Transfer of graphene fluoride platelets and study by electron microscopy and scanning tunneling microscopy.

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Abstract : We transfer and study few-layer and monolayer platelets of graphene fluoride by solution and mechanical exfoliation, followed by scanned probe and electron microscopy. Graphene fluoride is chemically derived by graphite intercalation, maintaining a layered structure with the advantage of a large (~3 eV) band gap. For solution transfer, graphite fluoride powder is deposited on silicon dioxide from dispersion in N-Methylpyrrolidone (NMP) and characterized by optical microscopy, atomic force microscopy (AFM), scanning electron microscopy (SEM), and energy-dispersive x-ray spectroscopy (EDX). A similar transfer to transmission electron microscopy (TEM) grids is used for structural characterization by TEM and electron diffraction. By AFM we verify the transfer of both few-layer and multi-layer graphene fluoride by dispersion in NMP, chosen for its use in graphene exfoliation [1]. We further probe by EDX the decomposition and chemical modification of graphite fluoride under electron bombardment [2]. By a dry-contact transfer (DCT) mechanical exfoliation process [3], we then transfer nanoscale platelets from fluorinated graphene powder onto the Si(100) 2x1:H surface. As withdemonstrations of graphene transfer [4], few layer $(CF)_n$ features are transferred to the target silicon substrate with negligible contamination of the surrounding surface. The ultra high vacuum (UHV) compatible DCT transfer process enables investigation by UHV scanning tunneling microscopy (STM), and under appropriate conditions the monolayer and few-layer graphene fluoride islands produced by DCT can be imaged. Our work investigates the atomic and electronic structure of graphene fluoride islands in the limit of single or few layer features.

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