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Spin-polarized tunnel injection and extraction effects on magneto-resistance in organic semiconductor spin valves[1] MOHAMMAD YUNUS, P. PAUL RUDEN, University of Minnesota, DARRYL L. SMITH, Los Alamos National Lab. — Experimental evidence of large magneto-resistance has been reported for organic spin valves. An organic spin valve consists of a conjugated hydrocarbon semiconductor sandwiched between two ferromagnetic contacts. Tunnel injection of charge carriers from a ferromagnetic contact can be strongly spin-polarized. The process is modeled as tunneling through a thin interfacial layer into localized molecular states of the organic semiconductor near the equilibrium Fermi level, and subsequent thermally activated hopping of the charge carriers out of these localized states into the bulk of the semiconductor, where the transport can be described by macroscopic device equations. The extraction of charge carriers follows an analogues process at the collecting contact. We explore the consequences of parallel or anti-parallel alignment of contact magnetizations on the spin-polarization and the magneto-resistance associated with the spin-polarized current in the device.

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P. Paul Ruden
University of Minnesota

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