SPIN GLASS LIKE BEHAVIOUR IN INTERACTING NANOPARTICLE SYSTEMS

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Abstract

Investigation of magnetic nanoparticle materials currently attracts vast research interest mainly due to the variety of their potential applications, but also from the fundamental point of view. Among the most intriguing topics regarding magnetism of these systems is slow spin dynamics including relaxation processes, aging (i.e., time dependence of magnetization) and memory effects (i.e., magnetization dependence on the system history). In the presence of significant interparticle interactions, relaxation dynamics of nanoparticle system drastically changes in comparison to the non/weakly interacting systems. In such a case, with the decreasing temperature and in the weak applied magnetic fields, progressive blocking of particle's magnetic moments is replaced with the freezing mechanism and the system is found to be in the spin glass like (SGL) state. Relaxation of magnetic moments becomes hierarchically constrained causing the occurence of nonequilibrium magnetic behaviour and phenomena. Although the certain theoretical and numerical efforts have been made (mainly through the implementation of canonical spin glass models) in order to interpret SGL behaviour [], the complete understanding of the experimentally observed effects and underlying physical processes is still unattainable. In this contribution, selected results of the experimental research focused on magnetic relaxation in strongly interacting nanoparticle systems will be discussed. The special attention will be devoted to the overview of the experimental procedures and protocols that can be used in DC and AC magnetization measurements in order to reveal complex nonequillibrium dynamics in SGL nanoparticle systems.

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