Graphene Enhanced Hydrogen Storage Tanks: Performance Comparison with Commercial Variants

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Hydrogen storage tanks with better structure are important for moving forward with clean hydrogen technologies and supporting the UN's Sustainable Development Goals (SDGs) for affordable and clean energy. So, building strong and lightweight tanks is key to making storage systems more efficient, safe, and long-lasting. Lately, researchers have been looking at carbon fiber-reinforced tanks (CFRTs) due to their features such as strength, lightness, and safety. These tanks help reduce both weight and system complexity. In this area, graphene and related materials (GRMs) have started to stand out, as they can improve both the mechanical strength of the tank and its hydrogen barrier properties [1,2,3]. In this study, we evaluate the performance of commercial graphene materials synthesized through top-down (TD) and bottom-up (BU) approaches, incorporated into carbon fiber-reinforced polymer (CFRP) composites for use in CFRTs. The results showed that both types of graphene-enhanced CFRPs exhibited improved interlaminar shear strength compared to the bare composites, with TD and BU samples reaching 62.7 ± 1.39 MPa and 62.27 ± 1.04 MPa, respectively. These findings demonstrate that graphene-based enhancements can significantly improve the mechanical performance of CFRP, thus a potential candidate for CFRTs.

References

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Figures

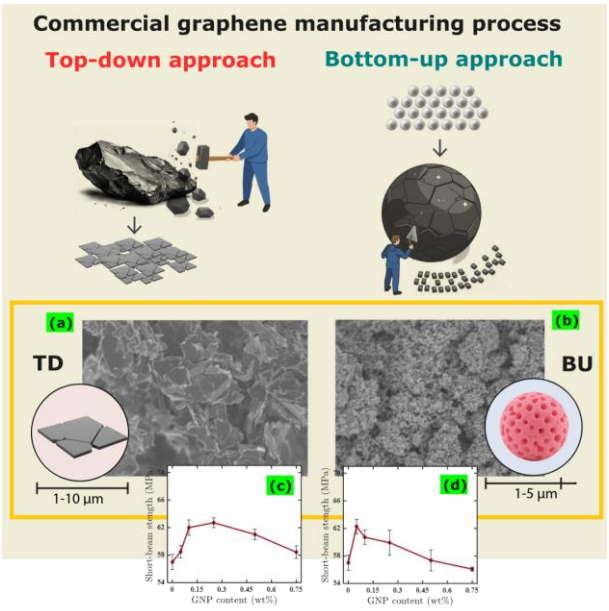

Figure 1: scanning electron microscope images of (a) TD, and (b) BU, and respective interlaminar shear strength testing results (d, and e) for CFRP.