Contribution ID: **24** Type: **Oral Presentation**

Magnetic Phase Diagram of Cr_{100-_{<I>x</I>}}Os_{<I>x</I>}alloys

Tuesday, 9 July 2013 10:30 (20 minutes)

Abstract content
   (Max 300 words)

The magnetic phase diagram of Cr_{100-<I>x</I>}Os_{<I>x</I>} exhibits a triple point at <I>T</I>_L = 315 K and <I>x</I>_L = 0.14,where the incommensurate (I) spin-density-wave (SDW),commensurate (C) SDW and paramagnetic (P) phases coexist. Previous studies [1,2] focused on measurements around the triple point and concentrations up to <I>x</I> = 2. However, the magnetic phase diagrams [1] of other Cr alloys with group-8 diluents, such as those of Cr-Re and Cr-Ru, show interesting features for <I>x</I> » <I>x</I>_L.This is indicative of the possible merits of an investigation into the magnetic phase diagram of Cr-Os,specifically at high diluent concentrations. For this purpose, a polycrystalline Cr_{100-<I>x</I>}Os_{<I>x</I>} alloy series with 2 < <I>x</I> < 22 was prepared. Sample buttons were arc-melted from high quality starting materials and characterized using scanning electron microscopy, electron microprobe analysis and X-ray diffraction. Analyses show that the alloys are homogenous in composition and single-phase for Os diluent concentration up to <I>x</I> = 22. Electrical resistivity (<I>ρ</I>) measurements as function of temperature (<I>T</I>),in the temperature range of 2 K < <I>T</I> < 1100 K, was used to obtain the magnetic transition temperatures of the various alloys. The onset of antiferromagnetism causes large anomalies in the <I>ρ</I> versus <I>T</I> curves, associated with the Néel transition temperatures (<I>T</I>_N)[1]. These results were used to determine the magnetic phase diagram of the Cr_{100-<I>x</I>}Os_{<I>x</I>} alloy system for <I>x</I> > 2. Present results show that <I>T</I>_N increases up to 575 K at <I>x</I> = 4, and then decreases for <I>x</I> > 4. This behaviour is similar to that observed for other Cr alloys with group-8 impurities [1].Interestingly, results reveal that the antiferromagnetism in the Cr_{100-<I>x</I>}Os_{<I>x</I>} alloy system is fully suppressed at <I>x</I> = 13. The present results are interpreted and explained in terms of the theory of Fedders and Martin [3].

[1] Fawcett E, Alberts HL, Galkin VY, Noakes DR and Yakhmi JV 1994 Rev. Mod. Phys. 66 25.
[2] Butylenko AK and Nevadcha VV 1982 Sov. Phys. Tech. Phys. 27(1) 102.
[3] Fedders PA and Martin PC 1966 Phys. Rev. 143 245.

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

ARE Prinsloo,
alettap@uj.ac.za,
Department of Physics, University of Johannesburg, PO Box 524, Auckland Park, 2006

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

Primary author: Mr FERNANDO, Pius Rodney (PhD Student)

Co-authors: Prof. PRINSLOO, A R E (University of Johannesburg); Dr SHEPPARD, C J (University of Johannesburg)

Presenter: Mr FERNANDO, Pius Rodney (PhD Student)

Session Classification: DCMPM2

Track Classification: Track A - Division for Condensed Matter Physics and Materials