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Stabilization of surface spin glass behavior in core/shell-Fe67Co33/CoFe2O4 nanoparticles GHULAM JAFFARI, Department of Physics and Astronomy, University of Delaware, Newark DE 19716, SYED ALI, Physikalisches Institut (IIA), RWTH Aachen University, 52056 Aachen, Germany, SYED HASANAIN, Department of Physics, Quaid-i-Azam University, Islamabad 45320, Pakistan, GERNOT GÜNTHERODT, Physikalisches Institut (IIA), RWTH Aachen University, 52056 Aachen, Germany, SYED SHAH, Department of Physics and Astronomy, University of Delaware, Newark DE 19716, Department of Materials Science and Engineering, University of Delaware — Magnetic properties of Co33Fe67–CoFe2O4 (core-shell) nanoparticles are presented. Both dc magnetization and ac susceptibility measurements indicate a spin glass (SG) like transition occurring at TF ∼175 K. The SG nature of the transition is also confirmed by the field dependence of the freezing temperature TF(H) following the well known Almeida–Thouless line, $\delta T\mathrm{F}\sim\mathrm{H}^{2/3}$. Additionally, the particles exhibit a large exchange bias (HEB ∼ 1357 Oe) arising from the core-shell (ferromagnetic-SG) coupling. The unusually high SG transition temperature and large exchange bias effects are attributed to a combination of several factors including the thickness of the amorphous oxide shell and large values of the exchange and anisotropy constants associated with the CoFe2O4 shell.

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