601 (2004) ; M. Galbiati et al., Adv. Mat. 24, 6429 (2012)