Engineering Graphene Derivatives through Tailored Functionalization for Sensing Applications

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Graphene is renowned for its exceptional conductive and mechanical properties, making it highly suitable for a variety of sensing applications. However, its chemical inertness poses significant challenges for precise lattice modification, often necessitating harsh processing conditions. Direct functionalization methods yield graphene derivatives like graphene oxide, but these materials are typically non-conductive and chemically complex, which greatly limits their effectiveness in electrochemical sensing applications.

Fluorographene (FG) chemistry offers a promising solution to overcome graphene's low reactivity by enabling the scalable synthesis of graphene derivatives under mild and controllable conditions [1,2]. This approach allows for the production of both single and double-sided functionalized graphene derivatives with tailored chemical moieties that are homogeneously distributed across the graphene lattice. Furthermore, the degree of functionalization can be precisely controlled, providing a broad scope for customization [3].

The graphene derivatives produced through FG chemistry are directly applicable to a wide range of electrochemical sensing applications. Tailoring the chemical function together with degree of functionalization leads to efficient material suitable for temperature sensing without humidity interference [4]. The chemical functionalities facilitate also conjugation with biocomponents, which is advantageous for the construction of biosensors [5,6]. Additionally, the lateral size of the individual flakes makes these processed graphene derivatives suitable for inkjet printing technology. Recently, the fabrication of fully inkjet-printed electrodes applicable to electrochemical sensing has been demonstrated [7].

References

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