MAR06-2005-001700

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

**Spin-polarized tunneling and spin diffusion in sub-micron lateral spin-transistors**[1]

SERGIO O. VALENZUELA, Physics Department, Harvard University, Cambridge MA 02138, USA

Much effort has been devoted to understand how the electron spin is transferred through interfaces and to identify the fundamental processes that suppress the spin polarization. Spin- transistors with the Johnson and Silsbees geometry are a unique tool to study these phenomena. In these devices, a spin- polarized current is injected into a non-magnetic metal using a tunnel junction in combination with a ferromagnet (FM), which acts as a spin source. The polarized current results in non- equilibrium spin populations in the non-magnetic metal, which are detected as voltages using a second FM. Fabricated aluminum- based devices with spin transresistances as high as 2 Ohm allow us to study spin-flip scattering mechanisms and spin-polarized tunneling. The tunneling polarization at zero bias is compared with the one estimated with the Meservey and Tedrow technique in the same sample. In addition, as the spin-transistor measurements can be extended to finite voltages and high temperatures, new valuable information is obtained on the character and polarization of the electrons that tunnel out of or into the ferromagnetic source. Surprisingly, the polarization is found to be strongly bias-dependent and asymmetric around zero bias. The origin of these phenomena is analyzed.

[1]In collaboration with D.J. Monsma, M. Tinkham, C.M. Marcus and V. Narayanamurti