Thickness and composition dependences of magnetic and magnetotransport properties of granular thin films Co$_x$Ag$_{100-x}$

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In this contribution we analyze the microstructure, magnetoresistive and magnetic properties of granular alloy films of Co$_x$Ag$_{100-x}$ as a function of sample thickness (20 ≤ d ≤ 85 nm) and composition (15 ≤ x ≤ 90 at.%). Samples with different thickness show a nonmonotonic dependence of magnetoresistance as a function of concentration [ΔR/R$_S$(x)]. For low and high x the magnetoresistance is very weak (ΔR/R$_S$ < 0.5%), however the origin of this effect is different. For the low concentration the distance between Co grains is large and the spin dependent transport is reduced. In contrary, for high x the threshold of structural percolation is exceeded and the Co grains are in direct contact. The Co concentration corresponding to the maximal values of ΔR/R$_S$ increases with the decreasing thickness of the sample. For example, ΔR/R$_S$ ≈ 12% and 4% were achieved for d = 85 nm, x = 32 at.% and d = 35 nm, x = 40 at.%, respectively.