

# SYNTHESIS OF GRAPHENE OXIDE, REDUCED GRAPHENE OXIDE & GRAPHENE FROM KAHATAGAHA VEIN GRAPHITE AND THEIR CHARACTERIZATION

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The form of vein graphite found in Sri Lanka is considered to be unique due to its high quality, especially its purity and mineralization. However, it is exported in raw form at extremely low prices (1.00 US\$/kg approximately). Exportation of our graphite as such has caused loss of great deal of export revenue and faster depletion of the graphite resources. Therefore, this research work was designed to synthesize value-added products from Sri Lankan graphite such as graphene (Gn), graphene oxide (GO), reduced graphene oxide (rGO).

GO was synthesized using a modified version of the Hummer's method from the Sri Lankan graphite obtained from Kahatagaha mine (KGr). This method was modified in such a way to enhance the efficiency of the oxidation process and quality of the GO. Graphite oxidation was carried out by varying the oxidation time and temperature. The optimum reaction temperature and time were found to be 35 °C and 24 h respectively. Under these conditions, the product, GO is free of unreacted graphite and optimally functionalized with -CO, -OH and -O- groups. In addition, its reactant (KGr) to product (GO) ratio is the highest (1:1.9). As the next step, GO was reduced to obtain rGO using a microwave-assisted thermal method, in which the microwave exposure time was optimized while keeping the reaction temperature fixed at 120 °C. The maximum reduction occurs in 25 min. of microwave exposure at 500 W power output.

Subsequently, graphene was synthesized from the reduced graphite oxide by a thermal method in an inert atmosphere. The prepared graphene was characterized by Powder X-ray diffraction, Fourier transform infrared spectroscopy, Scanning electron microscopy, Raman Spectroscopy etc. The characterizations indicate that the graphene prepared in the present study is highly exfoliated and it has a Brunauer-Emmett-Teller (BET) specific surface area of 398 m<sup>2</sup> g<sup>-1</sup>. The graphene exists in stacks of only a few layers, most likely the number of layers could be less than seven.