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Stability and deformation of skyrmions/antiskyrmions in crystals with axial symmetry

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Néel-type skyrmions [1] and *antiskyrmions* [2], recently realized in axially symmetric magnets, are substantially different from Bloch-type skyrmions, widely explored in chiral cubic magnets, in terms of their internal magnetic structure, their stability range as well as their response to external stimuli. More specifically, the axial symmetry of the host gives rise to an extended stability range by restricting the wave vectors of magnetic modulations to the plane normal to the high-symmetry axis. Since such skyrmions and antiskyrmions do not co-align with external magnetic fields, instead their orientation keeps confined to the high-symmetry axis of the host, they become asymmetric in oblique magnetic fields [3, 4]. This distortion gives rise to an additional degree of freedom, which affects their dynamics. Moreover, it can result in either an attractive or a repulsive skyrmion-skyrmion interaction, depending on the relative orientation of the pair. Corresponding experimental results on lacunar spinel and Heusler alloys hosting Néel-type skyrmions and antiskyrmions, respectively, will also be reviewed together with the magnetoelectric nature of these new skyrmion prototypes [1, 2, 5, 6].

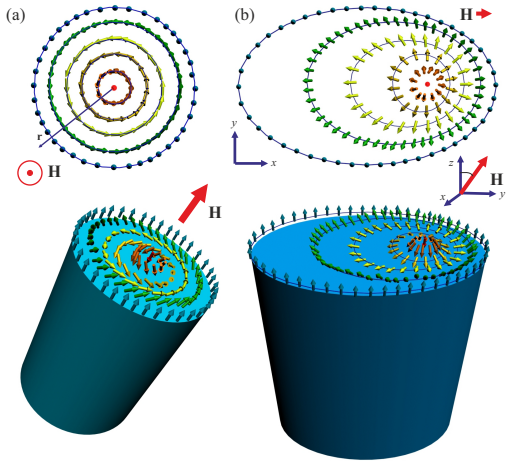

Figure 1: Spin texture of a Bloch (a) and a Néel (b) skyrmion in tilted magnetic fields. While Bloch skyrmions in cubic helimagnets co-align their cores with the field, Néel skyrmions displace their cores and lock it to the high-symmetry (polar) axis of the host material.

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