Thickness and composition dependences of magnetic and magnetotransport properties of granular thin films Co_xAg_{100-x}

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In this contribution we analyze the microstructure, magnetoresistive and magnetic properties of granular alloy films of Co_xAg_{100-x} as a function of sample thickness ($20 \leq d \leq 85$ nm) and composition ($15 \leq x \leq 90$ at.%). Samples with different thickness show a nonmonotonic dependence of magnetoresistance as a function of concentration $[\Delta R/R_S(x)]$. For low and high x the magnetoresistance is very weak ($\Delta R/R_S < 0.5\%$), 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 $\Delta R/R_S$ increases with the decreasing thickness of the sample. For example, $\Delta R/R_S \approx 12\%$ and 4% were achieved for $d = 85$ nm, $x = 32$ at.% and $d = 35$ nm, $x = 40$ at.%, respectively.