Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Spin Filtering Of Hot Holes in a Metallic Ferromagnet TAMALIKA BANERJEE, EHTSHAM HAQ, J.C. LODDER, RONALD JANSEN, MESA+ Institute for Nanotechnology, University of Twente — Spin-transport of non-equilibrium holes in ferromagnetic metals with energy below the Fermi level has been investigated using Ballistic Hole Magnetic Microscopy. Using a semiconductor/ferromagnet hybrid structure, we show that a thin ferromagnetic film acts as an efficient spin-filter for holes. Unpolarized hot holes injected from an STM tip after transmission through a ferromagnetic stack (NiFe/Au/Co) are collected in the valence band of p-type Si. The hole attenuation length for Co is found to be short and increases from 0.6 to 1.0 nm in the energy range 0.8 to 2 eV below the Fermi level. For a NiFe/Au/Co trilayer, the hole transmission is clearly spin-dependent with a surprisingly large magnetocurrent of 130%. The large spin dependence of the hole transmission as well as the increase of the attenuation length with energy cannot be explained by the phase space available for inelastic decay of hot holes. We discuss other factors to explain such a large spin asymmetry.

Tamalika Banerjee
MESA+ Institute for Nanotechnology, University of Twente

Date submitted: 04 Dec 2004 Electronic form version 1.4