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Topological Classification of Crystalline Insulators with Point Group Symmetry[1] DI XIAO, Carnegie Mellon University, PRIYAMVADA JADAUN, QIAN NIU, SANJAY BANERJEE, The University of Texas at Austin
— We show that in crystalline insulators point group symmetry alone gives rise to a topological classification based on the quantization of electric polarization. Using C_3 rotational symmetry as an example, we first prove that the polarization is quantized and can only take three inequivalent values. Therefore, a Z_3 topological classification exists. A concrete tight-binding model is derived to demonstrate the Z_3 topological phase transition. Using first-principles calculations, we identify graphene on BN substrate as a possible candidate to realize the Z_3 topological states. To complete our analysis we extend the classification of band structures to all 17 two-dimensional space groups. This work will contribute to a complete theory of symmetry conserved topological phases and also elucidate topological properties of graphene like systems.

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