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Boron diffusion due to annealing in CoFeB/MgO/CoFeB interfaces: A combined HAXPES and NEXAFS study ABDUL RUMAIZ, NSLS, Brookhaven National Laboratory, CHERNO JAYE, JOSEPH WOICIK, NIST, WEIGANG WANG, Department of Physics, Johns Hopkins University, DANIEL FISCHER, NIST, C.L. CHIEN, Department of Physics, Johns Hopkins University
— We report the hard x-ray photo-electron spectroscopy (HAXPES) and near edge x-ray absorption fine structure (NEXAFS) of CoFeB|MgO|CoFeB tunnel junctions as a function of annealing time. Upon annealing, the oxidation state of B changes from predominantly elemental (0 valence) boron in the as deposited sample to higher oxidation in annealed samples as evident from HAXPES spectra. The NEXAFS spectroscopy results showed that upon heating, B species migrate towards the MgO and interact with it. A comparison of the tunnel junction NEXAFS signature with some standards suggests that the B forms a 3-fold coordinated boron compound in the MgO environment and 4-fold coordinated boron resembling Kotoite mineral in the CoFe/MgO interface.

Abdul Rumaiz
NSLS, Brookhaven National Laboratory

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