Magnetization Process near the Curie Temperature of an Itinerant Ferromagnet CoS_2

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The field dependence of the magnetization of an itinerant ferromagnet close to the Curie temperature has received considerable interests recently in relation to the theory by Takahashi for a weakly ferromagnetic itinerant electron system[1]. Experiments have been reported for ferromagnetic Heusler alloys, where the critical index delta has been observed to be nearly 5.0 for strongly ferromagnetic cases of Ni_2MnGa and Co_2CrGa rather than weakly ferromagnetic cases of Co_2TiGa and Co_2VGa[2]. In this report, experimental results are presented for a typical itinerant ferromagnet, CoS_2 with a ferromagnetic moment of 0.85 Bohr magneton and a Curie temperature of 120 K up to an applied field of 50 kOe. The critical index delta has been obtained to be 5.0. The result is described by the theory by Takahashi rather than by a conventional molecular field theory. A reliable method is proposed for determining the Curie temperature of a ferromagnetic material using M^4 versus H/M plot rather than a conventional Arrot plot.

[1]Y. Takahashi, J. Phys. Soc. Jpn. **55**, 3553 (1986), Y. Takahashi, J. Phys.: Condense. Matter **13**, 6323 (2001).
[2]H Nishihara, Y Furutani, T Wada, T Kanomata, K Kobayashi, R Kainuma, K. Ishida, T Yamauchi, Journal of Superconductivity and Novel Magnetism **24** (2010) 679 and references therein.