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The topological Hubbard model and its high-temperature quantum Hall e TITUS NEUPERT, Condensed Matter Theory Group, Paul Scherrer Institute, Switzerland, LUIZ SANTOS, Department of Physics, Harvard University, SHINSEI RYU, Department of Physics, University of Illinois at Urbana-Champaign, CLAUDIO CHAMON, Physics Department, Boston University, CHRISTOPHER MUDRY, Condensed Matter Theory Group, Paul Scherrer Institute, Switzerland — The quintessential two-dimensional lattice model that describes the competition between the kinetic energy of electrons and their short-range repulsive interactions is the repulsive Hubbard model. We study a time-reversal symmetric variant of the repulsive Hubbard model defined on a planar lattice: Whereas the interaction is unchanged, any fully occupied band supports a quantized spin Hall effect. We show that at 1/2 filling of this band, the ground state develops spontaneously and simultaneously Ising ferromagnetic long-range order and a quantized charge Hall effect when the interaction is sufficiently strong. We ponder on the possible practical applications, beyond metrology, that the quantized charge Hall effect might have if it could be realized at high temperatures and without external magnetic fields in strongly correlated materials.

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