Fabrication of Epoxy Hybrid Materials via Crosslinking of Sol-Gel Derived Epoxy-Oligosiloxane with Phenolic Hardener

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Sol-gel derived epoxy-oligosiloxanes were cured by phenolic hardener, that is, Bisphenol-A Novolac (BN) to investigate the effect of bulky oligosiloxane on the curing kinetics and mechanical properties of epoxy system. Conventional epoxy resin, that is, Diglycidyl ether of bisphenol-A (DGEBA) cured by BN was used as a reference material. Epoxy-oligosiloxane was prepared using by simple sol-gel reaction of (3-glycidoxypropyl)trimethoxysilane. In most cases, it is difficult to cure the epoxy-oligosiloxane to be cross-linked due to its bulky oligosiloxane. Thus, the hardener for epoxy polymerization has been introduced to be cured easily. In this study, the different curing characteristics caused by the pendant of epoxy systems were revealed. Regardless of the curing mechanism, the fabricated epoxy hybrid material made epoxy network structure embedded with homogenous siloxane nano-clusters (oligosiloxane). Then, the embedding oligosiloxane in the epoxy matrix enhances curing characteristics to make more rigid structure. The dense and cross-linked epoxy hybrid materials were confirmed by thermal analysis and mechanical characterization.

Keywords: epoxy, hybrid, sol-gel, oligosiloxane