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Abstract

The viscosity of uncured epoxy resins is usually increased by their incorporation of dispersed fillers such as carbon nanotubes (CNTs). The present authors found that for the aliphatic epoxy resin, i.e. diethylene glycol diglycidyl ether, the viscosity increase is greatly suppressed when graphene oxide nanoribbons (GONRs) are dispersed instead of CNTs. The present study aims to compare the effects of CNT and GONR dispersions in this resin on the adhesive, tensile and thermal properties of the cured resin. GONR dispersions were found to be more effective than CNT dispersions at increasing the fracture toughness, lap shear strength and peel strength of the cured resin. A simple analysis based on a two-element Maxwell model was presented, which reproduced the differences in the temperature and velocity dependences of the lap shear strength and peel strength. This model suggested that the increase in the adhesive strength was due to the increase in the intrinsic adhesive failure energy of the GONR dispersions, while it was due to the increase in the viscoelastic energy dissipation within the resin for the CNT dispersions.