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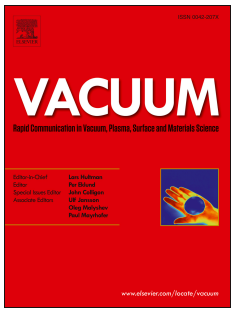

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Effect of Carbon ion-beam irradiation on Graphene oxide film

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Abstract

The effect of Carbon ion beam on Graphene oxide film (GO) is investigated using X-ray diffraction, Raman microscopy and Fourier Transform Infra-red (FTIR) spectroscopy. It is shown that defects were created in GO and water molecules detached from GO layer as evident from X-ray diffraction, Raman microscopy and FTIR spectroscopy. Theoretical simulations were performed using different parameters and concluded that the maximum lattice temperature raised (574 K) by ion beam irradiation was below the annealing and melting temperature of GO.

Keywords: Graphene oxide; swift heavy ion; disorder parameter; thermal spike model; electronic energy loss; nuclear energy loss.

1. Introduction

Graphene oxide is a functionalized form of graphene, which is a 2D carbon allotrope and zero-band-gap semi-metal [1]. Graphene has gained attention across the world for its superior electrical, thermal, mechanical and optical properties over other metals. Due to its complicated synthesis procedure for high quality, its oxide form, graphene oxide (GO), is regularly being used [2]. Graphene oxide can disperse in many solvents due to its oxygen-containing functional groups. These functional groups provide sp^3 hybridization along with sp^2 hybridization but the stoichiometric ratio of sp^2 and sp^3 is not fixed. Though its structure is still under debate, the most accepted model is given by Lerf and Klinowsky [3]. Graphene oxide is synthesized from the raw material, Graphite using Hummers [4] / modified Hummers [5] method and then reduced to obtain pristine-like graphene. Various research groups are involved in reducing graphene oxide to obtain graphene-like properties (referred as reduced graphene oxide, rGO) attempting thermal