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Magnetic susceptibility studies of the (Cr_{98.4}Al_{1.6})_{100-x}Mo_x alloy system

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Abstract content
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The magnetic behaviour of the Cr_{100-y}Al_y alloy system around the triple point concentration y_t ≈ 2 has recently attracted renewed interest amongst Cr alloys [1]. The temperature of the triple point concentration on the Cr_{100-y}Al_y magnetic phase diagram can be suppressed to below 2 K by the addition of Mo for y fixed at 1.6 at.% Al to form a (Cr_{98.4}Al_{1.6})_{100-x}Mo_x ternary alloy system. Previous studies on the (Cr_{98.4}Al_{1.6})_{100-x}Mo_x alloy system through electrical resistivity (ρ), Seebeck coefficient (S) and specific heat (C_p) showed the existence of a possible quantum critical point around 4.5 at.% Mo [2]. The present study was undertaken in order to extend the previous findings on this alloy system, through magnetic susceptibility (χ) measurements. Samples in the form of cylindrical discs were cooled from 300 K to 4 K in a zero magnetic field. Measurements were then taken from 4 K to 300 K in a constant magnetic field of 100 Oe. Alloys in the concentration range 0 ≤ x ≤ 3.0 depict anomalous χ(T)-behaviour in the temperature range of the Néel transition. This is attributed to local magnetic moments formed around the impurity atoms [3]. Néel temperatures obtained from χ(T) measurements decrease with Mo concentration and disappear near a critical concentration x_c = 4.5, where antiferromagnetism is suppressed to below 4 K. The present results corroborate the previous findings on this alloy system [2].

[1] Sheppard C J, Prinsloo A R E, Alberts H L, Muchono B and Strydom A M 2014 J. Alloys and Compounds 595 164
[2] Muchono B, Prinsloo A R E, Sheppard C J, Alberts H L and Strydom A M 2014 J. Magn. Magn. Mater. 354 222
[3] de Oliveira L M, Ortiz W A and de Oliveira A J A 2003 J. Appl. Phys. 93 7154

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Yes

Level for award
 (Hons, MSc,
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PhD

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