Electronic, magnetic and surface properties of graphene can be modified by covalent functionalization of graphene. The as prepared graphene derivatives significantly broaden application potential of graphene, e.g., in sensing, energy storage, catalysis etc. applications. So far, a wide range of various approaches have been developed for covalent graphene functionalization. However, despite the progress, covalent modification of graphene is still limited by its low reactivity and other conditions (support, number of layers etc.) affecting its reactivity. Due to these facts, there is an unceasing need for new strategies that permit high-yield graphene functionalization under controlled conditions.

Fluorographene (FG) is a stoichiometric graphene derivative with $\text{C}_1\text{F}_1$ composition. It can be prepared by delamination of graphite fluoride, which is an industrially available material. As a perfluorinated hydrocarbon, fluorographene was considered unreactive, but in reality, it undergoes various chemical reactions at rather mild conditions [1]. Fluorographene and fluorinated graphenes ($\text{CF}_x$) are susceptible for reductive defluorination, nucleophilic attack, Grignard [2], Bingel-Hirsch [3], photo Diels-Alder [4] and Sonogashira [5] reactions. The reactions result in homogeneously and densely functionalized graphenes. These findings make fluorographene a well-suited material for large scale synthesis of a wide spectrum of graphene derivatives. Such materials can be utilized in a broad spectrum of applications. Due to high-conductivity and water dispersibility some of them can be used as electrode materials for supercapacitors [3, 6]. Various hydroxyfluorographenes can bear room-temperature antiferromagnetic or ferromagnetic ordering based on their composition [7]. Cyanographene, and graphene acid [8] are well biocompatible materials suitable for further functionalization. Conjugating these materials with redox active centers, e.g., ferrocene, can lead to heterogenous catalysts [9]. Anchoring metal ions to cyanographene resulted in a single-atom catalyst very active in oxidative amine coupling reactions [10].

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