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Salt and water co-assisted exfoliation of graphite in organic solvent for efficient and large scale production of high-quality graphene

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Abstract

Graphene has attracted enormous attention due to its unique physical properties and attractive applications in many fields. However, it is an ongoing challenge to develop a facile and low-cost method for the large scale preparation of high-quality graphene (HQGr). In this work, we have developed an improved liquid-phase exfoliation method to mass produce HQGr. This method is quite simple but efficient by exfoliation of graphite in organic solvent with the co-assistance of sodium citrate and water. Remarkably, the concentration of as-exfoliated HQGr was as high as 0.71 mg/mL under optimal conditions, while the oxygen content in HQGr was only 2.39%. After annealing at 500 °C for 2 h in argon atmosphere, the mean conductivity of annealed HQGr was as high as $1.4 \times 10^4 \text{ S m}^{-1}$. Therefore, this facile method for liquid-phase exfoliation of graphite has excellent potential in the industrial-scale production of HQGr for numerous applications in energy storage, optical and electronic fields.

Keywords: liquid-phase exfoliation, co-assisted exfoliation, high-quality graphene (HQGr), large scale production

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