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Effect of molecular weight of polyurethane toughening agent on adhesive strength and rheological characteristics of automotive structural adhesives

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Abstract

Rheological and adhesive properties of automotive structural adhesives including polyurethane (PU) toughening agents have been investigated by adjusting the molar ratio of polytetrahydrofuran (polyTHF) and hexamethylene diisocyanate (HMDI) for the control of molecular weight of a PU prepolymer. Thixotropic behavior, crosslinking characteristics, and lap-shear and T-peel adhesion strengths for various adhesives were significantly affected by single or binary-mixed PUs with different molecular weights. Thixotropic hysteresis loop of shear viscosity along with shear rate of an adhesive became larger with increasing PU molecular weight, exhibiting favorable flowability, however, the adhesion strengths were not satisfactory for injection and coating applications. We found that both rheological and adhesive properties of adhesives could be interestingly tuned by combining PU components with different molecular weights.

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