Complex dynamics of self-generated magnetic clusters in phase-separated perovskites

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Systems of magnetic nanoparticles are interesting from both the scientific and technologic point of view. Nevertheless, practical realization of such systems involves usually sophisticated physical experimental setups or non trivial chemical routes [1]. In some cases solids generate spontaneously assemblies of magnetic regions whose behaviour resembles that of systems of magnetic nanoparticles. Here we show an example of how this happens in divalent-doped perovskites $La_{1-x}A_xMO_3$ (A= Ca, Sr; M= Mn, Co) with ferromagnetic interactions. In manganites and cobaltates the doping leads to a phase segregation of magnetic clusters. The complex dynamical behaviour caused by such segregation, that includes magnetic relaxation with slow decay and specific features in ac susceptibility [2,3], resembles the behaviour found in magnetic nanoparticle assemblies. A careful study of the non-linear susceptibility indicates a collective behaviour similar to non-conventional spin-glasses, as that found in strongly interacting nanoparticle systems [4]. In the case of cobaltates the behaviour is enriched with a changing spin-state of the cobalt ions with temperature [5].

References

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