Centre de Nanosciences et de Nanotechnologies

Séminaire

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11 h – C2N, Site Orsay, Salle 44

Bertrand Dupé
INSPIRE Group, Institute of Physics, Johannes Gutenberg University Mainz, Germany

"Interface engineering for topological spintronics"

Résumé

Surfaces and interfaces can host a wide range of physical phenomena: changes of chemical potential or hybridization can induce large spin orbit coupling and the breaking of inversion symmetry allows the emergence of new interactions. One of these interactions is the Dzyaloshinskii-Moriya (DMI) interaction. The DMI stabilizes chiral non-collinear magnetic textures such as domain-walls or skyrmions which can be manipulated efficiently by electrical currents [1].

Due to their unique dynamic properties, skyrmions offer attractive perspectives for future spintronic applications [1]. Skyrmions can be stabilized at surfaces, interfaces [2,3] and in multilayers at room temperature [4,5]. We have carried out first-principles calculations to study the stabilization mechanisms of skyrmions in ultra-thin-film and multilayers [3,4]. In particular, we showed that the competition between the Heisenberg exchange beyond first nearest neighbor, the DM, the anisotropy and the Zeeman interactions are crucial to describe equilibrium properties of skyrmions of few nano-meters diameter at interfaces. Especially, such competitions may stabilize higher order skyrmionic states [6,7].

Here, we focus on the dynamics of skyrmions and antiskyrmions under spin orbit torque. Counterintuitively, we show that their dynamics are not driven by their respective topological charge but rather by the symmetry of the DMI as well as the deformation of their core [9]. Finally, we propose to use surface reconstructions to control the symmetry of the interfacial DMI and tune the dynamics of magnetic skyrmions [10,11].

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[9] U. Ritzmann *et al.*, arXiv:1803.00534.
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