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**Morphologies of Equibiaxially Wrinkled Surfaces** DEREK BREID, University of Massachusetts, SHENGQIANG CAI, ZHIGANG SUO, JOHN HUTCHINSON, Harvard University, ALFRED CROSBY, University of Massachusetts — The morphological characteristics of a wrinkled film are largely determined by the state of stress at the onset of the instability. For surfaces compressed equibiaxially, it is well established that ridge-based structures, including herringbone or labyrinth patterns, provide the lowest energy state for stresses far exceeding critical buckling. For near-critical stresses, the equilibrium morphology is less understood. Using surface-oxidized poly(dimethylsiloxane) as a model wrinkling material, we control the applied stress by swelling the oxide film with a compatible vapor-phase solvent. The extent of swelling is controlled by the vapor pressure of the solvent and the thickness of the oxide layer, and the generated overstress in turn dictates the observed morphology. Analytical and numerical models are used to determine the deformation morphologies that provide the lowest energy state with increasing overstress. Comparison of experimental observations and theoretical predictions provides insight into the importance of substrate curvature in determining final equilibrium morphologies.

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