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CHEMICAL REDUCTION OF GRAPHENE OXIDE USING L-ASCORBIC ACID

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Chemical oxidation-reduction is one of the most promising and cost-effective methods for bulk production of reduced graphene oxide (RGO). The oxidation step causes the exfoliation of graphite to obtain graphene oxide (GO). The reduction process with several washing steps eliminates residual oxygen functional groups and metallic precipitates. The reduction procedure of GO significantly affects the structure as well as the morphology of RGO. In the reporting case, Sri Lankan natural graphite in powder form was used as starting material. The Hummers method with some modifications was used for the oxidation of graphite. During the oxidation process, ultrasonic treatment was carried out to peel off the oxidised outer graphite layers, allowing inner layers to undergo oxidation. The reduction process of GO was carried out at 95 °C for different time durations from 0.5 to 2.0 h using L-Ascorbic acid as the reduction agent. The surface morphology of products was studied using scanning electron microscopy (SEM), and structural analysis was done using powder X-ray diffraction (PXRD), Raman spectroscopy, and X-ray photoelectron spectroscopy (XPS). XPS analysis reveals that carbon to oxygen atomic ratio (C/O) decreases after oxidising graphite into GO from 23.4% to 2.3%. PXRD and Raman analysis exhibit the emergence of turbostratic disorder of layers and an increase in the level of disorder in GO compared to graphite. The minimum level of disorder and maximum crystallinity was exhibited by the GO sample reduced for 1.5 h. Compared to the GO sample, the RGO sample reduced for 1.5 h showed an increased C/O ratio (8.5%) and decreased d-spacing (3.62 Å), implying the elimination of some residual oxygen functionalities after the reduction step.

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