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Influences of lateral domains and interfacial domain wall formation on exchange bias phenomena in TbFe/GdFe bilayers STEPHANE MANGIN, THOMAS HAUET, FRANCOIS MONTAIGNE, LPM, U.H.P-Nancy I, BP 239 F-54506 Vandoeuvre cedex, France, YVES HENRY, IPCMS-GEMM, F-67037 Strasbourg cedex, France, ERIC FULLERTON, Hitachi GST, San Jose, CA
— We have studied the exchange bias (EB) in a ferrimagnetic TbFe/GdFe bilayer with antiferromagnetic interfacial coupling as a function of magnitude and angle of the cooling field. The magnetic configuration inside both layers has been followed by ultra sensitive magnetoresistance measurements. For increasing cooling field strength or angle from the GdFe easy axis we observe a continuous transition from negative to positive exchange bias. These effects are explained by the quenching of the magnetic configuration inside the random-anisotropy TbFe layer which leads to the presence of a frozen partial interface domain wall. The transition from positive to negative EB results from the continuous rotation of the direction of the interfacial pinning acting on the GdFe layer. Effects of the chirality of this domain wall on the EB have also been indentify. Finally the effect of lateral magnetic domains on EB have been investigated. The occurrence of multi-domain state is found to give rise to exotic and tunable hysteresis loops at low temperature that depend strongly on whether the domains are present in the TbFe or GdFe layers during cooling. The results are fully understood by taking into account both the presence of lateral domains and an interfacial domain wall.

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