

Recording-media-related morphology and magnetic properties of crystalline CoPt₃ and CoPt₃-Au core-shell nanoparticles synthesized via reverse microemulsion

ABSTRACT

A comparative experimental study of the magnetic properties of CoPt₃ and CoPt₃/Au nanoparticles as well as a detailed study of the structural properties of the samples by X-ray diffraction, Transmission electron microscopy, and vibrating sample magnetometer is presented in this work. In addition, the effect of particle size on the structure and magnetic properties of nanoparticles prepared by microemulsion is studied. The correlation between particle size, crystallinity, and magnetization was studied as well. CoPt nanoparticles have been studied intensively over the last decade because of their increased magnetic anisotropy in the ordered phase that can be interesting for high density magnetic recording. A significant high coercivity for as-prepared CoPt₃ and CoPt₃-Au nanoparticles was obtained at room temperature and enhanced after annealing. The focused aim of our study is to obtain high coercivity at room temperature that follows the Curie-Weiss law. This indicates an interacting system in which the nanoparticles behave like single domain ferromagnetic materials in the particle size range of 8 to 35 nm. In addition, the interaction increases by cooling the samples to low temperature around 15 K. Temperature dependence 1/M graph was obtained to investigate the behavior of nanoparticles at low temperature and shows the best fit with Curie-Weiss mode.

Keyword: Magnetic properties; Nanoparticles; CoPt₃; CoPt₃-Au; Reverse microemulsion