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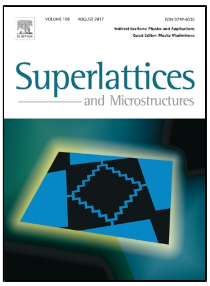

Performance Comparison of Ideal and Defected Bilayer Graphene Nanoribbon FETs

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Performance Comparison of Ideal and Defected Bilayer Graphene Nanoribbon FETs

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Abstract

Bilayer graphene has a zero bandgap as the same as monolayer graphene, and thus behaves like a semimetal. Recent studies have shown different methods for opening bandgap of bilayer graphene. One of the opening bandgap methods is using graphene nanoribbons. By applying a defect, there is more increase on band gap of a double-gated armchair bilayer (BL) graphene nanoribbon (GNR) field effect transistor (BLGNRFET). In this paper, a double-gated armchair BLGNRFET with one single vacancy (1SV) defect (so-called 1SVBLGNRFET) on top layer studied and compared with Ideal BLGNRFET (No defect). The results show that BLGNRFET with a single vacancy (SV) defect in one of layers (top layer) has a larger bandgap than Ideal BLGNRFET. The proposed new structure of BLGNRFET, which has one single vacancy defect in one of layers, shows that a defect in one of layers of BLGNRFET rarely affects the other layer of BLGNRFET. The proposed structure with one single vacancy (SV) defects (so-called 1SVBLGNRFET) has 94% larger $\left(I_{ON}/I_{OFF}\right)$ ratio than (No defect) Ideal structure BLGNRFET but this increase of $\left(I_{ON}/I_{OFF}\right)$ ratio still remains insufficient for obtaining an acceptable $\left(I_{ON}/I_{OFF}\right)$ ratio in CMOS performance. The energy band structure of nanoribbon is obtained by using an approximation tight-binding (TB) method. Transfer characteristic of the transistor is calculated with Poisson-Schrodinger equation self-consistently by using Non- Equilibrium Green Function (NEGF) and in the real space approach.

Keywords: Armchair bilayer graphene nanoribbon field effect transistor; Single vacancy defect (SV); Non-equilibrium Green's function (NEGF); Real space approach; Tight-binding.

1. Introduction

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