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Electrochemical conversion of graphite to graphene oxide: A preliminary study

M. D. Gunarathna and D. S. M. De Silva*

Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka
sujeewa@kln.ac.lk*

Graphene-based materials are two-dimensional atomic crystals composed of sp^2 hybridized carbon atoms. The family includes graphene, graphene oxide (GO), reduced graphene oxide, and graphene quantum dots. Graphene is an allotrope of carbon with hexagonal lattice and it has gained immense attention in many industries due to its exceptional applications in electronics, water purification, adsorption studies, etc. Many recent studies proposed different routes of GO synthesis. This study reports an electrochemical conversion of locally available raw graphite obtained from Bogalapathala to GO. Electrochemical conversion of graphite to graphene has great potential in the production of graphene oxide and it has gained the attention of the scientific community due to its easiness and environmentally friendly practices. The significance of the electrochemical conversion process is the minimal chemicals requirement compared to other methods developed. The local graphite powder was compressed into pellets using a pellet maker designed by the researcher with a cavity to accommodate the Pt electrode. The graphite pellet was tightly wrapped with a permeable cellulose membrane to avoid loosening of the pellet during electrochemical process. The electrochemical cell consisted of a Pt rod as the working electrode and a carbon rod is as the counter electrode. These electrodes were immersed in an $(NH_4)_2SO_4$ solution and a constant potential of 10 V was applied for 2 hours. The resulted product was dissolved in deionized water and centrifuged to collect the supernatant. The supernatant was heated at 90 °C under atmospheric pressure on a hot plate to evaporate the water and the residue was characterized using FTIR, UV visible spectrophotometry, and X-ray diffraction techniques. The UV and FTIR absorption spectra and the X-ray diffraction patterns confirmed the partial transformation of graphite to GO while the maximum yield of GO obtained after the evaporation was 1% (based on the mass of graphite powder used) and further investigations need to be performed to increase the yield.

Keywords: Graphite, Graphene oxide, Electrochemical conversion, Characterization

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