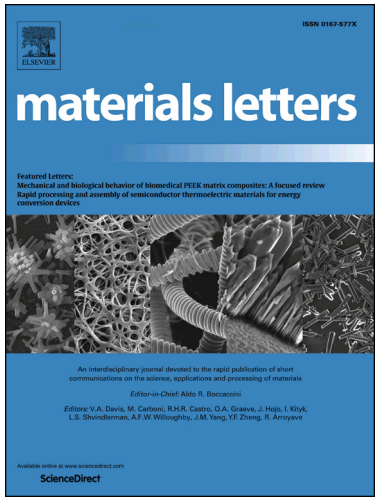

The ohmic contact between zinc oxide and highly oriented pyrolytic graphite

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The ohmic contact between zinc oxide and highly oriented pyrolytic graphite

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Abstract

Contacts between highly oriented pyrolytic graphite (HOPG) and graphene with many important semiconductors, including silicon, are of Schottky type with significant junction energy barrier heights. Here, we show that the junction between the transparent oxide semiconductor ZnO and HOPG is ohmic in nature, but the oxygen species adsorbed to the HOPG surface at the junction cause an electron energy barrier buildup and render the device current vs. voltage characteristics rectifying. Upon a brief heat treatment in vacuum, these devices demonstrate their intrinsic ohmicity. The presented model describes the obtained experimental data and clarifies the important role of the oxygen adsorption in determining the quality of the graphene/semiconductor electrical contacts.

Keywords: Carbon materials; semiconductors; contacts; electrical properties; zinc oxide; highly oriented pyrolytic graphite;

1. Introduction

Research on the electrical properties of the junctions of carbon materials with various semiconductors is intense [1]. Contact potential barriers formed at graphene junctions with Si, SiC and a number of III-V semiconductors have been shown to be significant, rendering their current vs. voltage (I-V) characteristics rectifying diode-like [2, 3]. The contact potentials formed at the junction between the highly oriented pyrolytic graphite (HOPG) and the mentioned semiconductors have also been investigated [4]. The results show that HOPG, similar to graphene, forms Schottky diodes of different junction barriers with all the mentioned

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