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Direct measurements of spin propagation in organic spin valves by low-energy muon spin rotation[1]

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Organic semiconductors fall into a class of materials that shows significant potential for future applications, but many of the fundamental mechanisms of spin relaxation and transport are not understood. As a result, the field is becoming extremely topical, but there is a need for suitable techniques that can yield information on intrinsic spin dynamics and transport in organic materials. I will present Low Energy Muon Spin Rotation measurements and demonstrate that this technique can directly measure the depth resolved spin polarisation of charge carriers in organic spin injection devices [1]. I will then go on to show that it is possible to separate out the various contributions to spin decoherence, differentiating between interface and bulk effects. By correlating macroscopic measurements with these separated interfacial and bulk effects, I will present evidence that it is possible to engineer interfaces in organic spintronic devices [2]. Finally, I will present some of the latest results on how spin injection and transport depend on bias voltage [3].

[1] A. J. Drew et al., Nature Materials 8, 109 (2009)
[2] L. Schulz et al., Nature Materials 10, 39 (2011)
[3] L. Nuccio et al., in preparation.

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