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Magnetic-order-driven topological transition in the Haldane-Hubbard model. HUITAO SHEN, WEI ZHENG, ZHONG WANG, HUI ZHAI, Tsinghua Univ — We study the Haldane model with on-site repulsive interactions at half-filling. We show that the mean-field Hamiltonian with magnetic order effectively modifies parameters in the Haldane Hamiltonian, such as sublattice energy difference and phase in next nearest hopping. As interaction increases, increasing of magnetic order corresponds to varying these parameters and consequently, drives topological transitions. At the mean-field level, one scenario is that the magnetic order continuously increases, and inevitably, the fermion gap closes at the topological transition point. Beyond the mean-field, fluctuation induced interaction can further open up the gap, rendering a first-order transition. Another scenario is a first-order transition at mean-field level across which a canted magnetic order develops discontinuously, avoiding the fermion gap closing. We find that both scenarios exist in the phase diagram of the Haldane-Hubbard model. Our predication is relevant to recent experimental realization of the Haldane model in cold atom system.

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