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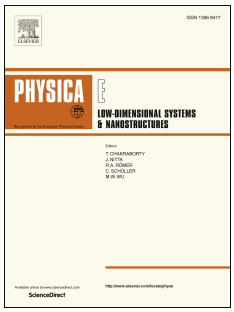

Magnetic adatoms in two and four terminal graphene nanoribbons: A comparison between their spin polarized transport

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Magnetic adatoms in two and four terminal graphene nanoribbons: A comparison between their spin polarized transport

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Abstract

We study the charge and spin transport in two and four terminal graphene nanoribbons (GNR) decorated with random distribution of magnetic adatoms. The inclusion of the magnetic adatoms generates only the z-component of the spin polarized conductance via an exchange bias in the absence of Rashba spin-orbit interaction (SOI), while in presence of Rashba SOI, one is able to create all the three (x, y and z) components. This has important consequences for possible spintronic applications. The charge conductance shows interesting behaviour near the zero of the Fermi energy. Where in presence of magnetic adatoms the familiar plateau at $2e^2/h$ vanishes, thereby transforming a quantum spin Hall insulating phase to an ordinary insulator. The local charge current and the local spin current provide an intuitive idea on the conductance features of the system. We found that, the local charge current is independent of Rashba SOI, while the three components of the local spin currents are sensitive to Rashba SOI. Moreover the fluctuations of the spin polarized conductance are found to be useful quantities as they show specific trends, that is, they enhance with increasing adatom densities. A two terminal GNR device seems to be better suited for possible spintronic applications.

Keywords: Graphene nanoribbon, Magnetic adatoms, spin polarized conductance

1. Introduction

Graphene-based nanostructures have attracted a wide attention owing to their several interesting electronic and transport properties [1, 2, 3, 4, 5, 6, 7] for a decade. Unconventional quantum Hall effect [1, 3, 4], half metallicity [5, 6], high carrier mobility [7], such interesting features make graphene as promising

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