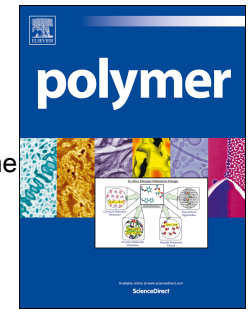
Accepted Manuscript



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PII: S0032-3861(17)30959-X

DOI: 10.1016/j.polymer.2017.10.003

Reference: JPOL 20045

To appear in: *Polymer*

Received Date: 28 July 2017

Revised Date: 26 September 2017

Accepted Date: 1 October 2017

Please cite this article as: Saleeb AF, Natsheh SH, Owusu-Danquah JS, A multi-mechanism model for large-strain thermomechanical behavior of polyurethane shape memory polymer, *Polymer* (2017), doi: 10.1016/j.polymer.2017.10.003.

A Multi-Mechanism Model for Large-Strain Thermomechanical Behavior of Polyurethane Shape Memory Polymer

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Abstract

The physical mechanisms underlining the unique shape memory behavior in polymers differ greatly from those in intermetallics. However, phenomenologically, both material systems exhibit pseudoplasticity and superelasticity. This provides the main motivation of the present work, in which a recently-developed multi-mechanism model, previously used successfully for intermetallics is extended to capture the thermomechanical responses of a polyurethane-polyester-polyol material having a glass temperature of 55 °C. To this end, *nine* different tensile test cases were considered, including engineering strains up to 200%, stress changes up to 120 MPa, temperature range from 35 °C to 75 °C, as well as cyclic isothermal and non-isothermal behavior. The model results were found to be in excellent agreement with the experiments. Additionally, investigations were carried out to provide macromolecular connection of the model inelastic state variables, as well as study its loading-mode and loading-rate sensitivities.

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