Biomass-Derived Graphene Synthesis via Ultrasonication: Investigation on cellular component and functions

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Abstract

In the rapid development of graphene synthesis research, several challenges are emerging, notably regarding sustainability, stability, quality, and cost [1]. The depletion of graphite resources highlights the demand for renewable and environmentally friendly substitutes for both raw materials and production processes. Biomass, as a relatively innovative feedstock in comparison to conventional graphite, necessitates an in-depth exploration of its intrinsic properties to comprehend its impact on subsequent reactions for graphene synthesis [2, 3]. This study investigates a prospective and straightforward approach towards producing graphene materials from biomass, with a focus on investigating the influence of plant cell composition and functionality. Different from conventional methods, ultrasonication serves as the primary synthetic mechanism for converting biomass into graphene material, potentially reducing the use of harsh chemicals by approximately 10.27% [4]. Simultaneously, there is an impressive yield of less than three-layered products at 90.24%, predominantly comprising monolayer graphene. Interestingly, nanopores are presented on the surface of the product, which is attributed to the presence of the cellular structure of biomass. These findings underscore the potential of ultrasonication for graphene production from biomass, particularly using rice stems, with extended applications in bioenergy, advanced materials, and biomedical fields.

References

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Figures

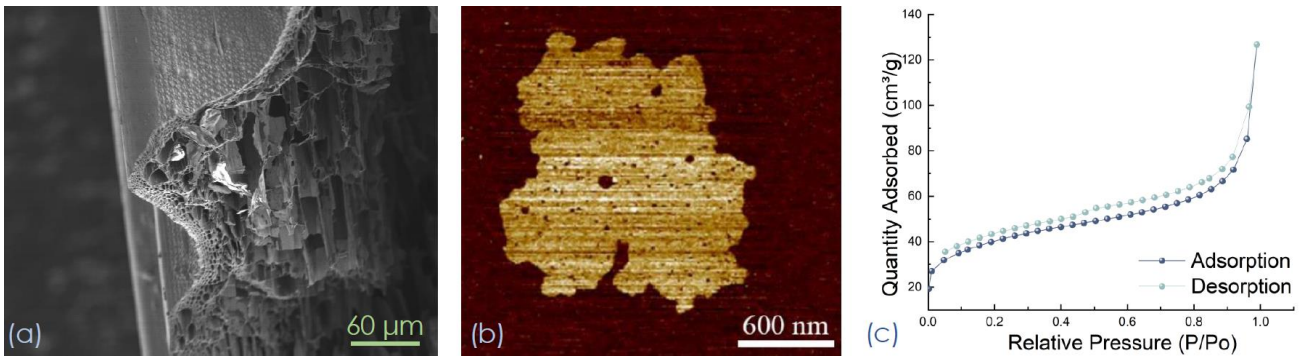

Figure 1: Characterization of biomass-derived biochar and graphene oxide: (a) Surface morphology of biochar, (b) surface morphology of synthesized graphene oxide, and (c) Nitrogen adsorption and desorption isotherms of graphene oxide product.