

High Elongation Properties of Nanostructured Polymeric Materials/Epoxy Blends

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Epoxy flexibilizing has been an interesting topic in industrial areas such as automotive and electronics. Core-shell rubber (CSR) particles usually leads to an impressive toughening effect as nanodomain tougheners for brittle epoxy resins, but also tends to a less effect on improvement in elongation or flexibility property of epoxy systems. In this study, nano-structured hyper-branched polymers(HBPs) as a flexibilizer are synthesized and incorporated into epoxy resin to improve the elongation and flexibility characteristics of epoxy resins. Two different HBPs, hyper branched poly methylacrylate-diethanolamine(poly(MA DEOA)) and poly methylacrylate-ethanolamine(poly(MA EA)), were prepared and blended with both epoxy and polyetheramine, a curing agent. The molecular size of HBPs was estimated to be less than 20 nm in diameter. HBPs are designed to provide sufficient miscibility with epoxy. The adhesion strengths of cured epoxy/HBP blends gradually decreased with increasing the HBP loading % in the blends. Over 10 wt% of HBP loading, the elongations approached to about 50%, but also the adhesion strengths dramatically decreased from 17 MPa to 8 MPa.