

Synthesis of Microwave-Assisted Low-cost Graphene Using Natural Vein Graphite in Sri Lanka

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Graphene is a planar monolayer of carbon atoms arranged into a two-dimensional honeycomb lattice. Due to the exceptional properties of graphene, it has a variety of industrial applications. Graphite remains the most popular precursor for large-scale graphene synthesis or low-cost production. The modified Hummers method and the Staudenmaier method are the popular techniques in which raw graphite is converted into a much valuable form of graphite called graphene oxide. As prepared graphene oxide, then reduce to prepare reduced graphene oxide (rGO). However, the Hummers method has some drawbacks and diminishes the physical properties of prepared graphene. As a result, alternative methods for synthesizing graphene from graphite are necessary. In this study, microwave radiation and low-cost, eco-friendly chemicals (H₂O₂ and commercial liquid hand wash) have been utilized to synthesize graphene from natural vein graphite in Sri Lanka. In this technique, the H₂O₂ and liquid hand wash intercalated natural vein graphite powder in an aqueous medium was microwave irradiated at 400 W for 5 min. Then, the microwave irradiated sample was sonicated for 30 mins to obtain the dispersion containing graphene flakes. The resulted graphite intercalated compound was characterized using the X-ray diffraction (XRD) method, and the prepared graphene dispersion was characterized using UV–visible spectroscopic technique. The XRD data exhibit a successful production of graphite intercalation compound. The UV-Visible data reveal that the sonicated aqueous dispersion contains graphene, although no indication of graphene oxide in the samples. This process has the advantage of manufacturing graphene quickly while using natural graphite and environmentally friendly chemicals.

Keywords: Sri Lankan vein graphite; Graphene; Microwave irradiation; Intercalation