

Abstract Submitted  
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**Non-equilibrium behavior of spin-cast films** KATHERINE THOMAS, University of Cambridge — The behavior of polystyrene films cast from various solvents using an electric field to weakly perturb the free surface of the polymer melt was examined. The effective viscosity and residual stresses of the as-spun films strongly depend on the casting solvent. As-cast films had a substantially reduced viscosity compared to annealed films, with the greatest reduction in films cast from solutions near  $\theta$ -temperature. The reduced viscosity is explained in terms of non-equilibrium effects from the film formation process; rapid quenching during spin-coating results in a lower entanglement density of chains compared to an equilibrium melt. The difference in films spun from the various solvents is explained by changes in chain conformations in the initial solutions and the vitrification point. The wavelength of the instabilities in as-cast films was higher than expected, indicating a weak stabilizing pressure. This is attributed to frozen-in normal stresses resulting from an asymmetric deformation of the chains due to evaporation of residual solvent after vitrification. The results show the non-equilibrium nature of as-cast polymer films and that processing conditions strongly influence their behavior.

Katherine Thomas  
University of Cambridge

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