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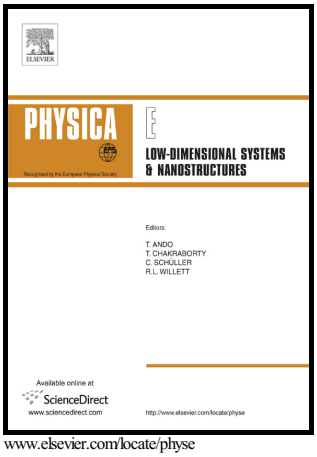

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Electronic transport properties of T-shaped silicene nanoribbons

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Abstract

Based on the tight-binding model and a generalized Green's function method, we theoretically investigated the electron transport properties of T-shaped silicene nanoribbons (TsSiNRs) structure composed of an armchair SiNR (ASiNR) with a sidearm connected to two semi-infinite ASiNR leads. In particular, we demonstrated that the transport properties sensitively depend on the sidearm width and length. Besides, we found that the metal to semiconductor transition occurs with the increase of the spin-orbit interaction (SOI) strength. The effect of the external perpendicular electric field on electron transport is also investigated and it is found that potential energy causes to the decrease of the energy gap leading to semiconductor to metallic transition.

Keywords: T-shaped silicene nanoribbon, Electronic transport, Green's function method, Spin-orbit interaction

1. Introduction

Graphene, a two-dimensional (2D) honeycomb carbon lattice, has aroused great attention in the recent years due to it's unique physical properties and applications in nanoelectronic devices. The application potentials of graphene stimulates considerable interest to explor other 2D honeycomb structures formed by group IV elements, such as germanene and silicene. Silicene, a monolayer of silicon with a hexagonal lattice structure, has been recently synthesized on various substrates [1, 2, 3]. The atomic structure of

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