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The role of symmetry of chain extender in controlling the morphology of thermoplastic polyurethanes ONYENKACHI WAMUO, CHENG SONG, SHAW LING HSU, University of Massachusetts, Amherst — Although polyurethane is a well-studied subject, the specific role of chain extender in the alteration of segmental dynamics and morphology formation has yet to be elucidated. Relatively low molecular weight thermoplastic polyurethanes synthesized from a two-step polymerization method were utilized in this study. The effect of the symmetry of chain extenders used in the polymerization on the morphological behavior has been studied. Comparison has been made for a number of chain extenders, including a symmetric 1,4 butanediol or 1,6 hexanediol and an asymmetric 1,2 propanediol or 1,3 butanediol. Using a combination of thermal analysis, spectroscopy and mechanical properties measurements, the development of morphological features were determined as a function of time and temperature. The symmetric chain-extended polyurethanes promotes the formation of hydrogen bonding, shows two glass transition temperatures consistent with a phase separation behavior and furthermore gives a more rigid, less extensible mechanical property when compared with the asymmetric chain-extended polyurethanes. In the latter case, the reacted polymer exhibits poor chain packing thus limiting the formation of robust hydrogen bonding behavior. It showed a singular glass transition representative of a more phase mixed system and shows more extensibility in terms of its mechanical behavior.

Onyenkachi Wamuo
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