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Long-range behavior of exchange bias in CoFe/FeMn-based multilayers NAM DAO, Department of Materials and Engineering, University of Virginia, WEI CHEN, Department of Physics, University of Virginia, KEVIN WEST, DAVID KIRKWOOD, JIWEI LU, Department of Materials and Engineering, University of Virginia, STUART WOLF, Department of Materials and Engineering and Department of Physics, University of Virginia — CoFe/FeMn-interface-based multilayers were grown in magnetic field and at room temperature. The exchange bias field H_{EB} depends strongly on the order of depositions and is much higher for CoFe/FeMn than FeMn/CoFe bilayers. By combining the two bilayer structures into symmetric CoFe/FeMn (t_{FeMn})/CoFe trilayers, H_{EB} is enhanced for both the top and bottom CoFe layers. Enhancements of exchange bias are also observed by reducing the FeMn thickness t_{FeMn} of the trilayers. These results evidence the propagation of exchange bias between the two CoFe/FeMn and FeMn/CoFe interfaces mediated by the FeMn antiferromagnetic order. Furthermore, the exchange bias is even considerably increased when a thin Al or Mg layer is inserted into the CoFe/FeMn interface (i.e., CoFe/Al/FeMn or CoFe/Mg/FeMn) and persists for the insertion layer thicknesses of up to about 1.5 nm. These results strongly indicate that exchange bias is not a pure interfacial phenomenon, but mainly governed by possible long-range couplings such as dipole-dipole and RKKY between the antiferromagnetic uncompensated spins and the ferromagnetic layer.

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