

Synthesis and Characterization of Graphene Oxide Using Boric and Phosphoric Acids as Protective Agents

Pramodika W.D.R.^{1,2*}, Koswaththa A.V.R.S.², Balasooriya N.W.B.^{1,2} and Kumara G.A.R.³

¹Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka

²Department of Geology, University of Peradeniya, Peradeniya, 20400, Sri Lanka

³National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka

The discovery of graphene in 2004 stunned the scientific community due to its extraordinary properties. The exorbitant cost of production limits the use of graphene on an industrial scale. Graphene oxide (GO) offers most of graphene's characteristics along with a few additional ones. The production of GO requires a number of chemical reactions that need to be carefully controlled. Protective agents are used to maintain the sheet-like structure of GO and improve the safety of the reaction. This study is examining the impact of the type of protective agent on the final GO product. The Tour's method was used to produce GO, with small changes in time and temperature. Preparations involved the use of the most common protective agents, phosphoric and boric acids. XRD, Raman, and SEM analyses were carried out to characterize both samples to confirm the formation of GO. The d spacing values for GO produced with boric and phosphoric acid were 8.1402 and 8.0160, respectively. For both samples, the number of layers was about two, and the I_d/I_g ratio was 0.87. GO produced without the use of protective agents frequently has more than 1.0 I_d/I_g ratio values. However, the GO prepared with phosphoric acid is comparatively planner sheets and has sharp edges, while the GO prepared with boric acid is slightly wrinkled. It is clear from this that both acids have beneficial protective effects despite having very different final GO structures. Therefore, the protective agent may be selected based on the requirements of the GO's final application.

Keywords: Graphene Oxide, Phosphoric acid, Boric acid, Protective Agent

Acknowledgements: Financial assistance from PGIS grant research (Grant No: PGIS/2020/18) is acknowledged.

*Corresponding author: ruvipramodika@gmail.com