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Equilibration of Polymer Films Cast from Solutions with Different Solvent Qualities RANXING NANCY LI, ANDREW CLOUGH, DONGDONG PENG, ZHAOHUI YANG, OPHELIA TSUI, Boston University — The preparation history can affect the physical properties of polymer thin films. In spin coating, films are made from a polymer solution. Due to rapid evaporation of solvent in this process, the polymer chains in the films cannot fully interpenetrate, resulting in a non-equilibrium conformation with reduced entanglement density. These in turn can affect the film's equilibration process and viscoelastic properties. On the basis that the chain conformation and entanglement density in a film depend on the conformation of the chains while in solution before spin-coating. We modify the structural properties of the films by adjusting the quality of the solvent used in spin-coating. We examine in detail how these adjustments affect the way polystyrene films approach equilibrium on annealing above the glass transition temperature. It is found that the equilibration time of the film is significantly increased as the solvent quality is decreased towards the Θ condition. We attribute this observation to reduced entanglement in the films with decreasing solvent quality.

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