

Multiscale study of the magnetization dynamics in magnetic nanostructures: surface and interaction effects

In this talk, I will present the research activities of our team « Nanoscale spin systems ». Our main interest is to investigate the magnetization dynamics of nanostructured materials (nanoclusters, thin films...).

Because of the size reduction, the magnetic properties of these nanostructures are very different from those of the bulk. In particular, surface effects acquire a non negligible contribution and must then be taken into account. Moreover, for very small structures, the magnetization becomes inhomogeneous and it is necessary to describe it at the atomic level. Finally, nanoclusters may be either isolated or in interacting assemblies; in the latter case, a subtle competition between intrinsic and collective effects is usually observed.

Using different models and analytical and/or numerical calculations, we investigate the magnetization dynamics and compute various observables such as the magnetization, the magnetic susceptibility, the switching probability or time, the magnetic excitation spectrum... Our research activities are carried out in collaboration with experimental studies (micro-SQUID, Magnetic Resonance Force Microscopy, pump-probe spectroscopy...) and in association with other theoretical methods (ab initio calculations, Monte-Carlo simulations...).

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