Preparation of graphene-based all-carbon hybrids based on fluorographene chemistry

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Fluorographene (FG) is a stoichiometric (C_1F_1) and well-defined graphene derivative,[1] which has been employed as an alternative precursor for the preparation of covalently modified graphene derivatives.[2] The reaction mechanism stems from FG electrophilicity and can be simplified as a nucleophilic substitution (S_N) mechanism initiated by radical point defects.[3] Owing to their bonding with the highly electronegative fluorine atoms, carbons of FG behave as electrophiles and hence, are susceptible to attack by nucleophiles.[4] Simultaneously with their substitution, nucleophiles cause reductive defluorination through promoting the heretolytic cleavage of the C-F bonds, which results in the formation of the extended π-network of graphene. Thus, practically fluorine-free graphene derivatives are prepared.[2] In this frame, a fullerene derivative bearing a primary amine unit as nucleophile reacted with the electrophilic FG, resulting in the synthesis of the first all-carbon hybrid based on the chemistry of FG.[5] Recently, going one step further and taking into account that F atoms of FG have been replaced by two different functionalities through tuning the equivalents of reagents,[6] first the covalent linking of FG with a carbon allotrope was performed and next, the remaining F atoms were employed for the grafting of another nucleophile, thus providing a selective – in respect with the other carbon allotrope – post modification.

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References

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Figures

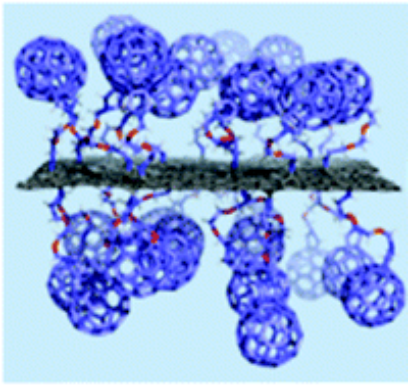

Figure 1: Covalently linked fullerene moieties onto graphene lattice *via* the chemistry of FG.