OP-29

Microwave reduction of graphene oxide using Sri Lankan vein graphite

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Graphene has attracted a tremendous attention owing to its outstanding electrical, mechanical, and thermal properties. Among several methods pursued to synthesize graphene sheets, thermal exfoliation of Graphene Oxide (GO) at high temperature has been identified as a highly efficient method for scalable graphene production. However, high energy consumption is a major limitation faced by this method. Microwave, an alternative energy input source, have been widely used in many fields. Although graphene is an excellent microwave absorbent, GO has poor microwave absorption capacity. Therefore, it needs the addition of a microwave absorbent, to carry out the microwave reduction. The objective of this study was to synthesize reduced graphene Oxide (rGO) starting with purified Sri Lankan vein graphite, via microwave irradiation, without adding a microwave absorbent. For this, first GO was prepared by Tour's method using purified needle platy graphite (NPG) which possesses the highest carbon content among the different morphological varieties of Sri Lankan vein graphite. Graphene Oxide Intermediate (GOI) was collected before washing the above product. The GOI was then treated in a domestic microwave oven at 900 W for 10 min. Fourier transformer infrared (FTIR) spectroscopy revealed the reduction of functional groups presented in GO. UV absorption peak of the GO dispersion gradually redshifts as the reduction proceeded, due to the restoration of the electronic conjugation in rGO. Further, the X-ray diffractometry confirmed the formation of the rGO phase with its major peak of d_{002} appearing at 24.95° corresponding to an inter-planer spacing of 0.365 nm, which is comparable with that of the thermally reduced graphene oxide. Moreover, the scanning electron microscopic images evidenced for an exfoliated structure of the graphite layers. Altogether, this study revealed the successful synthesis of reduced graphene oxide using Sri Lankan vein graphite via microwave irradiation, without adding a microwave absorbent.

Key words: *graphene oxide, microwave irradiation, reduced graphene oxide, vein graphite*