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Magnetic Studies on $Nd_2Fe_{14-x}Mn_xB$ Nanoflakes and Nanoparticles Produced by Surfactant-Assisted High Energy Ball Milling[1] GEORGE HADJIPANAYIS, NILAY GUNDUZ AKDOGAN, WANFENG LI, Department of Physics and Astronomy, University of Delaware, Newark, DE, U.S.A. — High temperature magnetic ordering studies on rare earth transition-metal nanoparticles and nanoflakes present a great challenge due to the very high reactivity of these materials. It is well known that Mn substitution for Fe in $Nd_2Fe_{14}B$ compound decreases the Curie temperature to a temperature range that allows for reliable measurements to be made. In this work, we have studied the magnetic properties of Mn substituted $Nd_2Fe_{14}B$ particles in the temperature range of 50-400 K. $Nd_2Fe_{14-x}Mn_xB$ nanoparticles and nanoflakes have been produced by surfactant-assisted high-energy ball milling (SA-HEBM). Different size nanoparticles have been obtained by varying the milling conditions. Anisotropic $Nd_2Fe_{14-x}Mn_xB$ nanoparticles have been found with a size from 13 to 25 nm. Both the nanoparticles and nano-flakes showed high coercivities at low temperatures, with values at 50 K of 2.4 kOe and 5.5 kOe, respectively. The Curie temperature was determined from the temperature dependence of magnetization. We have observed a different magnetic ordering behavior in the nanoparticles with Curie temperatures that are higher when compared to the bulk values.

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