

Introduction to Nanomagnetism: Basic Concepts and Applications

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Studies of magnetic nanoparticle systems have attracted much interest in the last few years owing to their fundamental interest and technological applications. In particular, the correlation of parameters such as size, morphology, crystalline structure, and shape of the particles with the resulting magnetic properties has been thoroughly investigated, but many open questions remain to be answered. Besides the effect of grain size distribution, which strongly affects the magnetic response of the system, important factors need to be controlled, such as the surface of the particles (both roughness and composition gradient), the shape, and the phases formed within the nanograins. Another crucial point is the role played by magnetic interactions among the magnetic entities. This subject has been extensively studied from both experimental and theoretical approaches, but up to now there it is not clear how the dipole-dipole interactions can affect the macroscopic magnetic response of the system.

An overview on the magnetic and magnetotransport properties of nanostructured magnetic materials will be presented, with particular emphasis on the basic features displayed by granular nanomagnetic solids [1]. Besides a review of the basic concepts and experimental techniques, the role of structural disorder (mainly the distribution of grain sizes), interparticle magnetic interactions and surface effects will be also presented with some detail. Recent results, models, applications and trends on the area will be also discussed.

References

[1] *M. Knobel, W.C. Nunes, L.M. Socolovsky, E. De Biasi, J. M. Vargas, J. C. De-nardin, J. Nanosci. Nanotech. Volume 8, Number 6, June 2008 , pp. 2836-2857(22).*