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$NdCo_5$ Nanoflakes and Nanoparticles Produced by Surfactant-Assisted High Energy Ball Milling[1] NILAY GUNDUZ AKDOGAN, WANFENG LI, GEORGE HADJIPANAYIS, Department of Physics and Astronomy, University of Delaware, Newark, DE, U.S.A. — The study of size and surface effects in rare earth transition metal nanoparticles is scientifically very important. In this work our studies were focused on $NdCo_5$ which is interesting because of its complex magnetic ordering behavior at different temperatures. Anisotropic $NdCo_5$ nanoparticles have been produced by surfactant-assisted high-energy ball milling (HEBM) of nanocrystalline precursor alloys. A two-stage ball milling method has been employed to produce the $NdCo_5$ nanoflakes and nanoparticles. $NdCo_5$ flakes have a thickness below 150 nm and an aspect ratio as high as 10^2 - 10^3; the nanoparticles have an average size of 7 nm. Both the nanoparticles and nano-flakes showed high coercivities at low temperatures, with values at 50 K of 3 kOe and 3.7 kOe, respectively. The high values of coercivity observed in a planar anisotropy phase can be attributed to the large surface anisotropy of nanoparticles that leads to an effective uniaxial-type of behavior. The nanoparticles also showed spin reorientation temperatures which are lower when compared to the bulk values.

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