Scalable Synthesis of Covalently Functionalized Graphenes

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Covalent functionalization of graphene broadens its application potential, because it enables efficient tuning of its electronic, magnetic and surface properties. So far, a wide range of various approaches have been developed for covalent graphene functionalization.[1] 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 and well-established graphene derivative introduced in 2010. It was considered rather unreactive as a counterpart of Teflon.[2] However, several recent studies have shown that FG is susceptible to reductive defluorination and nucleophilic attack at rather mild conditions.[3] It was shown that the FG reactivity is triggered by point defects.[4] The reactions result in homogeneously and densely functionalized graphenes. These findings indicate that FG is a suitable material for large scale synthesis of a wide spectrum of graphene derivatives.[5] Synthesis and properties of thiofluorographene,[6] hydroxyfluorographene,[7] chlorofluorographe-ne,[8] alkylated and arylated graphenes,[9] cyanographene,[10] and graphene acid[10] will be introduced. Application potential of these materials in sensing, energy storage and magnetism will be discussed.

References

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Figures

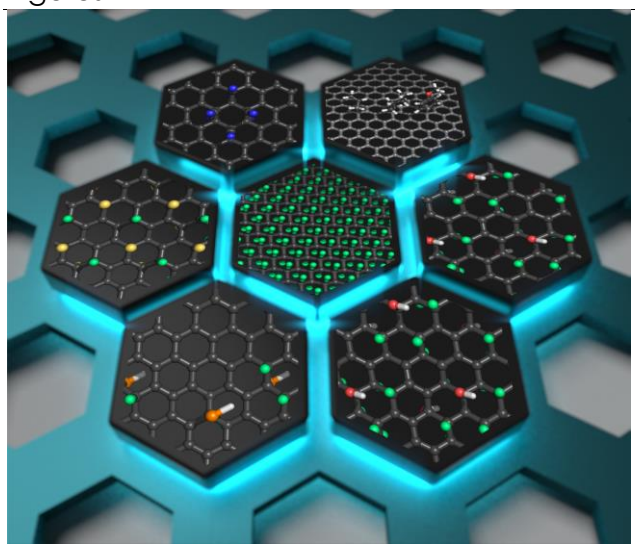

Figure 1: Fluorographene can be used as starting material for scalable synthesis of large family of graphene derivatives.

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