

High coercivity sized controlled cobalt–gold core–shell nano-crystals prepared by reverse microemulsion

ABSTRACT

Size-controlled cobalt–gold core–shell nanoparticles were synthesized via the reverse-micelle microemulsion method. In order to control the size of the nanoparticles, the nucleation and growth process were performed within a confined space by adjusting the water to surfactant ratio of reverse micelles solution during synthesis. The crystallinity percentage and percentage of phases presented in Co/Au core–shell nanoparticles were calculated using X-ray diffraction data. The results from transmission electron microscopy provide direct evidence for core–shell structure nanomaterials. Magnetic properties of the samples were investigated using a vibrating sample magnetometer. The as-prepared samples showed significant coercivity at room temperature. The intrinsic blocking temperature was experimentally deduced from zero-field-cooled warmed (ZFC-W) curves by a simple method without employing an external magnetic field. The B-field dependence temperature data of Co/Au nanoparticles exhibited an intrinsic blocking temperature at 45 K. Annealing these samples at 400 °C caused an increase in particle size, crystallinity percentage and further enhanced their magnetic properties.

Keyword: A. Magnetic materials; A. Nanostructures; B. Chemical synthesis; B. Magnetic properties; C. X-ray diffraction