Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Spin-polarized charge carrier injection by tunneling from ferromagnetic metals into organic semiconductors[1] MOHAMMAD YUNUS, P. PAUL RUDEN, University of Minnesota, DARRYL L. SMITH, Los Alamos National Laboratory, UNIVERSITY OF MINNESOTA COLLABORATION, LOS ALAMOS NATIONAL LABORATORY COLLABORATION — Efficient spin-polarized charge carrier injection from a ferromagnetic metal (FM) into a semiconductor is a challenging task. Because of the large differences between the conductivities of metals and semiconductors a spin-dependent injection mechanism, such as tunneling, is a critical requirement. We discuss a new model for such a mechanism for the specific case of organic semiconductors (OS), such as conjugated hydrocarbons. Spin injection is modeled as tunneling through an interfacial layer into localized molecular states 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. We explore the sensitivity of spin-injection to the parameters describing the FM and the OS. We also discuss the magneto-resistance that can result from spin-polarized injection and spin-transport if the extraction process is analogous to the injection mechanism.

[1]Supported by NSF ECCS under grant #0724886.

P. Paul Ruden
University of Minnesota

Date submitted: 27 Nov 2009 Electronic form version 1.4