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**Structure and Tensile mechanical properties of poly(ester urethane) materials.** MARILYN HAWLEY, ROBERT HOULTON, PHILIP RAE, E. BRUCE ORLER, DEBRA WROBLESKI, Los Alamos National Laboratory — Scanning probe microscopy (SPM) techniques, primarily phase imaging, and Stress/Strain Tensile Measurements were used to study the properties of model poly (ester urethane) and 23% Estane$^{TM}$ compression molded samples. SPM was used to characterize the surface microstructure and the corresponding distribution of hard and soft segments within these samples. The model samples contained a range of nitroplasticizer (NP) content from 0 to 15%. SPM phase imaging yielded maps of variations in local mechanical properties at the nanometer scale. Tensile stress/strain measurements were carried out at 0.1 mm/min. Sequential tensile stress/strain measurements to increasing strains, sequential tensile stress/strain measurements to the sample strain, and at different temperatures allow us to understand the deformation mechanism in this complex material. Significant elastic behavior was seen below the glass transition.

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