Synthesis of Expanded Graphite using Sri Lankan Vein Graphite via Ultrasonication

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Sri Lankan vein graphite, which is found in highly crystallized form with high purity (95 - 99 % carbon), have already been successfully developed for the anode of the lithium ion rechargeable battery. However, for their use in future energy storage applications, such as in sodium ion batteries, modification of the vein graphite structure is essential. Hence, this study focuses on structural modification of purified vein graphite by converting into expanded graphite via solvent assistant ultrasonication. Graphite oxide was synthesized from purified vein graphite by employing improved Hummer's method and then sonicated with propylene carbonate. The dried product was heated and again subjected to sonication with the same solvent. Then the solution was centrifuged to remove any non exfolliated graphite. Finally, the solution containing Graphite Oxide (GO) particles in PC were thermally reduced to produce reduced graphite oxide (rGO-PC). X-ray diffraction of crystal phase of the resulted graphite oxide shows the existence of a broad peak at 23.19 ° (2θ) corresponding to an interlayer spacing of 0.38 nm. The Fourier transform infrared spectrum obtained on the synthesized GO confirm the presence of O-H, C=O, COOH and C-O oxygen functionalities, which are then, confirm to be partly removed by the successive thermal treatment. Scanning electron microscopic images are evidence for the expanded structure with wrinkles and folded nature in contrast to the opaque and smooth structure observed in the pristine graphite. Altogether, these results confirm the successful formation of expanded graphite by the solvent assisted ultrasonication technique.

Keywords: Propylene carbonate, Sonication, Sri Lankan vein graphite, Graphene oxide