

Structural Evolution of Defective Graphene under Heat Treatment and Gamma Irradiation

Yifei Zhang[#], Jie Shi[#], Cheng Chen, Nan Li, Zhiwei Xu^{*}, Liangsen Liu, Lihuan Zhao, Jing Li, Miaolei Jing

State Key Laboratory of Separation Membranes and Membrane Processes, School of Textiles, Tianjin Polytechnic University, Tianjin 300387, China

Abstract

We have studied the structural change of defective graphene built by annealing in different temperature under the condition of gamma irradiation. Firstly, we found the heat treatment not only reduced but also striped the graphene. This behavior made defects become more firstly and then become less with the increase of temperature. And then gamma irradiation removed some oxygen-containing groups, by a simultaneous changed over carbon in the graphitic lattice from sp^3 to sp^2 . Also, the gamma irradiation decreased the interlayer spacing between graphene lowest to 3.391 Å and made a crosslink which resulting in the size of the ordered gaining. A variation was detected by Raman spectroscopy that the amorphous carbon was declined after gamma irradiation. Furtherly we found the degree of this decline raised first and then diminished with the increase in the number of defects. The change in repair capacity of gamma irradiation presented a strategy for repairing the defects of graphene.

Keywords: graphene; gamma irradiation; heat treatment; crystal size; defect

[#] These authors contributed equally to this work.

^{*} Corresponding author, xuzhiwei@tjpu.edu.cn, Tel./fax:+ 86 22 83955231.

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