Novel aspects of ordering processes in spin-crossover materials due to elastic interactions.

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Spin-crossover materials are compounds with bistable spin states, the so-called high-spin (HS) state and low-spin (LS) state, in which cooperative phenomena may take place. We have studied such cooperative phenomena using an effective Ising spin model. Because of the degeneracy of HS and LS states, the model has a temperature dependent Zeeman energy which causes a variety of cooperative processes. Beside it, due to the difference of the cell unit size for HS and LS states, an effective long-range interaction emerges due to the elastic interaction for the lattice distortion[1]. This effective long-range interaction causes various interesting phenomena such as a finite correlation length at the second order phase transition point[2], macroscopic nucleation phenomena[3] and a peculiar domain wall propagation[4], etc. Recently, a peculiar structure of the phase diagram with a horn structure was found as a consequence of competition between the long-range interaction and a short-range repulsive interaction[5].

Moreover, it has recently been found that the elastic interaction causes interesting cooperative switching process between HS and LS phases after femtosecond laser pulse excitation. The elastically driven expansion (elastic step) takes place separately from that of heating effects (thermal step)[6,7].

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