Additive Free, Single Layer Graphene in Water

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Abstract

Full exfoliation of graphite to form thermodynamically stable, negatively charged, graphene (graphenide) flakes in solution can be achieved by dissolution of graphite intercalation compounds (GICs) in low boiling point aprotic organic solvents under inert atmosphere.[1,2] We now report that, under certain conditions, graphenide can be transferred to water as single layer graphene. The organic solvent can then be evaporated to remain with an aqueous graphene suspension of ca 0.15 mg/ml concentration under ambient atmosphere. The Raman spectra (2.33 eV laser) collected in situ on such dispersions show bands at 1343, 1586, 1620 and 2681 cm-1 corresponding to the D, G, D' and 2D bands of graphene respectively. The 2D band at 2681 cm-1 is well fitted with a sharp lorentzian line (~28 cm-1) which is a hallmark of single layer graphene.[3] We have thus succeeded in preparing air stable, bulk suspensions of single layer graphene in water.[4] Upscaling towards industrial production of this graphene waters is underway.

References

[1] A. Catheline et al. Soft Matter, 12, 7882, (2012)

[2] A. Pénicaud & C. Drummond, Acc. Chem. Res. 46, 129 (2013)

[3] Y.Y. Wang et al. J. Phys. Chem. C., 112(29), 10637, (2008).

[4] G. Bepete, C. Drummond, A. Pénicaud, European patent, June 12, 2014, EP14172164