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γ -Ray Induced Reduction and Modification of Graphene Oxide

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Graphene has attracted increasing attention due to its striking electronic, mechanical and thermal-conducting properties. Up to now, graphene has been produced by numerous techniques such as micromechanical exfoliation of graphite, chemical vapor deposition, epitaxial growth and the reduction of graphene oxide (GO). Among these, the reduction of GO by γ -ray irradiation has been regarded as the most green, facile and economical method of the large-scale production of graphene and graphene-based composites.

A series of graphene were prepared by γ -ray induced reduction of GO suspension in different solvents, such as H₂O, alcohol, ethylene glycol, N, N-dimethyl formamide (DMF), N-methylpyrrolidone (NMP) and p-phenylene diamine (PPD) aqueous solution. Thermogravimetric analysis (TGA), X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD) were used to study the structure of GO after γ -ray irradiation. The results show that GO in these solvents were all reduced. Alkyl groups are attached onto the reduced GO (RGO) in alcohol or ethylene glycol solution due to the recombination of radicals. Besides, the protonated amine groups which generated from the radiolysis of DMF, NMP and PPD are interacted with residual COO⁻ groups on the edge of the as-synthesized RGO with the driving force of electrostatic interaction. This work provides a new approach to obtain different graphene.

Country/Organization invited to participate

China

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