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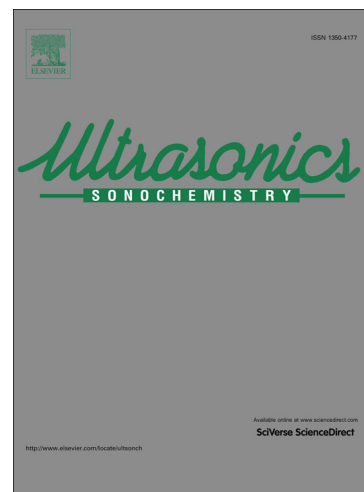
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Graphene nanosheets preparation using magnetic nanoparticle assisted liquid phase exfoliation of graphite: The coupled effect of ultrasound and wedging nanoparticles

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Abstract:

This study aims to investigate a novel technique to improve the yield of liquid phase exfoliation of graphite to graphene sheets. The method is based on the utilization of magnetic Fe₃O₄ nanoparticles as “particle wedge” to facilitate delamination of graphitic layers. Strong shear forces resulted from the collision of Fe₃O₄ particles with graphite particles, and intense ultrasonic waves lead to enhanced exfoliation of graphite. High quality of graphene sheets along with the ease of Fe₃O₄ particle separation from graphene solution which arises from the magnetic nature of Fe₃O₄ nanoparticles are the unique features of this approach. Initial graphite flakes and produced graphene sheets were characterized by various methods including field emission scanning electron microscopy (FE-SEM), transmission electron microscopy (TEM), Raman spectroscopy, atomic force microscopy (AFM), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and Zeta potential analysis. Moreover, the effect of process factors comprising initial graphite concentration, Fe₃O₄ nanoparticles concentration, sonication time,

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