A Three-dimensional Conductive Graphene-Based Epoxy Resin Nanocomposite by Filler Selective Localization

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A feasible and effective approach is developed to build an electrically conductive and double percolation network-like structure via incorporation of highly reduced graphene oxide (HRGO) into a polymer blend of diglycidyl ether of bisphenol A/polyetherimide (DGEBA/PEI). With the assistance of the curing reaction-induced phase separation (CRIPS) technique allows HRGO to form an interconnected network in the phase-separated network structure of the DGEBA/PEI polymer blend due to selective localization behavior. The DGEBA/PEI/HRGO nanocomposite was analyzed in terms of phase structure by content of PEI and low weight fractions of HRGO (0.5 wt.%). The HRGO delivered a high electrical conductivity in DGEBA/PEI polyblends, wherein the value increased dramatically at a low content of HRGO. Furthermore, the HRGO accelerated the curing reaction process of CRIPS due to its amino group. Finally, dynamic mechanical analyses (DMA) were performed to understand the CRIPS phenomenon and selective localization of HRGO reinforcement.