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Skyrmions in Multiferroic Insulator

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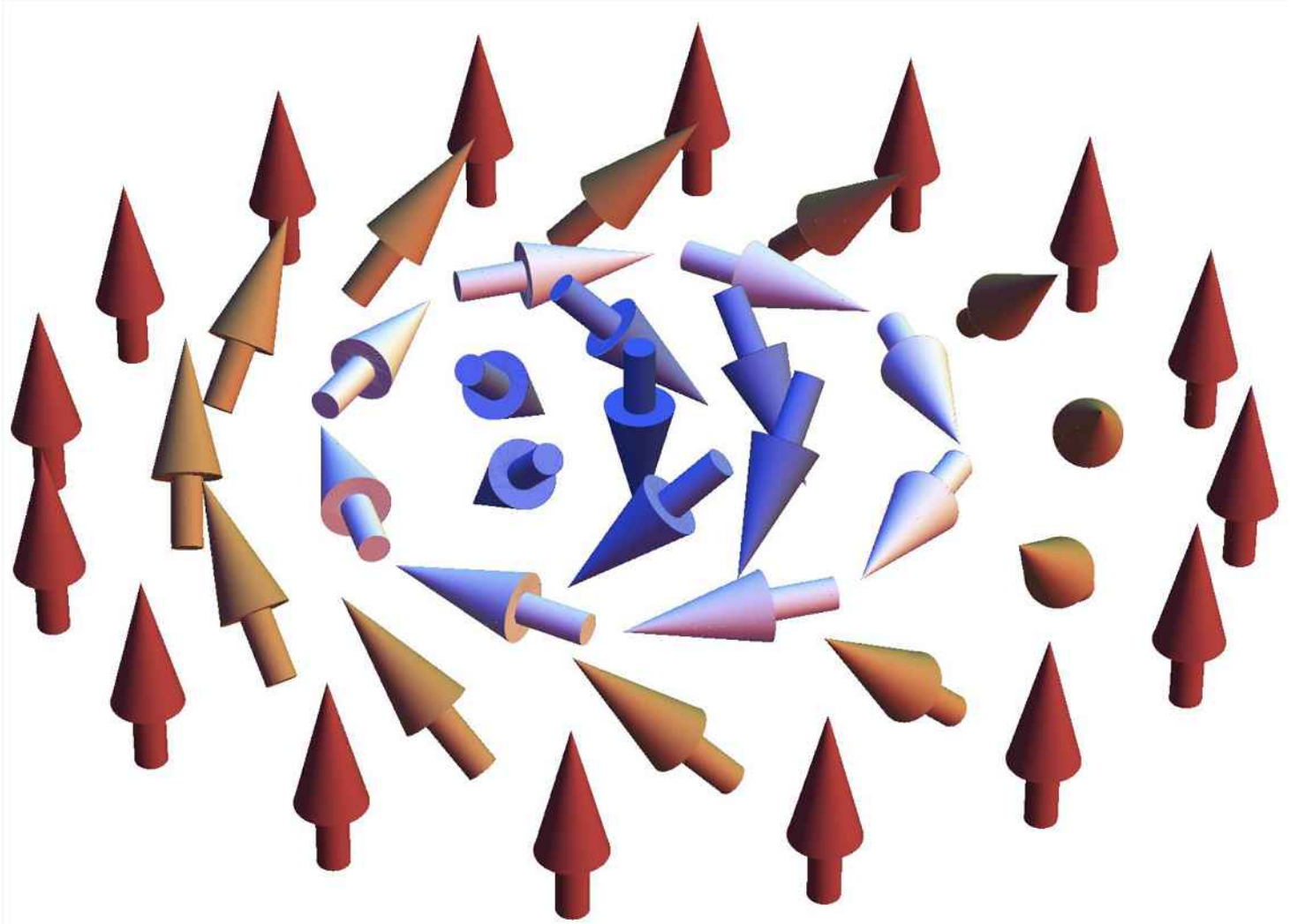
Magnetic skyrmion is a topologically stable particle-like object, which appears as nanometer-scale vortex-like spin texture in a chiral-lattice magnet [1]. In metallic materials (MnSi, FeGe, Fe1-xCoxSi etc), electrons moving through skyrmion spin texture gain a nontrivial quantum Berry phase, which provides topological force to the underlying spin texture and enables the current-induced manipulation of magnetic skyrmion [2]. Such electric controllability, in addition to the particle-like nature, is a promising advantage for potential spintronic device applications. Recently, we newly discovered that skyrmions appear also in an insulating chiral-lattice magnet Cu2OSeO3 [3]. We find that the skyrmions in insulator can magnetically induce electric polarization through the relativistic spin-orbit interaction, which implies possible manipulation of the skyrmion by external electric field without loss of joule heating. The present finding of multiferroic skyrmion may pave a new route toward the engineering of novel magnetoelectric devices with high energy efficiency. In this talk, our recent attempts to drive skyrmions by external field are also introduced.

[1] *S. Muhlbauer et al., Science 323, 915 (2009).,* ***[2]*** *F. Jonietz et al., Science 330, 1648 (2010).,* ***[3]*** *S. Seki et al., Science 336, 198 (2012).*



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