

517e Influence of Water on Cure Kinetics Via Eb-Irradiated Epoxy Resin

Jihean Lee and Giuseppe R. Palmese

The purpose of this investigation is to gain further understanding of the influence of water on phenyl glycidyl ether (PGE) and diglycidyl ether of bisphenol A (DGEBA). A near infrared (NIR) spectroscopy technique reported earlier was further developed to perform real-time in-situ kinetic analysis of radiation induced, electron beam (EB) and UV, cationic polymerization of epoxy systems with water. NIR spectroscopy was used to quantify the concentration of water in PGE and DGEBA prior to cure. The chemical kinetics results indicate that the presence of water affects the polymerization of the epoxy systems by (a) the appearance of a pronounced retardation period, (b) an accelerated reaction following the retardation period when compared to “dry” systems, and (c) higher conversion at shorter times. A kinetic mechanism was proposed to explain this behavior and a model based on this mechanism was found to be in good qualitative agreement with experimental results. It was also shown that the presence of water influences the behavioral characteristics of cationically cured epoxies by reducing Tg and increasing fracture toughness.