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A Spectroscopic Investigation on the Structural Evolution of Soy Based Polyurethane Foams DEEPA PUTHANPARAMBIL, CASEY KIMBALL, SHAW L. HSU, University of Massachusetts Amherst — Our current research deals with an economical and renewable soy based polyol for use in polyurethane foams. Infrared spectroscopic studies have revealed that the amount of polyurea segments formed and the kinetics of their formation in soy based polyurethane foam systems are considerably different from traditional systems employing ethylene oxide – propylene oxide based polyols. The most crucial aspect of this research deals with the miscibility of water in the reactive mixtures involving extremely hydrophobic soy-based polyols. High Field Nuclear Magnetic Resonance Spectroscopy (NMR) with D_2O as the probing agent was employed to determine the miscibility behavior at the molecular level. This technique was able to establish the structure and location of dispersed water, which can be extremely different based on the polyols used, thus affecting the morphology of the foam. The length and amount of polyureas directly impact the kinetics of the phase separation process to form the hard-segment rich domains and associated physical properties. The aggregation of these polyurea hard domains were characterized by the hydrogen bonds formed. This structural transformation as a function of reaction is also reflected in the segmental relaxation kinetics characterized by spin-spin diffusion, measured using a low field NMR instrument.

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