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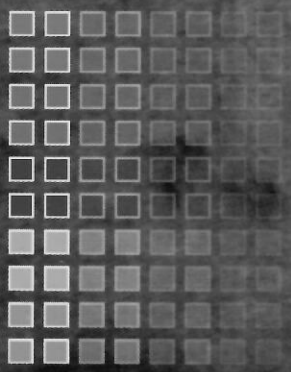

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INTERLAYER EXPANSION OF SRI LANKAN VEIN GRAPHITE VIA REDUCTION OF GRAPHITE OXIDE

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The growing market for portable electronic devices has fueled the demand for energy storage systems such as rechargeable batteries. Among them, the Sodium Ion Batteries (SIB) have recently drawn significant attention. Graphite has already been introduced as a viable electrode material for extensively used Li-ion batteries. However, ionic radius of Na^+ being larger than Li^+, expansion of interlayer spacing of graphite is essential in order to use it for the anode of SIBs. This study aims to expand the interlayer spacing of Sri Lankan vein graphite via thermal, microwave and chemical reduction of Graphite Oxide (GO) synthesized using natural vein graphite. For that, Needle Platy Graphite (NPG) morphological variety was crushed and particle size fraction <53 μm was separated. The powdered sample was first purified via acid leaching and then used to prepare GO by Tour's method using H_2SO_4, H_3PO_4, $KMnO_4$ and H_2O_2. The synthesized GO was reduced via thermal annealing, microwave reduction and chemical reduction with sodium hydroxide. X-ray diffractograms obtained for purified vein graphite, GO, Micro-Wave Reduced GO (MWRGO), Chemically Reduced GO (CRGO) showed their corresponding *d*-spacing as 3.35, 8.37, 3.65, 3.73 Å respectively. However, interestingly, the Thermally Reduced Graphite Oxide (TRGO) showed *d*-spacing of 6.42 Å, which could favour better Na^+ intercalation, hence showing its potentiality for SIB anode application. Further, Fourier Transformer Infrared spectroscopic analysis confirms that only few oxygen functional groups were reduced by the thermal treatment while most of the functional groups were reduced by the other two methods. Scanning electron micrographs evidence for the existence of a honeycomb-like structure in the WRGO and a puffed structure in the CRGO but a compact structure for TRGO. Altogether, this study shows that the thermal annealing of GO is the best among the investigated methods to obtain interlayer spacings suitable for SIB anode application from Sri Lankan vein graphite.

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Keywords: Vein graphite, Interlayer expansion, Thermal reduction, Na-ion batteries.