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Orbital and spin magnetization induced by electric current in crystals with helical structure TAIKI YODA, TAKEHITO YOKOYAMA, SHUICHI MURAKAMI, Tokyo Institute of Technology — Crystals with helical lattice structure lack inversion and mirror symmetries. In such systems with low symmetry, we expect various physical phenomena which never occur in systems having higher symmetry. In particular, because a helix is similar to a solenoid, we expect that an electric current will induce orbital and spin magnetization. To confirm this scenario, we introduce a simple tight-binding model with helical lattice structure. Using this model, we calculate the orbital and spin magnetization induced by electric field along the helical axis. The resulting orbital magnetization in response to the electric field is along the helical axis. The direction of the induced orbital magnetization is opposite for the right-handed helix and the left-handed one. Furthermore, when the spin-orbit coupling is included, the spin magnetization is also induced along the helical axis as well. This spin magnetization comes from a radial spin texture on the Fermi surface, which is totally different from the Rashba system having tangential spin texture. We also show that by changing the model parameters the model shows characteristic phase transitions into a Weyl semimetal and a weak topological insulator.

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