

Surface modification of graphene for highly thermal conductive and thermally stable epoxy composite

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A novel approach is used to directly functionalize graphene, by maintaining its pristine properties that normally alters during treatment with strong oxidizing agents. The graphene is mildly treated with molar solution of acid to originate some oxidize groups, which helps neulophilic substitution reaction with amine group of (O-phenylenediamine) OPD in presence on NH₃. FTIR and X-ray photoelectron spectroscopy confirmed that amine group is doped on the graphene surface. The amine group of graphene is further reacts with epoxy moieties in similar manner as the hardener reacts with epoxy. The functionalization helps to develop good interfacial contact between filler and the matrix, which reduced the thermal interface resistance (Kapitza resistance (RK) that limits the heat flow due to difference in phonon spectra of two different phase. The thermal conductivity of functionalized graphene filled epoxy composite (fG-Epoxy) was significantly increased by ~13 folds in comparison with the neat epoxy composite (G-Epoxy) with 6 wt.% of the filler. The thermal stability of the composite is improved up to 10% with respect to neat epoxy.