[QMS2020 invited talk]

Spin Liquid State and Topological Structural Defects in Hexagonal $TbInO_3$

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We report the coexistence of ferroelectricity and a spin liquid state in hexagonal $TbInO_3$ with quasi two-dimensional triangular spin lattice. Geometrical ferroelectricity associated with In trimerization accompanies topological ferroelectric structural defects. Magnetic susceptibility data show in-plane magnetic anisotropy of Tb spins without any long-range order above 1.8 K, and we also confirm no trace of any phase transition down to 0.15 K from a specific heat measurement, which indicates that this system is highly frustrated and may host a spin liquid ground state. By analyzing the Schottky anomaly in the specific heat results, we propose a model where crystal-field levels are different in each Tb sites, and only one of them has a magnetic ground state and forms a unique honeycomb spin lattice. These observations put forward an interesting possibility where spin liquid and ferroelectric behaviors coexist, and the atomically sharp ferroelectric domain walls may host new magnetic edge states or local spin excitations [1]. We also discuss the further tunability of this system by substituting rare-earth ions such as Sm, Eu, and Gd [2].

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