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Facile Reduction of Graphene Oxide Thin Films Using Ascorbic Acid for Improved Electrical Properties

Graphene oxide (GO) is a modified form of graphene and shows great potential for various applications because of its unique structural and chemical properties. It is rich in oxygen-containing functional groups like hydroxyl, epoxy, and carboxyl. This composition makes GO easy to disperse in water and enables it to interact well with other compounds, which is useful for chemical modifications and creating composites. However, these functional groups interrupt the sp^2 carbon network, greatly lowering its electrical conductivity. To address this issue, GO can be chemically reduced to reduced graphene oxide (rGO). This process partially restores its conjugated structure, improving its electrical properties while still keeping some functional versatility. In this study, we synthesized GO using a modified Hummer's method. We characterized it with X-ray diffraction (XRD), energy-dispersive X-ray analysis (EDAX), UV-Visible spectroscopy, and Fourier-transform infrared (FTIR) spectroscopy to confirm its structural and elemental features. We prepared a thin film composite of GO and polyvinylpyrrolidone (PVP) in a 3:1 ratio using deionized water. We then deposited this mixture onto a substrate using the spin coating technique. After drying the film, we chemically reduced it by immersing it in ascorbic acid at 90 ℃ for one hour, which resulted in the formation of rGO. After reduction, we measured the film's electrical conductivity. We found a significant increase in conductivity, confirming the successful transformation of GO to rGO and its potential use in electronic and sensing applications.

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