

Abstract Submitted
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Topological phases in layered pyrochlore oxide thin films along the [111] direction¹ XIANG HU, The University of Texas at Austin, TX, 78712, ANDREAS RÜEGG, University of California, Berkeley, CA 94720, GREGORY A. FIETE, The University of Texas at Austin, TX, 78712 — We theoretically study a multi-band Hubbard model of pyrochlore oxides of the form $A_2B_2O_7$, where B is a heavy transition metal ion with strong spin-orbit coupling, in a thin film geometry orientated along the [111] direction. Along this direction, the pyrochlore lattice consists of alternating kagome and triangular lattice planes of B ions. We consider a single kagome layer, a bilayer, and the two different trilayers. As a function of the strength of the spin-orbit coupling, the direct and indirect d -orbital hopping, and the band filling, we identify a number of scenarios where a non-interacting time-reversal invariant Z_2 topological phase is expected and we suggest some candidate materials. We study the interactions in the half-filled d -shell within Hartree-Fock theory and identify parameter regimes where a zero magnetic field Chern insulator with Chern number ± 1 can be found. The most promising geometries for topological phases appear to be the bilayer which supports both a Z_2 topological insulator and a Chern insulator, and the triangular-kagome-triangular trilayer which supports a relatively robust Chern insulator phase.

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