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Layer-controllable graphene by plasma thinning and post-annealing

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ABSTRACT

The electronic structure of graphene depends crucially on its layer number and therefore engineering the number of graphene's atomic stacking layers is of great importance for the preparation of graphene-based devices. In this paper, we demonstrated a relatively less invasive, high-throughput and uniform large-area plasma thinning of graphene based on direct bombardment effect of fast-moving ionic hydrogen or argon species. Any desired number of graphene layers including trilayer, bilayer and monolayer can be obtained. Structural changes of graphene layers are studied by optical microscopy, Raman spectroscopy and atomic force microscopy. Post annealing is adopted to self-heal the lattice defects induced by the ion bombardment effect. This plasma etching technique is efficient and compatible with semiconductor manufacturing processes, and may find important applications for graphene-based device fabrication.

Keywords: Graphene; Plasma thinning; Annealing; Raman

1. Introduction

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