

Functionalized Graphene Oxide and Graphene: Materials Synthesis and Electronic Applications

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In spite of its humble appearance, graphite is a very attractive precursor to graphene oxide and graphene due to its high abundance and low cost. It can also be easily exfoliated into bulk quantities of graphene oxide—oxygenated graphene sheets covered with epoxy, hydroxyl, and carboxyl groups—via chemical oxidation and mechanical exfoliation.¹ The resulting graphene oxide can be reduced back to graphene,² chemically modified graphene,³ or functionalizable reduced graphene oxide.⁴ This presentation will focus on the syntheses of these graphene oxide and graphene derivatives, including chemical modifications that make them compatible in both aqueous⁵ and organic solvents³ as well as in polymer matrices.^{6,7} These materials can then be used the bottom-up fabrication of new graphene-based macroscopic structures such as free-standing papers^{8,9} and polymer composites^{10,11} with electronic,^{12,13} energy storage,^{14,15} and structural applications.^{16,17,18}

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