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Exploratory investigation of spin density wave behaviour of a $(\text{Cr}_{86}\text{Re}_{14})_{100-y}\text{V}_y$ alloy system

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The Cr-Re alloy system was chosen in order to investigate a previous observation of the co-existence of superconductivity and antiferromagnetism, as well as the possibility of a quantum critical point (QCP) in this alloy system. For the initial studies a $\text{Cr}_{86}\text{Re}_{14}$ mother alloy was doped with V in order to decrease the electron to atom ratio, resulting in a decrease in the Néel temperature (T_N). The preliminary study focused on first obtaining a pure body centered cubic (BCC) $\text{Cr}_{86}\text{Re}_{14}$ mother alloy, as in this alloy system, a secondary A15 phase may co-exist. X-ray diffraction and electron microprobe analyses of as-cast and annealed samples revealed only BCC structure with good homogeneity and actual Re concentration of 16 ± 1 atomic percent. In order to initiate investigations into the magnetic properties and possible quantum criticality in this system, electrical resistivity and magnetic susceptibility measurements as a function of temperature are reported for $(\text{Cr}_{86}\text{Re}_{14})_{100-y}\text{V}_y$ alloys with $y = 0, 5, 7$ and 9 . Electrical resistivity as a function of temperature for these samples reveal an anomaly on cooling through T_N . The anomaly observed shifts down to lower temperatures as the V concentration is increased. Magnetic susceptibility data supports these observations. These promising results warrant further investigation into this alloy system with the possibility of contributing towards the current interest in quantum criticality in chromium alloy systems.

Level (Hons, MSc, PhD, other)?

PhD

Consider for a student award (Yes / No)?

No

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

No

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