Abstract

Hodge's formulization of the Tool-Narayanaswamy-Moynihan (TNM) equation from the Adam-Gibbs (AG) theory was re-evaluated. The non-linearity parameter (x) and the apparent activation energy (Δh^*) of the TMN equation were re-derived. Compared with the original derivations, the revised values of x and Δh^* were better correlated with experimental results. Of particular importance, the revised theoretical x correctly predicts the experimental trend of x for the cooling rate of polystyrene, whereas the original derivation predicted an opposite trend. Furthermore, the new derivation establishes a strong relationship between the fragility coefficient (m) and the x of a material. The relationship correlates well with the experimental values for a wide range of materials. Ultimately, the revised equations for x and Δh^* more precisely reveal the theoretical foundation of the phenomenological TNM equation, as it relates to structural relaxation of polymeric materials.