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Chern-Simons Composite Fermion Theory of Fractional Chern Insulators RAMANJIT SOHAL, LUIZ SANTOS, EDUARDO FRADKIN, University of Illinois at Urbana-Champaign — Fractional Chern Insulators (FCIs) are a class of two dimensional interacting lattice systems that realize the Fractional Quantum Hall effect in the absence of Landau levels produced by a uniform magnetic field. Time-reversal symmetry breaking effects that are responsible for non-trivial Berry curvatures in FCIs occur on length scales comparable to the lattice constants, rendering the analytical approaches much more challenging than for Landau levels. It is expected that strong lattice effects should modify the structure of hierarchical states. We formulate a Chern-Simons composite fermion theory for FCIs, whereby bare fermions are mapped into composite fermions (bound states of particles and flux) coupled to a discretized dynamical Chern-Simons gauge field defined on the same lattice as the fermions. We apply this construction to kagome and other lattices, and determine a rich structure of gapped topological phases characterized by fractionalized elementary excitations.

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