

SYNTHESIS OF THERMALLY REDUCED GRAPHENE OXIDE USING SRI LANKAN VEIN GRAPHITE

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Despite its short history of realization, graphene has attracted much attention because of its intriguing crystalline, mechanical and electronic properties. Chemical modification of graphene oxide (GO), which is derived from graphite oxide has been studied in the context of many applications including energy conversion, composites, electronic items and biomedical applications. Sri Lankan vein graphite, being renowned for its high crystallinity with high natural purity (95-99 %), extensive mineralization and mode of occurrences, has a very high potential to synthesize graphene at a comparatively low cost. GO can be reduced to graphene-like sheets by removing the oxygen-containing groups and with the recovery of a conjugated structure. The reduced graphene oxide (rGO) sheets are usually considered as one kind of chemically derived graphene. Oxygen functionalities of four kinds are known to exist in GO: epoxide (-O-), hydroxyl (-OH), carbonyl (-C=O), and carboxyl (-COOH). So far, no appropriate way has been reported on hydrazine-mediated reductions of the hydroxyl, carbonyl and carboxyl groups of GO.

The main objective of this study is to produce reduced Graphene Oxide (rGO) using highly purified Sri Lankan vein graphite through thermal reduction. This is a part of our investigations on higher value addition to Sri Lankan graphite by converting into advanced materials suitable for novel technological applications. For the present study, improved Hummer's method was initially employed to synthesize GO starting with needle platy variety of Sri Lankan vein graphite. The synthesized GO was then thermally reduced and the resultant Thermally reduced Graphene Oxide (TrGO) was subjected to further characterization. Under that, the X-ray diffractometric study confirms the formation of the required reduced Graphene Oxide with its major peak of d_{002} at 24.386° , corresponding to an inter planner spacing of 3.64 nm. Further, the scanning electron microscopic study evidences for an exfoliated structure of the graphite layers. Finally, the Fourier

transform infrared spectroscopic analysis confirms the successful reduction of oxygen functional groups by the thermal treatment introduced in this study. Therefore, this study reveals the successful synthesis of reduced Graphene Oxide by thermal reduction using Sri Lankan natural vein graphite as the starting material.

Keywords: vein graphite, higher value addition, thermal reduction, reduced graphene oxide