

Abstract Submitted
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Polymer Thin Film Buckling: Wrinkling and Strain Localizations¹ YURI EBATA, University of Massachusetts, Amherst, ANDREW B. CROLL, North Dakota State University, ALFRED J. CROSBY, University of Massachusetts, Amherst — Out of plane deformations of thin films are observed in everyday life, e.g. wrinkled aging human skin or folded fabrics. Recently, these deformations are being pursued for fabricating unique patterned surfaces. In this study, the transition from wrinkling, a low-strain buckling behavior, to localized deformations such as fold and delamination, is investigated for polystyrene films with thickness ranging from 5nm to 180nm. The thin films are attached to a uniaxially strained polydimethylsiloxane substrate and the strain is released incrementally to apply increasing compressive strain to the attached film. The wavelength and the amplitude of local out-of-plane deformation are measured as global compression is increased to distinguish between wrinkling, folding, and delamination. The transition from wrinkling to strain localizing events is observed by tracking the statistics of amplitude distribution sampled across a large lateral area. A critical strain map is constructed to denote the strain regimes at which wrinkle, fold, and delamination occur.

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