

## Green sonochemical synthesis of few-layer graphene in instant coffee

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### ABSTRACT

In this work, we reported for the first time the use of bath sonication of graphite in instant coffee to produce few-layered graphene flakes. The sonication of graphene in instant coffee allows facile production of graphene flakes in a green medium and avoids the application of commonly used organic exfoliating solvents such as Dimethylformamide or N, N methyl pyrrolidone. We verified the presence of graphene flakes in the resulting supernatant using local maximum UV spectrum (269 nm) and performed thickness and length measurements of said graphene flakes by atomic force microscopy and transmission electron microscopy. The defect and purity of exfoliated graphene flakes were investigated using Raman spectroscopy ( $I_D/I_G = 0.85$ ) and X-ray photon spectroscopy ( $C/O = 2.6$ ) meanwhile Fourier transform infrared spectroscopy was used to identify the functional group attached to graphene. The production of graphene flakes in coffee was shown to have a time exponent factor of 1.07, which impressively is higher than the time exponent factor for typical sonication in a solvent and surfactant.

**KEYWORDS:** Graphene; Ultrasonic; Liquid phase exfoliation; Green

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