# Efficient Way towards Covalently Functionalized Graphenes

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Covalent functionalization of graphene broadens its application potential, because it enables efficient tuning its electronic, magnetic and surface properties.[1] So far, a wide range of various approaches have been developed for 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 unceasing need for new strategies that permit high yielding graphene functionalization under controlled conditions.

Fluorographene (FG) also known as graphene fluoride is a stoichiometric and well-established graphene derivative introduced in 2010. It is hydrophobic material[2] with large band gap.[3] It was considered rather unreactive as a counterpart of Teflon.[4] However, several recent studies have shown that FG is susceptible to reductive defluorination and nucleophilic attack.[5] The reactions usually result in homogeneously and densely functionalized graphenes. These findings suggest that FG may be a useful alternative material to graphene for the preparation of graphene derivatives. In the contribution, we will present reactions of FG carried out in our lab. The reaction mechanism, properties and prospective applications of the as prepared graphene derivatives will be thoroughly discussed. Namely, we will focus on the reaction with sulfhydryl,[6] hydroxy,[7] dichlorocarbene[8] and nitrile groups[9] as well as Grignard reagents.[10]

## References

[1] Georgakilas V. et al., Chem. Rev., 112 (2012), 6156; Criado et al. Angew. Chem. Int. Ed., 54 (2015), 10734
[2] Karlicky F. et al. Ann. Phys. 526 (2014), 408; Karlicky F. et al. J. Chem. Theory Comput. 9 (2013), 4155
[3] Lazar P. et al., Carbon, 94 (2015) 804
[4] Nair R.R. et al., Small, 6 (2010) 2877
[5] Zboril R. et al., Small, 6 (2010) 2885; Dubecky M. et al., J. Phys. Chem. Lett., 6 (2015) 1430
[6] Urbanová V et al., Adv. Mater. 27 (2015), 2305
[7] Tucek J. et al., Nat. Commun. (accepted)
[8] Lazar P. et al., Small, 11 (2015), 3790
[9] Bakandritsos A. et al., ACS Nano (submitted)
[10] Chronopoulos D. et al., Chem. Mater (submitted)

## Figures

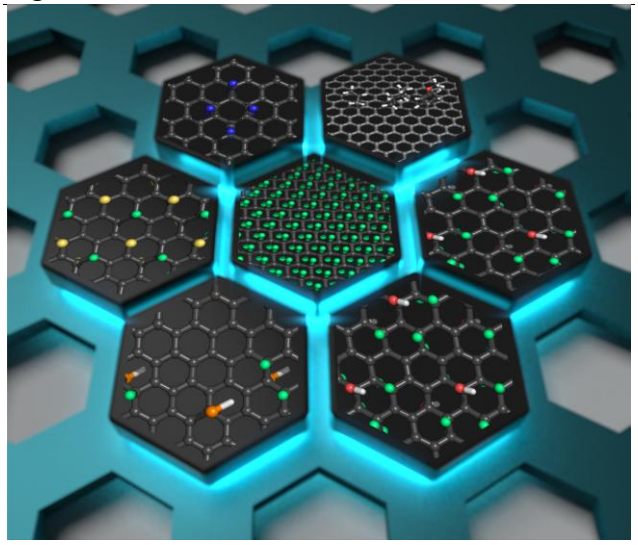

**Figure 1:** Fluorographene can be used as starting material for synthesis of large family of graphene derivatives.

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