Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Electronic bulk and surface transport in n- and p-InAs films on GaAs substrates[1] YAO ZHANG, V. SOGHOMONIAN, J.J. HEREMANS, L.J. GUIDO, Virginia Tech — We experimentally studied magnetotransport of bulk carriers and surface electrons in InAs MOCVD-grown on GaAs, as well as the spin interaction between surface carriers and transition metal ions. Hall and Shubnikov-de Haas data show the existence of 3 carrier types: interface carriers at the GaAs/InAs interface, bulk carriers and surface state carriers. In n-type samples total density n and total mobility μ increase with increasing n-doping. At a threshold doping level, transport in the system changes from multi-carrier to single-carrier. In p-type InAs, n and μ show a strong temperature dependence, partly due to carrier freeze-out. The p-type InAs also shows GaAs/InAs interface carriers. At low temperatures and low magnetic fields, weak antilocalization (AL) is observed due to spin-orbit interaction, mostly from electrons with Rashba spin-orbit interaction in the surface accumulation layer. Due to its sensitivity to spin phenomena AL can be used as a sensitive probe of interactions between the surface electrons and local magnetic moments. The magnetic species modify the surface electron spin-flip scattering and spin-orbit scattering. Spin-orbit scattering is seen to be increased by Co^{2+} and Ni^{2+}, while suppressed by Fe^{3+}.

[1]The work is supported by DOE DE-FG02-08ER46532.

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Date submitted: 30 Oct 2012 Electronic form version 1.4