

The Process Sensitivity of PBT-toughened Epoxies

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The toughness of brittle thermoset resins, which are considered non-toughenable by inclusion of rubber particles, have been considerably enhanced by inclusion of poly(butylene terephthalate) (PBT) without loss of inherent properties of the resins, such as Young's modulus and yield stress. However, the toughness of the PBT-modified epoxy is highly sensitive to the processing conditions, such as mixing temperature, amount of mixing, and the composition of the PBT phase. Changes in processing conditions cause significant changes in the toughness, the fracture mechanism, and the fracture morphology. The process sensitivity of PBT-toughened epoxy indicates the possible toughening mechanisms. The main toughening mechanism is the so-called phase transformation toughening which is well known in zirconia-containing ceramics. Other energy absorbing mechanisms active in PBT-toughened epoxy were crack path alteration, primary and secondary crack bridging, and ductile fracture of the matrix and included polymers.