

Abstract Submitted
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Generation of Oriented Buckling Patterns by Modulation of Local Elastic Moduli EDWIN CHAN, ALFRED CROSBY, University of Massachusetts

— Wrinkling patterns based on elastic instabilities are interesting due to the spontaneous formation of relief structures that consists of a dominant periodicity. While a wide variety of soft materials has been utilized to generate surface buckling patterns, alignment of these structures has only been demonstrated previously through pre-defined topographic patterns. In this contribution, we introduce a new methodology to producing aligned, or patterned, surface wrinkles through the manipulation of the local stress distributions. We define the specific regions of local differences in the elastic moduli of a poly(dimethyl siloxane) (PDMS) elastomer by selective oxidation of the PDMS surface into a silicate thin film. Subsequent swelling with a photopolymerizable monomer provides the buckling stress necessary for the formation of aligned surface wrinkles. We show that geometric confinement of the oxidized regions coupled with an osmotic stress controls the formation and orientation of the wrinkling structures.

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