Towards Room Temperature Spin Filtering in Oxide Tunnel Junctions$^1$ JODI IWATA-HARMS, FRANKLIN WONG, University of California, Berkeley, ELKE ARENHOLZ, Advanced Light Source, Lawrence Berkeley National Laboratory, YURI SUZUKI, University of California, Berkeley — Spin filtering, in which the magnetic tunnel barrier preferentially filters spin-up and spin-down electrons from a nonmagnetic electrode, has been demonstrated in junction heterostructures. By incorporating two spin filtering barriers, double spin filter magnetic tunnel junctions (DSF-MTJs) were predicted to yield magnetoresistance (MR) values orders of magnitude larger than that of conventional magnetic tunnel junctions. Recently, DSF-MTJs have exhibited spin filtering with magnetic electrodes at room temperature and at low temperature with nonmagnetic electrodes in EuS-based devices [1,2]. We have fabricated DSF-MTJs with nonmagnetic SrRuO$_3$ electrodes and room temperature ferrimagnets, NiFe$_2$O$_4$ and CoFe$_2$O$_4$, for spin filters in pursuit of room temperature functionality. Atomic force microscopy shows smooth films quantified by roughness values between 0.1–0.5nm. X-ray magnetic circular dichroism reveals ferromagnetic Ni$^{2+}$ and Co$^{2+}$, and element-specific hysteresis loops indicate the independent switching of the two spin filters. Transport data reveals junction MR and nonlinear I-V characteristics consistent with tunneling.


$^1$NSF Grant No. 0604277 and 1104401  
Jodi Iwata-Harms  
University of California, Berkeley

Date submitted: 15 Nov 2011  
Electronic form version 1.4