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Determining the sign of exchange coupling in a chromia based perpendicular exchange bias heterostructure[1] UDAY SINGH, MIKE STREET, WILL ECHTENKAMP, CHRISTIAN BINEK, SHIREEN ADENWALLA, Univ of Nebraska - Lincoln — Exchange bias arises from the coupling at the AFM/FM interface and, has been observed and studied in a wide range of systems. A key property of exchange bias systems is the sign of the coupling between the ferromagnet spins and the interfacial antiferromagnet spins, which may be aligned either ferromagnetically (parallel) or antiferromagnetically (antiparallel). Antiferromagnetic exchange coupling is known to be the generic cause of positive exchange bias. Determining the sign of exchange coupling is straight forward in system where the coupling is weak and can be overcome by Zeeman energy on field -cooling. It is, however, a challenging task when the available magnetic field is low or the magnitude of the exchange coupling is high. Here, we present a technique to determine the sign of the exchange coupling using low fields. We measure the exchange bias field as a function of ferromagnet magnetization during field cooling and the resultant behavior of the exchange bias vs. the magnetization uniquely determines the sign of the coupling. We use this to measure the sign of the exchange coupling in a Cr_2O_3(300 nm)/Pd(0.5 nm)/[Co(0.3 nm)/Pd(1 nm)]$_3$ heterostructure thin film system and verify our results with the conventional high field method.

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