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Influence of magnetic field on the transition temperature of the $(\text{Cr}_{84}\text{Re}_{16})_{89.6}\text{V}_{10.4}$ alloy

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Abstract content (Max 300 words)

In recent years interest in quantum critical behaviour (QCB) has intensified, as is reflected in literature [1,2,3]. A quantum critical point (QCP) is typically found in a material where the phase transition temperature has been driven or tuned to zero by the application of a tuning parameter such as magnetic field, pressure or through doping [1]. Previous studies on the $(\text{Cr}_{84}\text{Re}_{16})_{100-y}\text{V}_y$ alloy system, utilizing doping as a tuning parameter, showed the existence of a putative QCP at a critical concentration y_c of about 10.5 [4]. The present study extends these results by focusing on the antiferromagnetic alloy with $y = 10.4$ and using a new tuning parameter. The $(\text{Cr}_{84}\text{Re}_{16})_{89.6}\text{V}_{10.4}$ alloy has a concentration very close to y_c and possible QCB in this sample is investigated through the application of magnetic field. Magnetic susceptibility (χ) was measured as function of temperature (T) in the temperature range $1.9 \text{ K} < T < 200 \text{ K}$. The sample was cooled to 2 K in zero field, followed by measurements being collected upon warming the sample in static applied fields (H) in the range 0.01 T to 6.5 T. The $\chi(T)$ curves obtained for the various applied fields each show a clear peak and the temperature associated with the peak was taken as the Néel temperature (T_N). Results indicate that the sharpness of the peak improves with field and that the application of field suppresses T_N . The $T_N(H)$ curve shows a sharp gradient up to 2 T of approximately -6.177 K/T. In the region $2 \text{ T} < H < 6 \text{ T}$ a gradient of approximately -1.823 K/T is observed, above which the $T_N(H)$ curve tends to level off. Interesting conclusions are drawn from the present work and future investigations utilizing higher fields are proposed.

[1] Lee M, Husmann A, Rosenbaum TF and Aeppli G 2004 *Phys. Rev. Lett.* **92** 187201

[2] Yeh A, Soh Y, Brooke J, Aeppli G and Rosenbaum TF 2002 *Nature* **419** 459

[3] Takeuchi J, Sasakura H and Masuda Y 1980 *J. Phys. Soc. Japan* **49** 508

[4] Jacobs BS, Prinsloo ARE, Sheppard CJ and Strydom AM 2013 *J. Appl. Phys.* **113** 17E126

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD)?

PhD

**Main supervisor (name and email)
and his / her institution**

Prof ARE Prinsloo
alettap@uj.ac.za
University of Johannesburg

**Would you like to
 submit a short paper
 for the Conference
 Pro-
ceedings (Yes / No)?**

Yes

Primary author: Mrs JACOBS, Bincy Susan (University Of Johannesburg)

Co-authors: Prof. PRINSLOO, Aletta (University Of Johannesburg); Prof. STRYDOM, Andre (University Of Johannesburg); Dr SHEPPARD, Charles (University Of Johannesburg)

Presenter: Mrs JACOBS, Bincy Susan (University Of Johannesburg)

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