Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Non-metal spintronics: study of spin-dependent transport in InSb- and InAs-based nanopatterned heterostructures J.J. HEREMANS, HONG CHEN, Department of Physics, Virginia Tech, J.A. PETERS, Department of Physics and Astronomy, Ohio University, N. GOEL, S.J. CHUNG, M.B. SANTOS, Department of Physics and Astronomy, University of Oklahoma, W. VAN ROY, G. BORGHS, IMEC, Leuven, Belgium — Spin-orbit interaction in semiconductor heterostructures can lead to various spin-dependent electronic transport effects without the presence of magnetic materials. Mesoscopic samples were fabricated on InSb/InAlSb and InAs/AlGaSb two-dimensional electron systems, where spin-orbit interaction is strong. In mesoscopic devices, the effects of spin-orbit interaction are not averaged out over the geometry, and lead to observable electronic properties. We experimentally demonstrate spin-split ballistic transport and the creation of fully spin-polarized electron beams using spin-dependent reflection geometries and transverse magnetic focusing geometries. Spin-dependent transport properties in the semiconductor materials are also investigated using antidot lattices. Spin-orbit interaction effects in high-mobility semiconductor devices may be utilized toward the design of novel spintronics implementations. We acknowledge NSF DMR-0094055 (JJH), DMR-0080054, DMR-0209371 (MBS).

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Date submitted: 04 Jan 2006 Electronic form version 1.4