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Creasing instability of surface-attached hydrogels RYAN C. HAYWARD, VERONICA TRUJILLO, JUNGWOOK KIM, ANESIA BURNS, University of Massachusetts, Amherst — Surface-attached hydrogels provide a convenient means to tune interfacial material properties such as biocompatibility and tribology. When the gel undergoes hydration, however, the substrate provides a constraint against lateral expansion, thereby generating an in-plane compressive stress within the gel. For sufficiently large degrees of compression a creasing instability takes place, in which the gel surface locally buckles and forms sharp folds. While this instability has been known in practice for well over a century, it remains poorly understood. Using model polyacrylamide hydrogel systems, we have studied the onset of creasing as a function of material properties and gel thickness, and addressed basic questions regarding crease morphologies and growth mechanisms. Using the understanding gained from these studies, we are developing this instability as a route to create active surfaces, where both surface topography and chemical patterns can be controllably modulated.

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