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Theory of Chiral Transport in Chiral Carbon Nanotubes[1]
MASAKI NORO, Tokyo Institute of Technology, JYUNYA TANAKA, None, SHUICHI MURAKAMI, TAKEHITO YOKOYAMA, Tokyo Institute of Technology — In a chiral carbon nanotube, lower crystallographic symmetry allows chiral transport. Namely, when carriers exist by doping, an electric current along the tube axis induces a current around the tube. We calculate the chiral conductivity in carbon nanotubes induced by an electric field along the nanotube axis. We use a tight-binding model for various carbon nanotubes with different chiralities, and apply a constant relaxation time in Boltzmann transport equation. Because the band structure is different for each chiral carbon nanotube, we set electron concentration to be constant to compare quantitatively the chiral conductivity for each nanotube. We find that the chiral conductivity in chiral nanotube is in general non zero, and have either signs depending on their chiralities. We discuss the dependence on the chirality in comparison with the band structure in single-layer graphene, and attribute the chiral transport to the warping of the Fermi surface around the K and K' point in graphene.

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Masaki Noro
Tokyo Institute of Technology

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