MAGNETIC PHASE TRANSITIONS IN $(Fe_{1-x}T_x)_3Ga_4$ ALLOYS

H.J. Al-Kanani[a], J.G. Booth[a] and K.Y. Ko[b]
[a]Physics Department, The University of Salford, Salford M5 4WT, UK
[b]Ulsan College of Technology, Ulsan, S. Korea

9.7 cm

The intermetallic compound Fe_3Ga_4 is known to be an itinerant metamagnet. In weak fields it is antiferromagnetic with a Néel temperature of 392 K but in strong fields it transforms metamagnetically to another magnetic state. In previous articles we have reported the effect of Mn, V and Cr substitutions for Fe and have interpreted the results in terms of the Moriya-Usami/Isoda theories of itinerant metamagnetism. This paper deals with the effects of Ni and Ti substitution in changing the magnetic phase diagram. Magnetisation measurements on the Ni and Ti substituted alloys revealed that in contrast to the other substitutions, the Ni and Ti substitutions induce completely different type of effects on the magnetic properties in general. In the case of Ni substitution ferrimagnetic-like type of magnetic order is induced at low composition and low temperatures. Unlike the other substitutions, Ti substitution produces a ferromagnetic ground state. Alloys with low composition as the temperature is increased show a field transition which starts to appear at about 50 K and which persists up to room temperature suggesting a phase transition from the ferromagnetic to an antiferromagnetic state. The phase diagrams of the Ti system are also explainable in terms of the Moriya-Usami and Isoda theories. The behaviour observed so far on the various substituted systems lead us to believe that there is a clear relation between the magnetic properties and the relative position of the substitution element with respect to Fe in the Periodic Table.

13.4 cm

Subject category :

5. Phase Transitions and Critical Phenomena

Presentation mode :
Poster

Corresponding author :
Professor J. G. Booth

Address for correspondence :
Joule Laboratory, Department of Physics
The University of Salford, Salford M5 4WT, UK

Email address :
j.g.booth@physics.salford.ac.uk