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Effect of chain extender on the phase behavior and morphology of high hard block content polyurethanes ACHILLEAS TSIOTAS, University of Manchester, CHRIS LINDSAY, Huntsman Polyurethanes, ALBERTO SAIANI, University of Manchester — Thermoplastic polyurethanes (TPUs) are linear block copolymers typically constructed of statistically alternating soft and hard segments, the hard segment itself being composed of an isocyanate and a short chain extender. In this project we focused on the effect that varying the chain extender used has on the phase behavior and morphology of high hard block content TPUs. Four different chain extenders were used. DSC, SAXS / WAXS, TEM / AFM, mechanical testing and FTIR were mainly used to characterize the morphology and properties of our materials. Through this work we were able to show that small changes in the chain extender chemical structure had dramatic effects on the properties of the TPUs. The use of 3-methyl-1,5-pentanediol resulted in a fully phase-mixed system with poor mechanical properties, while the use of 1,3-propanediol resulted in stiff materials with relatively high crystallinity and melting temperature. The use of 2-methyl-1,3-propanediol and 1,5-pentanediol resulted in similar materials, although 1,5-pentanediol was found to phase separate / crystallize on cooling while 2-methyl-1,3-propanediol was found to separate / crystallize on heating, suggesting a higher chain mobility in the latter materials.

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