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Large-area single layer exfoliation of graphene oxide via Couette-Taylor flow reactor

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Larger graphene sheets can reduce the contact resistance caused by the number of graphene-graphene contacts and enhance the electrical conductivity. Furthermore, larger graphene sheets can be more effective in load transfer while graphene is used as reinforcement filler in composites. In previous studies, graphite oxide synthesized by the conventional Hummers' method was exfoliated through sonication process to obtain single layer graphene oxide. However, its lateral size was less than 10μm and additionally, omnidirectional mechanical energy input, such as sonication, reduces the lateral size of graphene oxide sheets. This lateral size reduction of single layer graphene oxide attributes to the further weakening of graphene sheets resulting from the hydroxyl and epoxy sites functionalized edge and plane of graphene sheets. Here, we describe a facile method to prepare large-area single layer graphene oxide, which uses the exfoliation of graphite oxide in a Couette-Taylor flow reactor. We found that the formation of Taylor vortex flow with shearing stress in the reactor is effective for exfoliation of graphite oxide, which allows for the production of a more than 100μm in lateral size single or few-layer graphene oxide platelets at a high yield of 90% within 60 min of reaction time. The properties of fabricated graphene oxide were examined by field emission scanning electron microscope, Raman spectra, atomic force microscope, X-ray photoelectron spectroscope and X-ray diffraction.

Biography

Won kyu Park is a PhD Candidate at School of Advanced Materials Science and Engineering, Sungkyunkwan University, South Korea. His research focuses on 'Graphene' at Electronic Materials and Device Research Center, Korea Electronics Technology Institute, South Korea. He has published more than 5 papers in reputed journals.

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