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Coupling Graphene with Polymers

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Abstract

Nowadays the concept of synergy through the combination of different materials is one of the most successful approaches at the frontiers of materials technology. In this respect, the combination of graphene with polymers provides a powerful tool for the creation of materials with countless applications almost in a combinatorial manner, because it does not only refer to the combination of two compounds but in the assembly of two families of materials.

The covalent route to connect graphene with polymers represents an interesting alternative to the conventional mixing methods for the development of novel composite materials with a compendium of interfacial interactions [1]. In this type of nanocomposites the concept of interface changes from a traditional view of molecular interactions between components at a polymer – filler interface (e.g. van der Waals, hydrogen bonding, halogen bonding, etc.), to the concept of a single compound where graphene forms an integral part of the polymeric chain [2].

Here, a series of synthetic approaches to covalently attach graphene and polymers are presented. These methods include alkyne-azide and thiol-yne click reactions as well as nitrene chemistry. While the click reactions need the previous modification of graphene with clickable polymers, the others involve the direct coupling of polymers to graphene.

These reactions also occur in graphene immobilized on surfaces [3] and, as some of them require the use of thermal or photochemical initiators, polymer brushes patterns on graphene surface can be obtained.

References

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