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Electrical properties of Cr_{100-x}Co_x alloy thin films on oriented MgO (100)

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Abstract content (Max 300 words) http://events.saip.org.za/getFile.py?target=_blank **Formatting** **Special chars**

The magnetic phase diagrams of Cr with group-8 magnetic transition metals Co and Fe exhibits a triple point, where the incommensurate (I) spin density wave (SDW), commensurate (C) SDW and paramagnetic (P) phases converge [1]. Cr-Co alloys has shown considerable promise in practical applications because of its Invar-like properties [2], as well as the fact that Cr/Co multi-layered systems show enhancement of the SDW due to the exchange interaction between the Co moments and the SDW these alloys [3]. This can find application in recording and storage media. Comparison between Cr in bulk and thin film forms revealed dimensionality plays an important role in modifying the SDW structure [4] and this study extends these investigations to include Cr-Co. Epitaxial Cr_{100-x}Co_x thin films of thickness (*t*) 200nm, with 0 < *x* < 8, were prepared on MgO(100) substrates using DC magnetron co-sputtering techniques. The epitaxial nature of these monolayers was confirmed using XRD analyses. The resistivity (*ρ*) for these samples was determined in the temperature range 2K < *T* < 395K and the temperature associated with the minimum in the *dρ/dT* versus *T* curves were used to determine the Néel transition temperatures (*T_N*) for the individual samples. The *T_N* versus *x* plot for this sample series shows that *T_N* decreases up to 2at.% Co and then increases, reaching a maximum at approximately 6at.% Co. Hall coefficients (*R_H*) for the films with *x* = 1 and 4 were determined on cooling from 300K down to 2K, in a constant magnetic field of 5 T. Interestingly, the *R_H* versus *T* plots appears to reveal a spin-flip transition at about 100K for 1at.% Co thin film, while it is absent for 4at.% Co sample. The present results will shed light on the effect of dimensionality on the electrical properties of the Cr-Co alloys.

[1] Fawcett E *et al*. 1994 *Rev. Mod. Phys.* **66** 25

[2] K. Fukamichi *et al*. 1976 *Trans. Jpn. Inst. Metall.* **17** 125

[3] Ge S *et al*. 1988 *J. Appl. Phys.* **63**(8) 4297

[4] Zabel H 1999 *J. Phys. Condens. Matter* **11** 9303

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No

Level for award (Hons, MSc, PhD)?

-

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Yes

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