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Fractional topological phase in one-dimensional flat bands with nontrivial topology HUAIMING GUO, Department of Physics, Beihang University — We show the existence of the fractional topological phase (FTP) in a one-dimensional interacting fermion model using exact diagonalization, in which the noninteracting part has flat bands with nontrivial topology. In the presence of the nearest-neighboring interaction V_1, the FTP at filling factor $\nu = 1/3$ appears. It is characterized by the threefold degeneracy and the quantized total Berry phase of the ground states. The FTP is destroyed by a next-nearest-neighboring interaction V_2, and the phase diagrams in the (V_1, V_2) plane are determined. We also present a physical picture of the phase and discuss its existence in the nearly flat band. Within the picture, we argue that the FTP at other filling factors can be generated by introducing proper interactions. The present study contributes to a systematic understanding of the FTPs and can be realized in cold-atom experiments.

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