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Fluctuations and topological defects in proper ferroelectric crystals[1] SERGEI PROKHORENKO, YOUSRA NAHAS, LAURENT BELLAICHE, Physics Department and Institute for Nanoscience and Engineering, University of Arkansas — In this work we use a combination of homotopy theory and first-principles-based effective Hamiltonian simulations to investigate the stability of topological defects in proper ferroelectric crystals. Taking $BaTiO_3$ as a model example, we show that, despite a nearly trivial topology of the order parameter space, these materials can exhibit stable topological point defects in their tetragonal polar phase and stable topological line defects in their orthorhombic polar phase. Stability of such defects originate from a novel mechanism of topological protection related to finite- temperature fluctuations of local dipoles.

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