Functionalization of Graphene and Dielectric Property Relationships in PVDF/graphene Nanosheets Composites

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In this paper, a series of the functionalized graphenes, such as graphene oxide (GO), reduced graphene oxide (rGO), carboxylated graphene oxide (GOCOOH), reduce carboxylated graphene oxide (rGOCOOH), fluorinated graphene oxide (GOF), and reduce fluorinated graphene oxide (rGOF), were successfully fabricated, and were introduced into the Poly (vinylidene fluoride) (PVDF) matrix to form composites. The effects of these functional groups on dielectric properties of GO/PVDF composites were systematically investigated. The results show that the reduced functional graphene/PVDF composites (rGOCOOH/PVDF, rGOF/PVDF) exhibit more excellent dielectric properties than that of composite samples without undergoing the reduction reaction (GOCOOH/PVDF, GOF/PVDF). The reduced samples not only possess high dielectric constant, but also maintain lower dielectric loss. And, the rGOCOOH/PVDF composite has better dielectric properties ($\epsilon_r = 17.64$, $\tan\delta = 0.031$) than others, due to strong interfacial and dipolar interactions between PVDF matrix and fillers. These results could be used as a guide to tune dielectric properties of polymer/graphene composites for their applications in embedded capacitors.

Keywords: Functionalized graphenes; PVDF; Dielectric properties

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