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Effect of boron addition on the structure and magnetic properties of CoPt nanoparticles

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We reported the effect of boron addition on magnetic properties and structure of CoPt nanoparticles. The CoPt-B nanoparticles were synthesized by means of the polyol process. The magnetic property measurement showed that the CoPt-B sample exhibited a much larger coercivity compared to the sample without B additive at the same annealing temperature. Transmission electron microscopy and energy dispersive X-ray spectroscopy revealed that the average particle size was about 2 nm for the as-synthesized sample with the ratio of Co and Pt was close to 1:1. After annealing, the particle sizes increased but the composition was maintained. The phase transformation of the nanoparticles versus temperature was investigated using a combination of X-ray diffraction and in-situ X-ray absorption analysis. It was shown that the phase transition temperature at which the nanoparticles change from the disordered A1 phase to the ordered L10 phase occurs at temperature of 600 ⊠C. We concluded that boron additives could reduce the ordering temperature of CoPt of about 100 ⊠C.
The addition of B at up to 60% promoted the formation of the L10 phase when the nanoparticles were subjected to annealing at 600 ⊠C. If the B content is higher than 60%, the phase transition is suppressed. The evidence of B addition on the structure of CoPt nanoparticles was further supported by the magnetic measurements. The results show that the coercivity of the annealed CoPt-B nanoparticles was enhanced by the B additions from 20 to 60%, with the maximum coercivity of 12,000 Oe for the CoPt-40%B sample.

Keywords: CoPt, nanoparticles, magnetic properties, boron addition, phase transformation, recording media

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