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Topological indices, defects, and Majorana fermions in chiral superconductors DAICHI ASAHI, NAOTO NAGAOSA, Department of Applied Physics, University of Tokyo — We study theoretically the role of topological invariants to protect the Majorana fermions in a model of two-dimensional (2D) chiral superconductors which belong to class D of the topological periodic table. A rich phase diagram is revealed. Each phase is characterized by the topological invariants for 2D (Z) and 1D (Z2), which lead to the Majorana fermion at the edge dislocation and the core of the vortex. The topological invariants are determined by the hopping integrals along x and y directions. Interference of the Majorana fermions originating from the different topological invariants is studied. The interaction between zero-energy states at edge dislocations and at vortex cores eliminates the zero-energy states when they coexist at the same position. The stability of the Majorana fermion with respect to the interlayer coupling, i.e., in 3D, is also examined. We found that the zero-energy state survive a finite hopping integral along the z-direction unless the energy gap closes.

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