Hydrothermal preparation of high saturation magnetization and coercivity cobalt ferrite nanocrystals without subsequent calcination.

Abstract

In this work, CoFe2O4 nanocrystals with high saturation magnetization (Ms) and high coercivity (Hc) have been fabricated via a simple hydrothermal method and without subsequent calcination. The resulting CoFe2O4 nanocrystals are characterized by X-ray diffraction, transmission electron microscopy, scanning electron microscopy, energy-dispersive X-ray spectrometry, differential scanning calorimetry and vibrating sample magnetometry. The results indicate that CoFe2O4 nanocrystals are single crystal and the average crystallite size is increasing with the hydrothermal temperature. The electron micrographs show that the nanocrystals are well-dispersed and possess uniform size. The shape of CoFe2O4 nanocrystals is transformed from spherical into rod by increasing the hydrothermal temperature. The nanocrystals show relatively high Ms of 74.8 emu g−1 and Hc of 2216 Oe, as compared to previous reported results. The obtained results reveal the applicability of this method for efficiently producing well crystallized and relatively high magnetic properties CoFe2O4 nanocrystals as compared to other methods. More importantly, it does not require further calcination processes.

Keyword: Chemical synthesis; Magnetic materials; Magnetic properties; Nanostructures.