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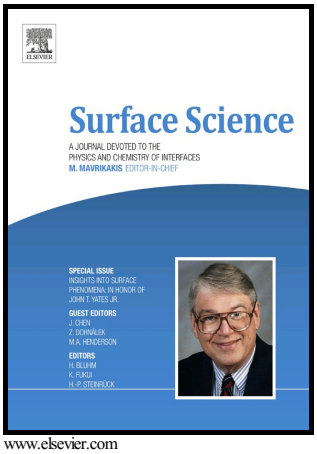

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Revisiting HOPG superlattices: structure and conductance properties

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Abstract

Superlattices observed on highly oriented pyrolytic graphite (HOPG) have been studied extensively by scanning tunneling microscopy (STM). The interest in the study of graphite superlattices has seen resurgence since the discovery of graphene. Single layer graphene, bilayer graphene, and few layer graphene can now be grown on different substrates. The adherence of graphene to various substrates often leads to a periodic out-of-plane modulation and superlattices due to lattice mismatch. In this paper we report scanning tunnelling microscopy (STM) imaging and scanning tunnelling spectroscopy (STS) of different kinds of superlattices on HOPG characterized by a variation in lattice periodicities and in the number of layers. Our study also shows evidence for the structural transition of the same superlattice due to displacement of the topmost HOPG layer by continuously scanning the same/different region. A correlation between lattice periodicity and number of layers forming the superlattice with its conductance properties is derived. The results of this work are important for understanding the origin of the superlattice structure on HOPG. Investigation of such superlattices may open up possible ways to modify two dimensional electron systems to create materials with tailored electronic properties.

Keywords:

Scanning Tunnelling Spectroscopy; Scanning Tunnelling Microscopy; Graphite; superlattice

Introduction