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Determination of the Nonlinearity Parameter in the TNM Model of Structural Recovery ROZANA BARI, SINDEE SIMON, Texas Tech University — Structural recovery of non-equilibrium glassy materials takes place by evolution of volume and enthalpy as the glass attempts to reach to equilibrium. Structural recovery is nonlinear, nonexponential, and depends on thermal history and the process can be described by phenomenological models of structural recovery, such as the Tool-Narayanaswamy-Moynihan (TNM) and the Kovacs-Aklonis-Hutchinson-Ramos (KAHR) models. The goal of the present work is to analyze methods to determine the nonlinearity parameter x and activation energy $\Delta h/R$. The methods to determine x includes the inflectional analysis, time-temperature superposition, and two-step temperature jump methods. The activation energy $\Delta h/R$ can also be obtained by the first two methods. The TNM model is used to simulate structural recovery data, which are then used to test the accuracy of the methods to determine x and $\Delta h/R$, with a particular interest in data obtained after cooling at high rates as can be obtained in the Flash DSC. The nonlinearity parameter x by the inflectional analysis and two-step temperature methods are accurate for exponential recovery. However, for real systems with nonexponential relaxation, methods to determine x are not reliable. The activation energy is well estimated by both the time-temperature superposition and inflectional analysis methods, with the former being slightly better.

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