Spin-Glass and Antiferromagnetic Transitions in Ru$_{2-x}$Fe$_x$CrSi

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Measurements of the magnetization $M(T)$ of the Heusler compound Ru$_{1.9}$Fe$_{0.1}$CrSi have revealed two anomalies; one is a peak in $M(T)$ at $T_N^* \sim 30$ K and the other is strong irreversibility in $M(T)$ below T_N^*, the onset of which is defined as T_g. This behavior suggests successive spin-glass transitions, which may be interpreted in terms of theoretically proposed AT (de Almeida-Thouless) and GT (Gabay-Toulouse) transitions.[1] On the other hand, the properties of Ru$_2$CrSi were not investigated, and thus in the present study the magnetization $M(T)$ and specific heat $C_P(T)$ are investigated. Clear peaks observed in $M(T)$ and $C_P(T)$ indicate that an antiferromagnetic transition occurs at $T_N = 13$ K. This is in marked contrast with the case for Ru$_{1.9}$Fe$_{0.1}$CrSi, where no anomaly in $C_P(T)$ was observed at T_N^* or at any other temperatures.[2] In $M(T)$ for $0 < x < 0.1$ the characteristic two anomalies are also observed, and T_g (~ 15 K) appears not to change with x while T_N^* appears to decrease with decreasing x. This result suggests the relation between the anomaly at T_N^* and the antiferromagnetic transition at T_N for $x = 0$.

[1]M.Hiroi *et al.*, Phys. Rev. B **79**, 224423 (2009).
[2]M.Ito *et al*, Phys. Rev. B **82**, 024406 (2010).