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Hyperbranched polyether epoxy grafted graphene oxide for benzoxazine composites: enhancement of mechanical and thermal properties

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ABSTRACT

Hyperbranched polyether epoxy (HBPEE) grafted graphene oxide (GO-HE) was designed to improve the dispersion/exfoliation and interfacial interaction between graphene oxide and benzoxazine (BOZ). The structures and morphologies of graphene oxide (GO) and GO-HE sheets were characterized by FT-IR, XRD, XPS, Raman spectroscopy, TEM and AFM. BOZ composites containing GO and GO-HE were prepared with different loadings and systemically investigated. GO and GO-HE produced 88% and 139% improvements, respectively, in impact strength at 0.05 wt% loading. The three-point bending test indicated that the BOZ/GO-HE composites exhibited higher flexural strength and modulus than the neat BOZ or BOZ/GO composites. For BOZ composites containing 0.05 wt% GO-HE, the flexural strength increased by 14.4%, and the flexural modulus increased by 10.0% compared to that of neat BOZ. Furthermore, the T_g and thermal stability of BOZ/GO-HE composites were significantly improved compared to those of neat BOZ and BOZ/GO composites. These improvements can be ascribed to better dispersion of GO-HE and a stronger interfacial interaction between GO-HE and the matrix, according to TEM and SEM analyses.

Keywords: Hyperbranched; epoxy; graphene oxide; benzoxazine

1. Introduction

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