On the Conditions Leading to the Gaussian Distribution of the Magnetic Moments in a Spin-glass State

Pawel Gusin, Jerzy Warczewski, *University of Silesia, Institute of Physics,ul. Uniwersytecka 4, PL-40007 Katowice, Poland.* E-mail: pgusin@us.edu.pl; warcz@us.edu.pl

The unperturbed ideal ferromagnetic system is described by a Hamiltonian of the Heisenberg type with the coupling constants J_{ij} (i and j numerate the magnetic ions). The presence of dopants (or defects) affects the values of J_{ij} for the magnetic ions surrounded by these dopants (or defects) in the random way. Thus the magnetic properties of such a system will depend on: the number of magnetic ions surrounding a j-th magnetic ion and interacting with it with the coupling constants J_{ij}, the number of dopants (or defects) surrounding a j-th ion, the coupling constants between i-th and j-th ions in the presence of dopants (or defects), and the random probability distributions of appearance of dopants (or defects) between i-th and j-th ions. These distributions correspond – after introducing so-called "global" magnetic coupling constant (which turns out to be also random) - to the conditions of the central theorem of the theory of probability (the Lyapunov theorem). Thus the distributions of magnetic moments in such systems are Gaussian. Therefore one can use the Anderson-Edwards model of the spin-glass state in order to describe the system. Several examples of the spin-glass state are described in this approach.

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