

Covalent modification of graphite via iodonium salts: A versatile alternative to diazonium salts.

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Covalent modification of carbon materials with organic functional groups is highly desired as it allows manipulation of their functional properties. Diazonium chemistry has remained a method of choice since it was first applied in 1992 for covalent attachment of aryl groups onto the surface of an amorphous carbon electrode.^[1] Reductive decomposition of diazonium salts, which can be achieved electrochemically, chemically, or photochemically, to produce aryl radicals has been used for modification of a wide variety of substrates including graphene and MoS₂.^[2,3]

While diazonium salts have proven to be versatile over the years, they are often unstable under ambient conditions necessitating their generation *in-situ* during the functionalization protocol. This complicates the already complex process of surface functionalization. Secondly, their high reactivity, while desired for modification of unreactive substrates such as graphene, often leads to side reactions that are difficult to control.

In this contribution, I will discuss the use of iodonium salts for covalent functionalization of graphite and graphene. Iodonium salts are known to be stable under ambient conditions compared to their diazonium counterparts and hence provide a comparatively simpler alternative. Furthermore, in contrast to aryl diazonium salts, this chemistry allows attachment of heterocycles^[4], and alkynyl groups^[5] groups to the surface. The covalent modification of graphite and graphene using electrochemical decomposition of iodonium salts will be discussed. The in-depth characterization of the modified surface using atomic force microscopy (AFM), scanning tunneling microscopy (STM) and Raman spectroscopy will be presented. Finally, a thorough comparison between the surfaces modified using diazonium chemistry and iodonium chemistry will be presented.

References

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