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**Molecular confinement and residual stress in ultrathin polymer films**[1] ARNOLD YANG, National Tsing Hua University, GUNTER REITER, University of Freiburg, Germany, YI-HSIN CHANG, YI CHIEN, National Tsing Hua University — The residual stress operative in thin films of a polymer (polystyrene) prepared by spin coating was determined from local elastic stress release induced by pinhole nucleation during dewetting instability. The measured stress was orders of magnitude greater than the capillary force and attributed to chain recoiling of the confined macromolecules. The entropy-driven stress was found to be small for thicker films but increase dramatically as film thickness became less than the unperturbed molecular dimensions. The chain conformations in these films can only be described by the Langevin, rather than Gaussian, statistic and the draw ratio was determined to be around 5, comparable to that in craze fibrils, for film thickness of 4 nm. The effects of spin speed, aging-induced relaxation, and molecular packing were investigated. The molecular processes during spin coating were proposed. In addition, conjugated polymers when squeezed into the molecular thicknesses were found to emit light with much enhanced efficiencies due to the large molecular deformation.

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