Chemistry of fluorographene towards advanced sensing, magnetic and environmental technologies

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Fluorographene (GF) is the thinnest known insulator and surprisingly reactive graphene derivative enabling highly efficient and selective covalent functionalization of graphene via nucleophilic substitution.[1] GF and its derivatives like thiographene and hydroxofluorographene can be used as advanced biosensors (Figure 1) and room temperature 2D magnets (Figure 2), respectively.[2] At the same time, covalent chemistry of GF allows to synthesize various alkyl/aryl derivatives, and halogenated graphenes.[3] Recently discovered cyano-graphene and graphene acid (carboxy-graphene) possess an exceptional affinity to bind metallic and molecular species.[4] The applicability of these derivatives in environmental technologies, prevention of the bacterial resistance to silver nanoparticles,[5] and in the development of sustainable molecular magnets will be demonstrated.

Finally, non-covalent hybrids of fluorographene and metal organic frameworks (MOFs) will be introduced as superhydrophobic/oleophilic nanofibrous and hierarchical superstructures for the separation of oil fractions and organic solvents from water.[6]

References

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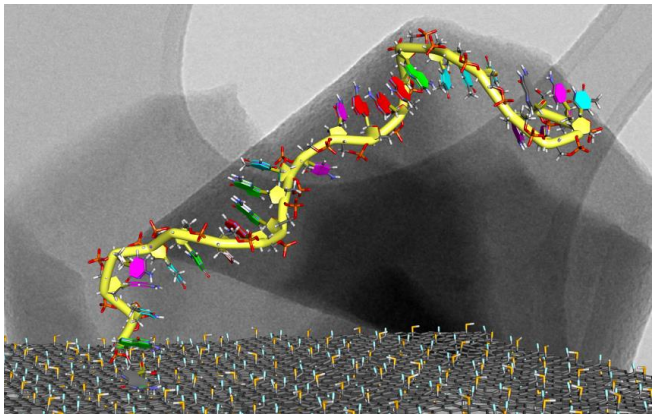

Figure 1: Schematic representation of thiographene-based DNA biosensor.

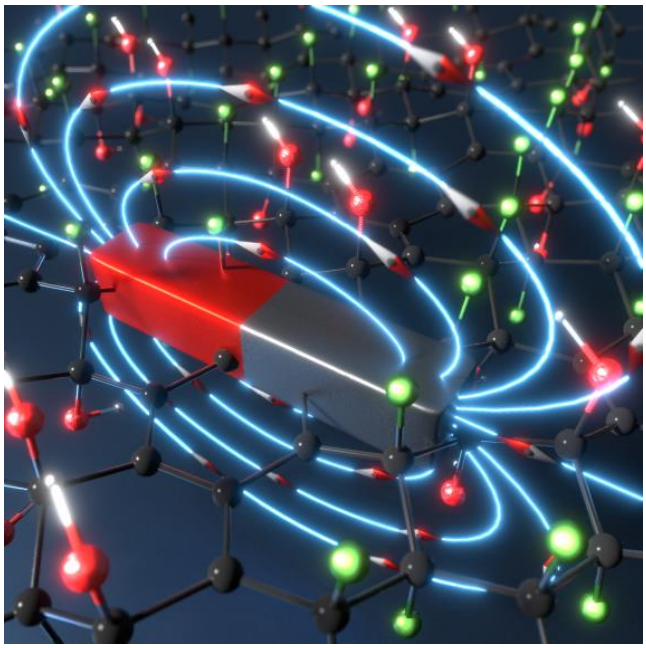

Figure 2: Schematic representation of hydroxofluorographene representing the first room temperature non-metallic 2D magnet.