Contribution ID : **16** Type : **Talk**

Dynamic realignment of the antiferromagnetic structure of exchange-biased CoFe /MnPt

Monday, 4 November 2024 12:00 (20)

Neutron scattering studies were carried out on single crystal bilayers of exchange-biased MnPt(001)/CoFe grown epitaxially on MgO[001] using magnetron sputtering. Polarized neutron diffraction measurements taken around the hysteresis loop with sample aligned along the bias direction showed changing peak shape and width for the 101 reflections while the 100 reflection only showed weak intensity changes. This suggests a change in domain size in the out-of-plane direction while in-plane the domain size remains constant. The through-thickness anti-ferromagnetic structure of 100 nm thick MnPt films was successfully explained by a multi-domain model based on reorientation of the antiferromagnetic moments with a chiral structure. A model in which there is a partial twist at the turning points of the hysteresis loop with resulting relaxation and spin reorientation at saturation is consistent with the observations and provides an improved means to understand exchange-bias in thin films for use in future spintronic devices.

Topics

Magnetism and Condensed Matter

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Session Classification : Talks