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Boundary properties between monolayer and bilayer graphene and valley filter TAKESHI NAKANISHI, AIST, MIKITO KOSHINO, Tohoku Univ., TSUNEYA ANDO, Tokyo Inst. Tech. — Graphene consists of a two-dimensional hexagonal crystal of carbon atoms, in which electron dynamics is governed by the Dirac equation. The purpose of this paper is to study the boundary between monolayer and bilayer graphenes and show a valley polarization in transmission probability through the boundary [1]. We consider the boundary of monolayer and bilayer graphene, in which lower layer in bilayer graphene is continuously connected to the monolayer graphene and upper layer is terminated along a straight edge having zigzag or armchair structures. Boundary conditions between monolayer and bilayer graphene are derived in an effective-mass scheme. The transmission probability vanishes at the Dirac point and increases roughly in proportional to the electron density. The transmission probability varies strongly as a function of the incident angle and its maximum appears at an angle deviating from the vertical direction. This asymmetry is opposite between the K and K' points, showing that strong valley polarization can be induced across the interface of monolayer and bilayer graphenes.

[1] T. Nakanishi et al., PRB 82 (2010) 125428.

Takeshi Nakanishi
AIST

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