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Study on a novel thermoset nanocomposite form DGEBA–cycloaliphatic diamine and metal nanoparticles

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Abstract

The thermo-physical properties of diglycidyl ether of bisphenol A (DGEBA)/isophoronediamine (IPDA) with iron nanoparticles were investigated using DSC, DMT, and TG analysis. Because of the higher values of the glass transition, it is recognized that the optimum behavior of the three-component system corresponds to the 10% loading level of iron nanoparticles. The addition of iron nanoparticles into the epoxy matrix resulted in a significant increment in the storage modulus and crosslink density. Also, the DGEBA/IPDA/10% iron nanoparticles showed an enhanced thermal stability owing to the introduction of iron nanoparticles as reinforcing filler. Curing reaction of DGEBA/IPDA with 10% iron nanoparticles was investigated by DSC at dynamic mode. Activation energy was calculated based on Kissinger method (66.52 kJ mol^{-1}). Also, the advanced isoconversional method is utilized to describe the curing reaction process. In the dynamic DSC analyses, the curing kinetics could be successfully described with the two-parameter autocatalytic model (Sěsták–Berggren equation) and the overall reaction order was about 2.78.

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