

FERROELECTRICITY IN SPIRAL MAGNETS WITH CYCLOIDAL COMPONENT

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Some multiferroic materials show long-wavelength magnetic structures in addition to unusually strong couplings between magnetism and ferroelectricity. For example, TbMnO₃ with long-wavelength magnetic structure exhibits a ferroelectric order as well as a gigantic magnetoelectric effect [1]. A recent neutron diffraction measurement on TbMnO₃ revealed that the ferroelectric phase is accompanied by a transversely-modulated spiral magnetic structure [2]. More generally, recent calculations pointed out possible phenomenological and/or microscopic mechanisms of the magnetoelectric effect in spiral magnets with a cycloidal component [3]. These studies indicate that a cycloidal-spiral spin structure with spin helicity plays a key role in breaking inversion symmetry, i.e., induction of finite electric polarization. In this talk, we will present the appearance of ferroelectricity and its magnetic control in several spiral magnets. The results suggest that cycloidal-spiral spin systems are a new class of ferroelectrics in which the ferroelectricity is induced by a magnetic order.

[1] T. Kimura et al., Phys. Rev. B 71, 224425 (2005).

[2] M. Kenzelmann et al., Phys. Rev. Lett. 95, 087206 (2005).

[3] For example, H. Katsura et al., Phys. Rev. Lett. 95, 057205 (2005).