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Structured Interfaces of Surface Wrinkles for Adhesion, Optics and Sensors EDWIN CHAN, ALFRED CROSBY, University of Massachusetts Amherst — From the adhesion of the gecko to the optics of the dragonfly's eye, nature provides numerous examples that utilize optimized microstructures to control interfacial properties. Inspired by the natural world, many research groups have adopted similar approaches to generate devices that are based primarily on top-down strategies – i.e. lithography. An attractive alternative for creating surface structures is surface wrinkling. Surface wrinkling has been observed by many researchers over the past several decades and is associated with the onset of an elastic instability. The wavelength and critical stress of formation are determined by a combination of geometry and materials properties. Here, we present a new approach to generating stable surface wrinkles based on swelling of an elastomer with a photocrosslinkable monomer formulation. We explore dimensional, orientational and spatial control of the wrinkled structures by creating polymer surfaces with defined regions of contrasting elastic moduli. Specifically, we present an experimental phase diagram of various wrinkle structures, which highlights the discovery of two morphologies that have not been previously observed. We demonstrate how these unique structures can be used for enhanced control of adhesion in soft polymers and the simple fabrication of microlens arrays and compound lens structures.

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