Hydrodynamic Cavitation Assisted Synthesis of Graphene

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Abstract
Scalable production of high-quality graphene is essential for industrial and energy-related applications. In this work, graphene was synthesized using modified Hummers' method, liquid phase exfoliation (LPE), and hydrodynamic cavitation (HC) assisted exfoliation. The study compares the structural quality of graphene obtained from conventional chemical and physical routes with the cavitation-assisted technique. Hydrodynamic cavitation enables efficient graphite exfoliation through microbubble collapse, generating localized shear forces for layer separation under controlled conditions. Structural characterization was performed using XRD, Raman spectroscopy, SEM with EDX mapping, and TGA. Raman analysis indicated comparatively lower defect density and improved graphitic ordering in HC-derived graphene. XRD confirmed effective exfoliation, while SEM revealed thin, wrinkled sheet morphology. TGA showed comparatively improved thermal stability. The results demonstrate that hydrodynamic cavitation is a scalable and environmentally benign method for graphene production with strong potential for large-scale applications.

References

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[3] Zhigang Shen et al, Nanotechnology, 36(2011),7pp
[4] Frederic Ayela et al, Oil &Gas Science and Technology, 72(2017),7pp

Figures

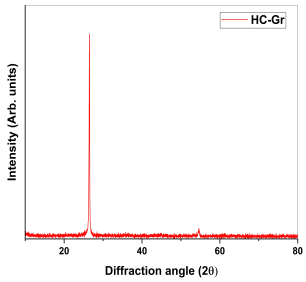

Figure 1: XRD of Hydrodynamic Cavitation Graphene

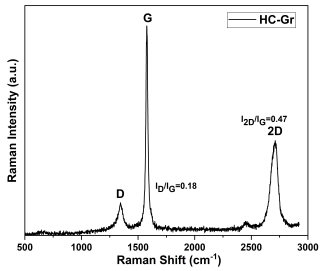

Figure 2: Raman of Hydrodynamic Cavitation Graphene