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Residual Stress in Floating Polymer Sheets KAMIL TOGA, JIANG-SHUI HUANG, BENNY DAVIDOVITCH, NARAYANAN MENON, THOMAS RUSSELL, University of Massachusetts — Capillary wrinkling of floating polystyrene (PS) sheets offers a simple methodology to investigate the properties of polymers without the constraint of adhesion to an underlying substrate. A radially symmetric wrinkle pattern forms when a small water droplet is placed at the center of a floating circular film. Residual biaxial tension resulting from preparation conditions and the line tension imposed by the three-phase contact line at the droplet and film edges can be quantified by observing the film topography under the water droplet. Fluorescent PS films of varying thicknesses were prepared by spin coating and transferred to the water surface. The residual stress were measured an order of magnitude smaller than that reported for films on solid substrates. A strong dependency on film thickness and weak molecular weight dependence were found. The length of wrinkles radiating from the droplet was accurately calculated; residual stress determined in this manner.

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