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SYNTHESIS OF HIGHLY OXIDIZED AND EXFOLIATED GRAPHENE OXIDE USING BORIC ACID AS A PROTECTIVE AGENT

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Sri Lankan natural vein graphite has a higher potential for industrial-scale uses due to its outstanding purity and high crystallinity. Over the last two decades, graphene oxide (GO) has attracted a lot of interest in the scientific and industrial world. However, more attention is needed to introduce and develop new rapid methods of graphene oxide synthesis. The modified Tour method was used to synthesize graphene oxide from Sri Lankan natural vein graphite. Natural vein graphite powder (<90 µm), which contains the highest carbon percentage (99%), was added to the mixture of H_2SO_4 and H_3BO_3 (acid ratio of 1:10). Then, $KMnO_4$ was slowly added to the beaker. The reaction mixture was maintained at 40 ^{0}C. Then the mixture was poured into the ice bath, and deionized water was added. The solution was heated to 70 ^{0}C and kept at this temperature for 30 min with stirring. The process was completed by reacting with H_2O_2 (50%). Structural evaluation of the synthesized GO was carried out using Raman analysis and X-ray diffractometry (XRD). Scanning Electron Microscopy (SEM) images were used for morphological analysis, and the chemical composition of the synthesized GO was determined using Fourier Transform Infrared (FTIR) spectroscopy. The oxidation of graphite is confirmed by developing the strong D, G, and 2D bands in Raman spectroscopy. Using the XRD data, the calculated values of d-spacing, crystalline size (D) and number of layers (n_l) for synthesized GO powder were 9.71 Å, 1.41 nm and 2.45, respectively. This modified, rapid Tour method can be introduced as a simple, environmentally-friendly and time-efficient method to prepare graphene oxide with a minimum number of layers.

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Keywords: Graphene Oxide, Modified Tour's method, Protective agent, Sri Lanka Vein Graphite