

# **Cleaner deoxygenation of graphene oxide from agro-byproducts for downstream and biological applications**

## **Abstract**

Reduced graphene oxide is a nanomaterial with an ultrathin 2-dimensional structure, one of the most utilizing materials, which has been extensively applied in several down-stream purposes owing to its good optical, mechanical, physical, and thermal properties. The most reliable and widely used methods to get high quantity and quality of reduced graphene oxide is by chemical synthetic pathway. However, in the process of deoxygenated graphene oxide synthesis, the chemicals involved in the reaction are extremely hazardous. From this point of view, scientists have put in their effort in finding environmentally friendly methods to replace the use of a hazardous chemical reductant. Medicinal phytoextract reveals another route that can be an excellent reductant to reduce graphene oxide, due to the presence of phenolics, alkaloids, lipids, proteins, carbohydrate, terpenoids, and other nitrogen-containing compounds. Since the nature of phytoextract is clean and non-poisonous, the reduced graphene oxide obtained by using medicinal phytoextract as a reductant can then be applied in biomedical applications. This review presents the methods to synthesize graphene oxide by different approaches using various medicinal phytoextracts as a biological reductant to reduce graphene that could motivate researchers to generate and improve the cleaner methods for industrial-scale production.

## **Keywords**

Cleaner production; Graphene; Medicinal phytoextract; Reduced graphene oxide