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Structure and Dynamics Characterization of HMDI- and MDI-based Poly(urethane urea) Elastomers via Solid- State NMR WEIGUO HU, University of Massachusetts Amherst, ALEX HSIEH, B. CHRISTOPHER RINDERSPACHER, TANYA CHANTAWANSRI, U.S. Army Research Laboratory — High performance elastomers have recently gained considerable interest throughout DoD, particularly for their potential in ballistic impact protection and blast mitigation capabilities. Recent simulation results based on coarse-grained modeling have revealed the role of the intermolecular interaction and the flexibility of interface between hard and soft segments on the morphology and mechanical deformation behavior of poly(urethane urea), PUU, elastomers. In this work, we exploit solid-state nuclear magnetic resonance (NMR) techniques to investigate the influence of hard domain size on molecular dynamics by comparing the diisocyanate chemistry (aliphatic 4,4'-dicyclohexylmethane diisocyanate (HMDI) vs. aromatic 4,4'-diphenylmethane diisocyanate (MDI)) in PUU elastomers. Despite identical stoichiometry and soft segment chemical structure, large difference in the molecular dynamics, indicated by the ^{1}H dipolar dephasing time (T_d), is observed. The T_d of HMDI-PUU is shorter and it exhibits higher activation energy, suggesting finer phase mixing. Results from ^{1}H spin echo measurements are also included for comparison.

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