Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Ferromagnetic-organic interfacial states detected by transient conductivity and their role on low voltage current injection in organic spinvalves HONGTAO ZHANG, THEO KREOUZIS, WILLIAM GILLIN, ALAN DREW, Queen Mary University of London — Recently, there has been an increasing interest in utilising organic materials as spin transport layers as they have long spin-coherence times due to low spin-orbit and hyperfine coupling present in these materials [1]. Whilst there has been considerable research into organic spinvalves, there is a fundamental unsolved problem of how spin injection occurs. All organic spinvalves have been found to operate best at very low voltages, in the order of millivolts, where there should be no carrier injection. In this work we investigate the role of hybrid interface states (HINTS) between a ferromagnetic contact (FM) and an organic semiconductor (OSC). Using transient conductivity measurements on a variety of devices, the presence of these HINTS in a real device but only in the presence of a FM contact. We then consider the consequences that these filled HINTS will have on the electrical properties of devices. We argue that the filling of these HINTS introduces a large electric field at the FM-OSC interface, which causes an effect analogous to "band-bending" in conventional semiconductors. This explains the Ohmic injection seen in organic spinvalves which results in hole injection even at low (mV) applied voltages.

[1] Dediu, V. A., Nat. Mat. 8, 707-716 (2009).

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Date submitted: 12 Nov 2013 Electronic form version 1.4