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Topological phase transition in metallic single-wall carbon nanotube induced by magnetic field RIN OKUYAMA, Faculty of Science and Technology, Keio University, WATARU IZUMIDA, Department of Physics, Tohoku University, MIKIO ETO, Faculty of Science and Technology, Keio University — The single-wall carbon nanotube (SWNT) can be regarded as a one-dimensional topological insulator owing to the sublattice symmetry for A and B lattice sites [1]. It is characterized by a Z topological invariant, winding number, in both the absence (class BDI) and presence (AIII) of magnetic field. We theoretically study the topological phase transition in a metallic SWNT, in which a small energy gap is opened by the mixing between σ and π orbitals owing to a finite curvature of the tube surface and closed by applying a magnetic field $B = B^*$ parallel to the tube axis [2]. We demonstrate discontinuous changes in the winding number at B^*, which can be observed as a change in the number of edge states owing to the bulk-edge correspondence. This is confirmed by numerical calculations for finite SWNTs of length ~ 1 μm, using a 1D lattice model to effectively describe the mixing between σ and π orbitals and spin-orbit interaction [3]. — [1] W. Izumida, R. Okuyama et al., Phys. Rev. B 93, 195442 (2016). [2] R. Okuyama, W. Izumida, and M. Eto, arXiv:1610.05034. [3] W. Izumida et al., J. Phys. Soc. Jpn 78, 074707 (2009).

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