Buried-interface characterization in magnetic nanostructures using standing wave-excited x-ray emission and resonant inelastic x-ray scattering

Masamitsu Watanabe, RIKEN / LBNL, Brian Sell, UC Davis / LBNL, See-Hun Yang, IBM Almaden, Bongjin Mun, LBNL, Norman Mannella, Stanford / LBNL / UC Davis, Long Pham, UC Davis / LBNL, Stephanie Ritchey, UC Davis / LBNL, Akira Nambu, Univ. of Tokyo / LBNL, Farhad Salmasi, LBNL, Jinghua Guo, LBNL, Jeffrey Kortright, LBNL, S.S.P. Parkin, IBM Almaden, Charles Fadley, LBNL / UC Davis — Yang et al. (J. Phys. Cond. Matt. 14, L406 (2002)) have discussed a new method for studying buried interfaces using soft x-ray standing waves created by Bragg reflection from a multilayer mirror, combined with a wedge-shaped sample profile. Prior work has been based on photoemission, a photon-in/electron-out spectroscopy. We will here discuss the first experimental results of applying this method via more bulk-sensitive photon-in/photon-out spectroscopies: x-ray emission (XES) and resonant inelastic x-ray scattering (RIXS). We have measured XES and RIXS intensities from an Fe/Cr bilayer that is a prototypical giant magnetoresistance combination via both sample-scanning and rocking-curve methods. Magnetic circular dichroism has also been measured in Fe RIXS spectra. Combining this data with x-ray optical calculations permits determining the compositional and magnetic structure of the Fe/Cr interface. Work supported by DOE Off. of Science, Basic Energy Sciences, Mat. Sci. Div.