Thermodynamic Properties of Heusler Compounds $Ru_{2-x}Fe_xCrSi$

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Full-Heusler compounds with a generic chemical formula X_2YZ (X and Y are transition elements, Z is an sp element) attract much interests because this system shows a number of physical properties and some of them have a potential for the technological applications. We have measured specific heat $C_P(T)$ of Full-Heusler compounds $Ru_{2-x}Fe_xCrSi$ with $x = 0.1, 0.3, 0.5$ which show spin-glass behavior in its magnetic properties[1]
In $C_P(T)$ for each sample, a discontinuity indicating magnetic long range order is not observed at around temperature appearing a cusp-like peak anomaly in temperature dependence of magnetization $M(T)$. As is well known, $C_P(T)$ of a spin-glass system does not have discontinuity.
For all x samples, $C_P(T)$show quadratic-temperature (T^2)dependence in low temperature range. This is in contrast to simple linear-T dependence for conventional a spin-glass material. The quadratic-temperature dependence of $C_P(T)$ may be associated with Almeida-Thouless (AT) transition.

[1]M. Hiroi, T. Rokkaku, K. Matsuda, T. Hisamatsu, I. Shigeta, M. Ito, T. Sakon, K. Koyama, K. Watanabe, S. Nakamura, T. Nojima, T. Nakano, L. Chen, T. Fujiwara, Y. Uwatoko, H. Manaka, and N. Terada, Phys. Rev. B **79**, 224423 2011.