

Interface and magnetic characterization of ultrathin EuO films with XRS and XMCD

*E. Negusse*¹; *J. Dvorak*¹; *J. Holroyd*¹; *M. Liberati*^{1,3}; *Y. U. Idzerda*¹; *T. S. Santos*²; *J. S. Moodera*²; *E. Arenholz*³;

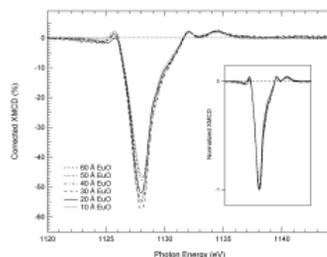
1. Physics, Montana State University, Bozeman, MT, USA.

2. Francis Bitter Magnet Lab, Massachusetts Institute of Technology, Cambridge, MA, USA.

3. Advanced Light Source, Lawrence Berkeley National Lab, Berkeley, CA, USA.

Abstract Body: Spin filtering using ferromagnetic EuO barriers in tunneling junctions has great potential for spin-injection, spin-detection and other spintronic applications. Here we present work done on EuO films with thicknesses varying from 10 to 60 Å grown as a stepped wedge on Si/Cr(20 Å)/Cu(90 Å) and capped with Y(20 Å)/Al(80 Å). The films were characterized by x-ray resonant scattering (XRS) and x-ray magnetic circular dichroism (XMCD) at the europium M_{4,5} and copper L₃ edges. The films' high quality and consistent magnetic properties were confirmed by SQUID magnetometry, which revealed a constant saturation moment independent of film thickness. XAS at the Cu L₃ edge showed that the bottom Cu electrode is metallic (oxidation free). XRS measurements at the Eu M₅ and Cu L₃ edges reveal that the top (EuO/Y) interface is smoother than the bottom (Cu/EuO) interface (perpendicular roughness values of 2.8 and 3.7 Å respectively). We report an XMCD intensity of 52% (Fig. 1), the highest measured thus far, and in close agreement with theoretical predictions. Experiments were carried out at the Advanced Light Source and the National Synchrotron Light Source, both supported by U.S. D.O.E.

References: 1. J. B. Goedkoop, B. T. Thole, G. van der Laan, G. A. Sawatzky, F. M. F. de Groot and J. C. Fuggle, Phys. Rev. B 32, 5107 (1985).



XMCD spectra corrected for incomplete magnetization at 18 K, saturation moment and fraction of EuO. Inset: Normalized XMCD spectra overlaid, confirming that the dichroism originates only from ferromagnetic EuO.

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