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Studies of Magnetization Reversal and Switching Characteristics of Individual Iron Filled Carbon Nanotubes using Cantilever Magnetometry PALASH BANERJEE, M.R. HERMAN, D.V. PELEKHOV, YU. OBUKHOV, P. CHRIS HAMMEL, Dept of Physics Ohio St University Columbus OH 43210, F. WOLNY, S. PHILIPPI, T. MÜHL, A. LEONHARDT, B. BÜCHNER, Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany — Iron-filled carbon nanotubes (FeCNTs) form a class of novel materials in which a single-crystal iron nanowire is encapsulated within a carbon nanotube. The iron filled core can be grown to significant lengths (10–15 μm). Their narrow diameters (15–25 nm) and high crystalline quality make them promising candidates for studying magnetism in thin nanowires. We present a detailed characterization of the magnetic properties of a single FeCNT. These were measured by attaching individual FeCNTs to silicon cantilevers and performing ultrasensitive cantilever magnetometry. We find that the magnetization reversal in the FeCNT occurs at an exceptionally well defined and reproducible switching field and in a single step. These switching fields are characterized by a narrow distribution ($\sim$ 1 Gauss) and their measured temperature dependence reveals that their magnetization reversal is thermally activated. We also compare and contrast these results with the low temperature switching behavior of high anisotropy individual micron sized SmCo particles and FePt nanoparticles.

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