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Tuning the shape and sign of organic magnetoresistance (OMAR) by controlling the interface defects in organic diodes.

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In general, magnetoresistance (MR) is measured in spin-valve like devices where a non-magnetic layer is sandwiched between ferromagnetic electrodes. However, there is a growing interest for another type of MR observed in organic semiconductors sandwiched between *non-magnetic* electrodes. This effect, called organic magnetoresistance (OMAR), occurs at room temperature and low magnetic field (~ mT) in many organic semiconductors.[1-3]

An interesting feature of OMAR lies in its relation to defects. Indeed, while most organic semiconductors properties are rapidly degrading with the device deterioration, OMAR has been found to increase with the defects concentration.[4] Based on this information, we tried to observe the evolution in OMAR by changing the roughness of the interface between the anode and organic layer (Fig. 1). Interestingly, we found that not only the OMAR ratio, measured as the magnetocurrent (MC), but also the sign and shape of the OMAR curves were changed (Fig. 2). An explanation based on impedance spectroscopy measurements of the samples will be proposed.

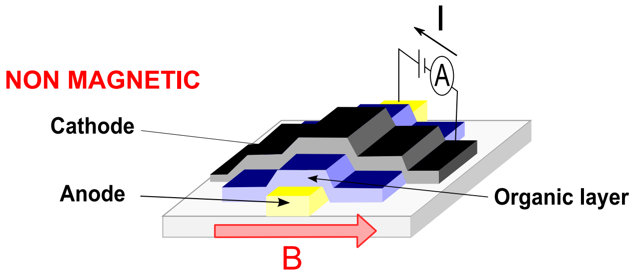

Figure 1. Schematic of the organic diode used in this study.

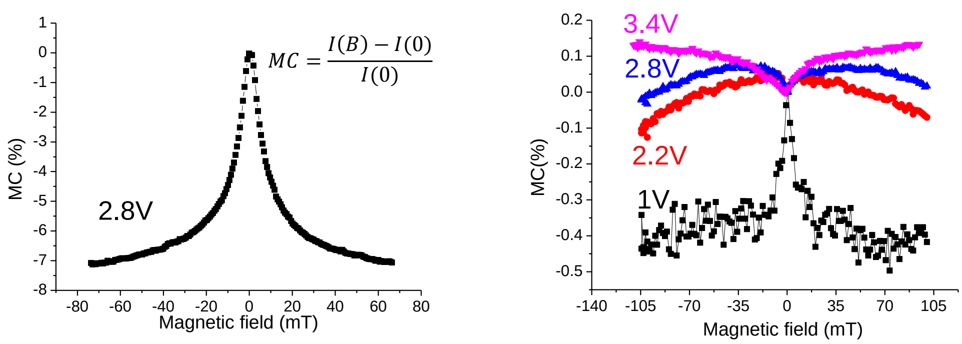

Figure 2. Magnetocurrent (MC) curves for devices with (a) a rough interface (R_{RMS}=12.9nm), and (b) a smooth interface (R_{RMS}=1.6nm) between anode and organic layer.

[1] T.L. Francis et al., *New J. Phys.*, **6**, 185 (2004).
[2] B. Hu, Y. Wu, *Nature Mater.*, **6**, 985 (2007).
[3] P.A. Bobbert et al., *Phys. Rev. Lett.*, **99**, 216801 (2007).
[4] T.D. Schmidt et al., *Synth. Met.*, **161**, 637-641 (2011).