Isolated grafted graphenes via intercalation

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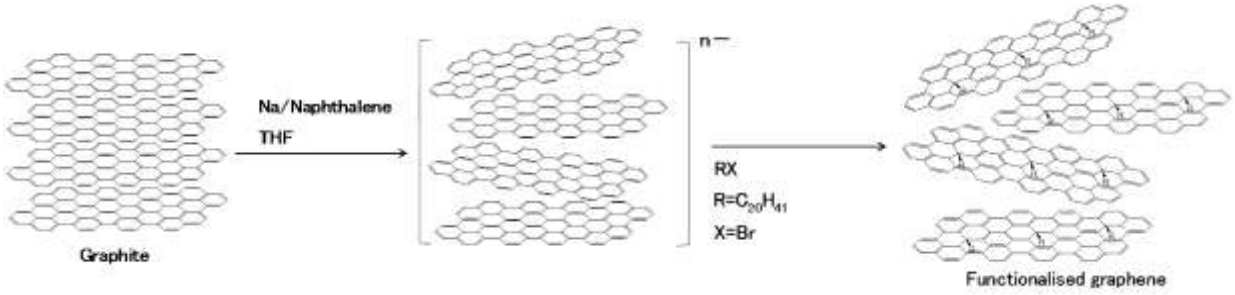
Graphenes have recently attracted attention as superior nanofillers for polymer composites, owing to their intriguing high mechanical, electrical, and thermal properties. Covalent functionalisation of graphene with polymers is an attractive route to realising improved properties in such systems and other bulk applications. Here, we synthesize graphenes grafted with long alkyl chains, by reacting Na-reduced graphites with alkyl halides. The effect of alkyl chain length, stoichiometry, and halide species on the degree of functionalisation of the alkylated graphenes obtained has been evaluated. Increasing the alkyl chain length of alkyl halides led to large decrease of the functionalisation degree, demonstrating that steric factors play an important role in determining the outcome of these reactions. However, the degree of functionalisation can be significantly improved, even in the case of using long alkyl halides such as eicosyl bromides, by using particular carbon/Na (C/Na) ratios in the reaction; the optimum balances total charge and charge condensation effects. The obtained eicosylated graphenes showed improved dispersibility in organic solvents, and a very high yield of single functionalised monolayers. This approach is very promising for preparing large quantities of graphenes with minimal damage to the carbon framework, avoiding the severe oxidation or sonication associated with other routes.



Schematic synthesis of graphene grafted via an *in situ* functionalisation of Na-reduced graphite.