

MSE 2024

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Topic S: Structural Materials

S11: Advanced Polymer-Amine Based Thermal Latent Curing Agents for One-Component Epoxy Resins

Epoxy resins are utilized in polymer matrix composites (PMCs) as either two-component epoxy resins or one-component epoxy resins (OCERs). OCERs have longer shelf life, increased energy efficiency, better control over curing temperatures, and reduced risk of human error compared to two-component epoxy resins. Latent curing agents used in OCERs are activated by various methods including light irradiation and thermal activation although thermal latent curing agents (TLCs) are the most commonly used latent curing agents. In this work, polyoxazolines (POZs) were prepared and used with amine-based curing agents to create TLCs. POZ-based TLCs either in the form of POZ-amine complexes or POZ-amine conjugates were prepared and used with diglycidyl ether bisphenol A (DGEBA) resin to prepare OCERs. POZs were characterized by ^1H NMR, FTIR, GPC, TGA, and DSC. POZ-amine-based TLCs were characterized by FTIR and optical microscopy. Cure kinetics studies were performed using dynamic and isothermal DSC to investigate the curing behavior of the prepared OCERs. The effect of parameters such as amine content, POZ: amine ratio, POZ molar mass, and the type and number of pendant groups on the thermal latency behavior of OCERs was investigated. The results indicated that the OCERs with POZ-amine-based TLCs exhibited improved latency in curing and longer shelf lives compared to epoxy mixtures prepared with corresponding amines.

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