

One Pot Functionalization of Graphene with Porphyrin using Cycloaddition Reactions

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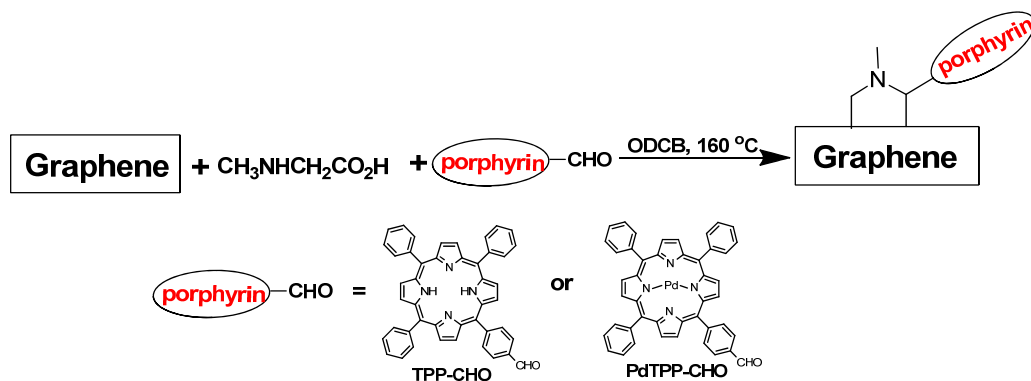
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Two types of graphene based hybrid materials, graphene-TPP (TPP: tetraphenylporphyrin) and graphene-PdTPP (PdTPP: palladium tetraphenylporphyrin) were prepared directly from pristine graphene using one pot cycloaddition reactions. The hybrid materials were characterized by TGA, UV/Vis, FTIR, TEM, Raman, luminescence spectroscopy and fluorescence/phosphorescence lifetime measurements. The covalent linkage between graphene and porphyrin was confirmed by FTIR, Raman spectroscopy and further supported by control experiments. The presence of TPP (or PdTPP) in the hybrid material was demonstrated by UV/Vis spectroscopy, and TGA results indicate that graphene-TPP and graphene-PdTPP hybrid materials contain approximately 18% TPP and 20% PdTPP, respectively. The quenching of fluorescence (or phosphorescence) and decreased lifetime suggests excited state energy/electron transfer between graphene and the covalently attached TPP (or PdTPP) molecules. Considering the unique properties of both graphene and porphyrin, these two hybrid materials may have potential applications in a number of areas, such as solar cells, catalysts, sensors.

References

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Scheme 1. Synthesis scheme of graphene-TPP and graphene-PdTPP hybrid materials.