Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Direct elemental and magnetic contrast of magnetic thin films and nanoparticles measured by synchrotron X-ray scanning tunneling microscopy and spectroscopy ANDREW DILULLO, Argonne National Laboratory, IL 60439, USA, N. SHIRATO, M. CUMMINGS, Argonne National Laboratory, Lemont, IL 60439, USA, H. KERSELL, Ohio University, Athens, OH 45701, USA, S.-W. HLA, V. ROSE, Argonne National Laboratory, IL 60439, USA — Synchrotron X-ray scanning tunneling microscopy (SX-STM) combines two of the most robust characterization instruments of materials science in a single setting and it can provide elemental fingerprinting of materials down to the atomic limits [1]. Here, we show that the SX-STM can also be useful for the magnetic measurements with elemental specificity by combining tunneling microscopy and spectroscopy with the X-ray magnetic circular dichroism (XMCD) technique. The experiments are performed in the Advanced Photon Source beam line 4-ID-C using a custom-built SX-STM system. During the experiment, the circularly polarized synchrotron light is projected onto iron nanoclusters adsorbed on a cobalt thin film on Cu(111) surface, and the resulting photo-current is collected by a nano-fabricated SX-STM tip. The photocurrent intensity clearly reveals majority and minority spin states when measured at L2 and L3 edges of the magnetic materials. We will also discuss the enormous potential of this nascent technique in characterizations of materials at atomic limits.

[1] N. Shirato, M. Cummings, H. Kersell, Y. Li, B. Stripe, D. Rosenmann, S.-W. Hla, and V. Rose. Elemental Fingerprinting of Materials with Sensitivity at the Atomic Limit. Nano Lett. 14, 6499–6504 (2014).

Heath Kersell
Ohio Univ

Date submitted: 14 Nov 2014 Electronic form version 1.4