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Oxygen induced Dzyaloshinskii-Moriya interaction in Pt/CoFe and Cu/CoFe bilayers HANS T. NEMBACH, NIST and JILA University of Colorado, ERIC EVARTS, EMILIE JUE, JUSTIN M. SHAW, NIST — The Dzyaloshinskii-Moriya interaction (DMI) can exist in systems with broken inversion symmetry and gives rise to chiral domain-walls and skyrmions. So far research on bilayers has concentrated on systems, where a ferromagnet is in contact with metallic high spin-orbit materials. The early work on DMI has focused on bulk magnetic oxides. The weak ferromagnetism in these oxides, for example Fe_2O_3, originates from the DMI, which has been explained in terms of anisotropic superexchange. In order to answer the question if ferromagnet/oxide bilayers also exhibit DMI, we have prepared Pt/CoFe and a Cu/CoFe sample series by sputter deposition. The CoFe layer was exposed in-situ for a time T of up to 1000 s to an Oxygen-Argon gas mixture to create an oxide coverage. The samples were subsequently capped by Cu/Ta to prevent further oxidation. We used the magnetic moment of our samples measured by SQUID magnetometry to quantify the thickness reduction during oxidation. We determined the DMI induced frequency-shift in these samples by Brillouin-Light-Scattering spectroscopy. The measured frequency-shift was corrected for surface anisotropy contributions before determining the DMI. We normalized the DMI to a 1nm ferromagnetic film thickness to account for the interfacial nature of the DMI. We found that in both sample series the DMI increases with the degree of oxidation, unambiguously demonstrating that the ferromagnet/oxide interface induces DMI in thin bilayers systems.

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