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Web of Science
Page 1 (Records 1 -- 1)
[1]

Print

Record 1 of 1

Title: Effect of irradiation upon single layer graphene on SiO2/Si substrate using electron beam irradiation (EBI)

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Abstract: Graphene is of particular interest in utilizing it as a carbon-based radiation device due to its unique electronic properties. The understanding of radiation damage mechanism in graphene is crucial for applications in radiation harsh environments. In this paper, we investigate the influence of high energy (MeV) electron beam irradiation on structural and electrical properties of single layer graphene (SLG) prepared by Chemical Vapor Deposition (CVD) on SiO2/Si substrate using Raman Microscopy and Current-Voltage (I-V) measurement. The samples were irradiated at doses of 50 kGy, 100 kGy and 200 kGy with high energy voltage of 3 MeV. It was found that as irradiation dose increases to 100 kGy, the 2D bands and G bands shift to lower frequency energy and surprisingly no appearance of D band. As dose increases to 200 kGy, the G band shifts to higher frequency energy and 2D band shifts back to position similar with the pristine graphene as before irradiation. Only a small D band appear at 1349 cm(-1) after 200 kGy of irradiation. This means that only small number of defects formed in SLG structure even after it is irradiated at higher electron energy (MeV), indicating stability of the SLG used in this study. I-V analysis shows non-monotonic behaviour of graphene which electrical conductance increase at 50 kGy, decrease at 100 kGy and increase significantly at 200 kGy. The major mechanism is probably related to the charge-transfer doping due to the high dose of electron irradiation and low defect scattering. (C) 2019 Elsevier Ltd. All rights reserved.

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Web of Science
Page 1 (Records 1 -- 1)
[1]

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