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Micromagnetic simulation to observe the reversal mechanism in exchanged biased system of NiFe/NiMn JYOTIRMOY SAHA, Department of Physics & Astronomy, University of Minnesota, Minneapolis, MN 55455, USA, RANDALL VICTORA, Electrical and Computer Engineering, University of Minnesota, Minneapolis,MN 55455, USA — Understanding the mechanism of exchange interaction between a ferromagnet (FM) and an antiferromagnet (FM) has been both a scientific and technological endeavor in recent years. However, the theoretical and computational efforts so far have rarely predicted important parameters such as exchange bias (H_E) and enhanced coercivity (H_c) for any particular system. In our attempt to explain the same, we have simulated the behavior of a FM (NiFe) in the presence of a polycrystalline AF (NiMn) through a moment-moment interaction. To incorporate the surface roughness of the AF grains, the surface spins were selected using a random number generator. This assigned a net moment to each AF grain at the interfacial surface. Our design incorporates about a quarter million cubes which has been the key factor to our understanding of the magnetization reversal mechanism. The time evolution of the FM moments is governed by the solution to the Landau Lifshitz Gilbert equation. The hysteretic behavior of the AF grain includes the effect of thermal excitation. Our results indicate that the reversal mechanism can be either domain nucleation or uniform rotation depending on field direction and training. The hysteresis loop yields an exchange bias of 120 Oe and enhanced coercivity of 100 Oe.

Randall Victora
Electrical and Computer Engineering, University of Minnesota
Minneapolis,MN 55455, USA

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