PAPER

Exchange bias in $BiFeO_3$ and $Bi_{0.9}La_{0.1}FeO_3$ nanoparticles

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Abstract

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The exchange bias (EB) effects of $BiFeO_3$ (BFO) and $Bi_{0.9}La_{0.1}FeO_3$ nanopowders are investigated. An EB field of 152 Oe and 902 Oe at 60 K are observed for BFO and $Bi_{0.9}La_{0.1}FeO_3$, respectively, when cooled in 20 kOe magnetic field. The enhancement of EB values in the case of $Bi_{0.9}La_{0.1}FeO_3$ is explained based on the combination of Malozemoff's and domain state models. Training effect measurements data fitted with Binek's model suggested that the origin of EB lies in the interaction between the antiferromagnetic (AFM) core and the soft magnetic shell. Memory effect measurements, thermoremanent and isoremanent magnetization studies, and time decay of thermoremanent magnetization studies are done to understand the nature of the shell of both the samples. Time decay of thermoremanent magnetization of BFO is fitted with a stretched exponential based on Kohlrausch–Williams–Watt model, the obtained shape parameter value lies in the range of Heisenberg type spin-glasses. From thermoremanent and isoremanent magnetization plots, a 2D-diluted AFM shell is

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