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Effects of crosslinker concentration and chemical disorder on the nonlinear mechanics of thermoreversibly associating networks GLENN H. FREDRICKSON, University of California, Santa Barbara, ROBERT S. HOY, Yale University — We present simulation studies of thermoreversibly associating polymer networks that relate dramatic differences in nonlinear mechanics (e. g. creep and fracture) to differences in crosslinker placement and consequent differences in the equilibrium structure and quiescent dynamics of these systems. Our results illustrate how the greater structural and dynamical heterogeneity in systems possessing randomly placed crosslinkers leads to higher mobility, increased creep compliance and decreased fracture toughness in comparison to systems with uniformly spaced crosslinkers. Further quiescent-dynamical slowdown and mechanical property enhancement may be obtained through well-defined but nonuniform placement of crosslinkers. The variation of properties with crosslinker concentration c and parent chain length N is also investigated. Increasing characteristic chemical distances between crosslinkers decreases effects arising from network "loops," the prevalence of which is closely associated with chemical order. At fixed c, while differences associated with chemical (dis)order decrease with increasing N, they remain dramatic in the $N \sim N_e$ regime which is often used in practical applications.

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