

Abstract Submitted  
for the MAR10 Meeting of  
The American Physical Society

**Direct detection of spin chemical potential shift through spin filtering effect**<sup>1</sup> GUOXING MIAO, JAGADEESH MOODERA, MIT — Spin filtering (SF) effect is a unique way to generate highly spin-polarized tunnel currents from nonmagnetic electrodes. Magnetic tunnel junctions based on pure SF effect have been realized recently [1] as a clear demonstration of principle for the spin manipulation through SF effect. The next challenge is the readout of spin information. In this work, we present the direct detection of the spin chemical potential shift in an Al nano cluster sandwiched between two SF EuS tunnel barriers. The spin channels are split by depositing Al directly onto EuS, and the indirect exchange interaction between the Al conduction electrons and the localized Eu 4f electrons gives rise to an effective Zeeman splitting with the strength of a few mV. EuS on the readout side is isolated from the Al clusters with a natural Al<sub>2</sub>O<sub>3</sub> barrier. In a vertical measurement geometry with no transport current, we directly detected the spin dependent voltage levels by aligning the detection SF barrier parallel or antiparallel to the first SF barrier, corresponding to the equilibrium up- and down-spin chemical potentials. A simple analysis treating the barriers as a set of resistors revealed that the observed voltage difference is the actual chemical potential shift modulated by the SF efficiency.

[1] G.X. Miao, M. Muller, J.S. Moodera, PRL102,076601(2009)

<sup>1</sup>Work supported by NSF and ONR grants.

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Date submitted: 09 Dec 2009

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