Thermodynamic Model for Glass Transition Temperature Dependence on Molecular Weight

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A new molecular thermodynamic model to predict the dependency of the glass transition temperature (Tg) of polymer on its molecular weight was developed based on the configurational entropy model and the Flory-Huggins theory. In this model, the disorientation entropy of the polymer (Sdis) has been taken into account. Quantitative descriptions according to the proposed model are consistent with experimental Tg data of several polymers against the number of chain segment (χ). At the same Tg.∞ (Tg of polymer at a infinite χ value), the degree of polymer disorientation is strongly correlated with the slope of straight line at lower χ regions in the Tg vs χ plot, which is quantitatively identified by physical parameter (χdis) in this model.