SKYRMION STATES IN CHIRAL MAGNETS

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9.7 cm

Chiral interactions stabilize smooth "Skyrmion" textures in ordered condensed matter systems. In noncentrosymmetric magnetic crystals, such chiral couplings are realized as Dzyaloshinskii-Moriya exchange. Unconventional Skyrmion states may be observable in magnetic nanostructures, where the chiral Dzyaloshinskii-Moriya exchange arises owing to reduced dimensionality and modifications of the electronic properties on surfaces [1]. We develop a phenomenological theory for modulated and localized states in thin films of noncentrosymmetric ferromagnets and chiral liquid crystals. In such systems, strong surface anisotropy or anchoring stabilizes collinearly ordered states where Skyrmions can exist as localized and topologically stable excitations. The solutions for these two-dimensional "Baby-Skyrmions" in magnetic films are related to well-known spherulitic or bubble domains in chiral nematic films. The theory for magnetic films describes Skyrmions with a great variety of shapes. This variety is determined by the nature of the chiral coupling, which may arise due to broken inversion symmetry at surfaces or due to noncentrosymmetric lattice structures as in the chiral ferromagnets MnSi or FeGe [2]. [1] C. Pfleiderer, U.K. Rößler, Nature 447 157 (2007) [2] U.K. Rößler, A. N. Bogdanov, C. Pfleiderer, Nature 442, 797 (2006)

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