

High coercivity and giant magnetoresistance of CoAg, CoCu granular films

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Abstract: We report our study on the structure, magnetic and giant magnetoresistance properties of two systems: $\text{Co}_x\text{Ag}_{1-x}$ ($x=33, 48, 49, 52$ at%) and $\text{Co}_y\text{Cu}_{1-y}$ ($y=11, 13, 15, 17$ at%) granular films prepared by RF sputtering. The thermal transition measured by the SDT 2960 apparatus revealed exothermal peaks at 400 °C, corresponding to the crystallization of FCC-Co crystallites. The studied films were annealed in a temperature range of 300-450 °C for 1 h. The structure and particle size were determined from the X-ray diffraction data. Superparamagnetic state was shown in as-deposited films. After appropriate heat treatment, coercivity increased up to 1100 Oe in the $\text{Co}_{52}\text{Ag}_{48}$ film annealed at 350 °C, and 690 Oe in the $\text{Co}_{13}\text{Cu}_{87}$ film annealed at 400 °C. Maximum magnetoresistance up to 4.25% in the $\text{Co}_{48}\text{Ag}_{52}$ film, and 5.4% in the $\text{Co}_{15}\text{Cu}_{85}$ film annealed at 400 °C was obtained. Our values for magnetoresistance are quite high compared with recent studies. © 2006 Elsevier B.V. All rights reserved.

Author Keywords: Giant magnetoresistance; Metal nanoparticle; Nanogranular alloy; Superparamagnetism; Thin film

Index Keywords: Annealing; Cobalt compounds; Coercive force; Giant magnetoresistance; Magnetoresistance; Magnetron sputtering; Superparamagnetism; Granular films; Metal nanoparticles; Nanogranular alloys; Thin films

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