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Impact of Nanotube Addition on Stress Recovery of Thermoplastic Elastomer Nanocomposites. DANIEL POWERS, MAX ALEXANDER, RICHARD VAIA, Air Force Research Laboratories, MICHAEL ARLEN, University of Akron, HILMAR KOERNER, University of Dayton Research Institute — Recent extension of polymer nanocomposite concepts to shape memory polymers has demonstrated potential to substantially improve recovery stress and provide novel triggering options, while still maintaining large deformations. One such example is multi wall carbon nanotubes (MWCNT)s in thermoplastic polyurethane (PU), where the MWCNTs increase modulus and modify strain induced crystallization leading to improved strain set and recovery force relative to unfilled PU as well as conventionally-filled PU. The impact of MWCNT alignment on the stress recovery rate depends on MWCNT concentration and the procedure used to 'set' the deformation. Differences in response time upon shape recovery are observed whether the nanocomposites are 'set' above the melting point of soft segment crystallites or at room temperature (RT). A detailed dynamic mechanical analysis protocol reveals that recovery rate and shape fixity are increasing as a function of MWCNT volume fraction and that RT processed nanocomposites show overall superior results. Recovery times can be described with a modification of the Kohlrausch-Williams-Watt equation, indicating a contribution from elasticity of the carbon nanotubes or chain scission of the matrix PU.

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