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Dynamics of Segmented Polyurethane Elastomers Using Dielectric Spectroscopy[1] JAMES RUNT, The Pennsylvania State University, DANIEL FRAGIADAKIS, ALICIA CASTAGNA, TAEYI CHOI — This investigation focuses on the molecular dynamics of segmented polyurethane copolymers with different hard segment contents (30 to 52 wt percent) and soft segment chemistries. Methylene bis(p-phenyl isocyanate) and 1,4-butanediol constitute the hard segments in all materials under investigation, while soft segments include poly(tetramethylene oxide) and a 80-20 mixture of poly(dimethylsiloxane) and poly(hexamethylene oxide). The dynamics of these materials were explored over a wide temperature and frequency range using dielectric spectroscopy. In addition to investigating the details of segmental and local processes, three dielectric relaxations above Tg were observed for the first time in segmented polyurethanes, and their origin discussed in the presentation. For example, the highest temperature process is assigned to Maxwell-Wagner-Sillars interfacial polarization. The strength of the MWS process is a sensitive indicator of the change in microphase-separated character. It disappears at a temperature similar to that at which the small-angle X-ray scattering maximum disappears, indicating the transformation to the single phase state.

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