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Incommensurate magnetic order in PrNiAl_4

The RNiAl_4 intermetallic series (where $\text{R} = \text{Ln}^{3+}$) has been the subject of much investigation over a number of years. These compounds are known to possess some interesting magnetic behaviours including multiple magnetic phases and metamagnetism. TbNiAl_4 , ErNiAl_4 and NdNiAl_4 are all known to have incommensurate magnetic structures determined from neutron diffraction[1-3], whereas the presence of an incommensurate magnetic phase in PrNiAl_4 is more tentative, based only on specific heat and magnetisation measurements[4]. Recent neutron powder diffraction experiments have confirmed the presence of this incommensurate magnetic phase at 7 K and 7.5 K, well within the range of 6.9-8.1 K predicted by the specific heat data. Analysis of the diffraction patterns puts the propagation vector of the magnetic phase at $\mathbf{k} = (0.071(1), 1, 0)$, with the magnetic moments pointing along the a-axis.

[1] Hutchison W D, Goossens D J, Nishimura K, Mori K, Isikawa Y and Studer A J 2006 Journal of Magnetism and Magnetic Materials 301 352-8

[2] Hutchison W D, Goossens D J, Saensunon B, Stewart G A, Avdeev M and Nishimura K 2007 31st Annual Condensed Matter and Materials Meeting, (Wagga Wagga) Vol. 1 (Australian Institute of Physics)

[3] Mizushima T, Isikawa Y, Sakurai J, Mori K, Fukuhara T, Maezawa K, Schweizer J and Ressouche E 1994 Physica B 194 225-6

[4] Nishimura K, Yasukawa T, Mori K, Isikawa Y, Hutchison W D and Chaplin D H 2003 Japanese Journal of Applied Physics 42 5565-70

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