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Stress induced topographic patterning in thin diblock copolymer films ANDREW CROLL, North Dakota State University, ALFRED CROSBY, University of Massachusetts, Amherst — When a thin rigid polymer film is attached to a soft elastic substrate and placed in a state of compressive stress, the system wrinkles as a critical stress is surpassed. This simple deformation pattern contains information about the mechanical state of both the polymer film and substrate. Although classical mechanics can be used to relate the global deformation of the film/substrate to the local wrinkle geometry as a function of materials properties, relatively little is known about how the thin capping film material accommodates the localized bending (and therefore localized stress). Here we conduct wrinkling experiments using a model diblock copolymer/elastomer composite. Wrinkling a homogeneous, disordered block copolymer film places the film in a well-defined initial stress state. When heated above its glass transition, the wrinkled film flows, microphase separates, and relaxes from the stress imposed by local wrinkle deformations. The periodic stress relaxation leads to the emergence of a new pattern in the microphase separated surface structure, thus providing new insight into how block copolymers react to stress.

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