Graphene induced nanostructures in graphene-based composites and the performance of these composites have been explored in this study. For the metallic nanoparticles decorated graphene aerogels composites, the fabrication of hierarchically structured, reduced graphene oxide (rGO) aerogels with heavily metallic nanoparticles was realized. Higher loading of palladium nanoparticles in graphene aerogels leads to improved hydrogen gas sensing performance. For polymer derived ceramics (PDCs) composites with anisotropic electrical properties, the fabrication of composites was realized by embedding anisotropic reduced graphene oxide aerogels (rGOAs) into the PDCs matrix. Raman spectroscopy and X-ray diffraction studies of PDCs composites with and without graphene indicate that graphene facilitates the transition from amorphous carbon to graphitic carbon in the PDCs. For composites composed of PDCs and edge functionalized graphene oxide (EFGO), bulk PDCs based composites with embedded graphene networks show high electrical conductivity, high thermal stability, and low thermal conductivity. For the study of poly(3-hexylthiophene) (P3HT) crystallization on graphitic substrates (i.e. carbon nanotubes, carbon fibers and graphene), different types of P3HT nanocrystals (i.e. nanowires, nanoribbons, and nanowalls) were observed. The type of nanocrystals grown from graphitic substrates depends on the curvature of graphitic substrates, the molecular weight of P3HT molecules, and the concentration of P3HT marginal solutions. Besides, both specific surface area and curvature of graphitic substrates have major effects on P3HT crystallization processes.

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The public is welcome to attend.