Physical properties of epitaxially-grown $Cr_{100-x}Co_x$ alloy films

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In $Cr_{100-x}Co_x$ alloys the Co local moment is strongly coupled to the spin-density-wave (SDW). It is therefore expected that dimensionality should more strongly influence the SDW, and thus the various properties of this system, than in the case of pure Cr. In order to probe this, the present study extends investigations to include epitaxial $Cr_{100-x}Co_x$ thin films, with $0< x <8$ and thickness 200 nm. Samples were prepared on MgO(100) substrates using DC magnetron co-sputtering. The magnetic phase diagram for these samples indicates a decrease in Néel temperatures (T_N) up to a triple point concentration of x_L=2.6, where after the T_N values increase and peak at $x \approx 5$. Hall coefficients determined at 2 K, R_H^{2K}, as function of x shows a peak at $x \approx 4$. XRD analyses indicate that for samples with $x \approx x_L$ the crystal coherence length in growth direction (100) is a maximum, while the mosaicity is a minimum. AFM studies indicate roughness is a minimum at x_L, where cubical structures are observed. Structures for $x < x_L$ are small and elongated, while for $x > x_L$ large tilted cubic structures are formed.