Abstract Submitted
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Correlation of microstructure and magnetotransport in organic semiconductor spin valve structures[1] Y. LIU, J. GORHAM, T. LEE, H. FAIRBROTHER, H. E. KATZ, D. H. REICH, The Johns Hopkins University, S. WASTON, J. BORCHERS, NIST — Magnetoelectronic devices based on organic semiconductors (OSC) hold promise due to the long spin relaxation time and the ability to tune relevant properties such as interface barriers. However, it is unclear to date whether magnetotransport effects observed in these systems is due to tunneling, or whether spin-coherent diffusive transport is also possible. We have studied magnetotransport in Co/OSC/Fe trilayer junctions, with 50 to 150 nm thick OSC layer, where tunneling would not be expected. Positive magnetoresistance (MR) is observed at T = 4.2 K for several OSCs and it persists up to T = 290 K for two systems: tris(8-hydroxyquinoline) Aluminum (III) (Alq3) and copper phthalocyanine (CuPc). In order to probe the origins of MR, we have done structural studies on Co/Alq3/Fe trilayer films by x-ray reflectivity and Auger depth profiling. The results indicate well-defined layers with modest interface roughness (3-5 nm) between the Alq3 and the surrounding FM layers. While these results rule out large-scale intermixing of Co or Fe into the OSC, they do not as yet rule out the existence of local defects, such as pinholes, in the OSC layers that could enable tunneling to occur.

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