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Spin Valve Effects in Hybrid Organic-Inorganic Devices[1] YAOHUA LIU, TAEGWEON LEE, HOWARD E. KATZ, DANIEL H. REICH, The Johns Hopkin University — Magnetoelectronic devices based on organic semiconductors (OSC) hold promise due to the long spin coherence in these materials and the ability to tune relevant properties such as carrier mobility and interface barriers via organic synthesis. We have studied spin valve effects in vertical geometry organic-based devices, using Fe and Co as the bottom and top electrodes. Several different organic semiconductors, including Perylenetetracarboxylic dianhydride (PTCDA) and the previously studied Alq3, have been used as the spin transport layers. At low temperatures, up to 5% positive hysteretic magnetoresistance (MR) has been observed at low field in devices with semiconductor thickness of 140 nm, which is much larger than the tunneling limit. The MR decreases as the bias voltage or current increases. Possible mechanisms for spin-polarized transport in these devices and prospects for synthesis of materials with improved performance will be discussed.

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