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How Chemical Reactions Take Place in Reactive Ternary Blends YOUNG GYU JEONG, TOMOKO HASHIDA, SHAW LING HSU, Polymer Science and Engineering Department, University of Massachusetts Amherst — Reaction mechanism and kinetics of reactive ternary blends, consisting of a crystallizable polyester, an amorphous polyether, and an acrylate with high glass transition temperature, have been investigated using time-resolved Fourier transform infrared spectroscopy. Since the polyester and polyether have reactive isocyanate units, they are able to react with water vapor in the environment. A specially-designed cell was constructed to obtain reaction kinetics for reactive ternary blends with a variety of thickness at different relative humidity and temperatures. The reaction kinetics obtained are significantly slower than expected for a diffusion-limited mechanism of a homogeneous medium, indicating that curing reactions in the thin dimension are primarily controlled by the reaction-limited mechanism. Morphological features (phase-separated structure, degree of crystallinity, and crystalline domain size), which have been characterized by vibrational spectroscopy, optical microscopy, and atomic force microscopy, are dependent on composition, thermal history, and initial phase behavior. Reaction rates were shown to be highly dependent on sample morphology and composition, being faster with smaller phase-separated domains and lower degrees of crystallinity.

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