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NMR Characterization of the Interface in Polyurethane/Carbon Nanotube Composites PETER MIRAU, Air Force Research Laboratory, DANIEL POWERS, Air Force Research Laboratory, JENNIFER GARBER, Wright State University, HILMAR KOERNER, Air Force Research Laboratory, RICHARD VAIA, Air Force Research Laboratory — Solid-state proton NMR has been used to investigate the structure and dynamics of shape recovery polymers and composites with carbon nanotubes (CNTs). The thermoplastic polyurethane (Morthane) has both soft and hard segments. The soft segments are mobile at ambient temperature and give rise to a 2 kHz-wide proton signal. The proton signals shift and broaden with the introduction of CNTs. The proton spin-lattice and spin-spin relaxation times are relatively insensitive to the presence of CNT, demonstrating that the broadening is a consequence of proximity of the CNTs rather than a change in the molecular dynamics. The structures of the films in the stretched and relaxed states are probed using proton spin diffusion experiments. The results show the hard segments form 12 nm-sized domains and that the spin diffusion curves are very sensitive to the onset of soft-segment crystallinity as the samples are stretched. The effect of CNTs on the domain sizes and spacings are also measured in stretched and relaxed films.

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