CEA - Saclay 91191 Gif-sur-yvette Cedex

Service de Physique de l'Etat Condensé

SÉMINAIRE

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Mercredi 15 juillet 11h15

Orme des Merisiers SPEC Salle Itzykson, Bât.774

Ferromagnetic Resonance in Ultrathin Films and Nanostructures with Perpendicular Magnetic Anisotropy

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This talk will cover two types of ferromagnetic resonances studies we have conducted on transition metal thin films with perpendicular magnetic anisotropy (PMA): conventional FMR and spin-transfer driven FMR on individual (sub 150 nm lateral scale) nanostructures. An aim has been to understand the origin of the enhanced FMR linewidths in materials with PMA, which is one order of magnitude larger than soft magnetic materials, such as pure iron (Fe) and permalloy (NiFe) thin films. For the studies on thin films a broadband FMR setup has been used to investigate Ni/Co multilayer films. The FMR linewidth depends linearly on frequency for perpendicular applied fields and increases significantly when the magnetization is rotated into the film plane. Irradiation of the film with Helium ions decreases the PMA and the distribution of PMA parameters. This leads to a great reduction of the FMR linewidth for in-plane magnetization. These results suggest that fluctuations in PMA lead to a large two magnon scattering contribution to the linewidth for in-plane magnetization and establish that the Gilbert damping is enhanced in such materials ($\alpha = 0.04$, compared to $\alpha = 0.002$ for pure Fe). Spin-transfer driven FMR have been conducted on spin-value nanopillar junctions that incorporate Ni/Co multilayers. These results will be contrasted to those of extended films with the same layer structure. If time permits, results of studies of ST-FMR driven non-linear magnetization dynamics will be presented and discussed.

References: J. M. Beaujour et al., cond-mat/ arXiv:0905.4779 W. C. Chen et al., Applied Physics Letters 92, 012507 (2008) Journal of Applied Physics, 103, 07A502 (2008)
