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Structural relaxation of thin polymer films[1] BRADLEY FRIEBERG, EMMANOUIL GLYNOS, University of Michigan, GEORGIOS SAKELLARIOU, University of Athens, PETER GREEN, University of Michigan — Time-dependent structural relaxations, physical aging, of films with thicknesses in the range of 50 nm to 2 microns, of star-shaped polystyrene (SPS) macromolecules are dependent on film thickness, H. In contrast to linear chain PS (LPS) where the aging rate, R, is independent of molecular weight, M, R is dependent on the functionality, f, and on the molecular weight per arm, Marm for SPS macromolecules. For example, the aging rates decreased 15 percent, for f of 8, and 40 percent, for f of 16, in comparison to that of linear chains, for a given film thickness. The aging rates, R, of the SPS macromolecules moreover are appreciably slower than their linear chain analogs, for a given H. The aging rates of the linear chain and star-shaped polymer films may be reconciled in terms of a model that accounts for changes in the local glass transition of the polymer films as a function of distance from an interface.

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