The Fluctuation Character on the Existance of Magnetocaloric Effect

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Since the Curie temperature of Gd-metallic system which is on its stable-s-state is reported to be T_c=289 K even in high pressure, the cause of its higher value in some-Gd-intermetallic compounds with nonmagnetic elements is a question(Tc=340K).A strong exchange fluctuation can be considered where high resistivity ,surprising displacement of magnetic ions and even crystal phase trnsition is manifested. Even though exchange fluctuation is known to be the cause of phenomena, but the anisotropy must plays an important role which can be due to the competition of FM-AFM. But the nature of anisotropy in the Gd case should be cleared up where; the considered system is on its FM phase transition and the competition of two magnetic phases do not exist and even more the hydrostatic pressure effect does not change the behavior except a small change in compressibility. Since in the isostructural compounds the only parameters which determine the magnetic behavior as the sign and the strength of the exchange parameter J_{ij} is depend on; (1) the topological positions of the magnetic ions, and (2) the nature and the density of c.e, both of which are strongly depend not only on the nearest-neighbors but also on the correlation length defined by the $R_c = 2K_f R_{ij}$, there should exist a critical composite for which the R_c should be on its extremum value. At this value of R_c the dominance of dispersion of exchange or even the competition of magnetic ions (intra-cluster exchange) overcome the thermal fluctuations $\mu_0 H_{in} \geq K_B T$ where $H_{in} = \ll S_i.S_j \gg$ and consequently the fluctuation can be due to the displacement of the atomic positions in direction lowering of free energy resulted to increasing the entropy.

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