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Creasing Instability of Hydrogel Surfaces: Nucleation, Growth Dynamics & Hysteresis RYAN HAYWARD, JINHWAN YOON, JUNGWOOK KIM, University of Massachusetts Amherst — The free surface of a hydrogel film supported on a rigid substrate will become unstable to formation of sharp folds when placed under sufficiently large compressive swelling stresses. We seek to exploit this mechanical creasing instability to design smart polymer films with reversible stimuli-responsive properties, however many fundamental questions remain about the mechanism and dynamics of crease formation. We have studied the process of crease nucleation and growth, as well as presence of hysteresis in the level of compressive stress at which folds form and disappear using temperature-responsive surface attached hydrogels. To further understand these processes, we have also studied the influence of skin layers coated on the gel surface and defects in the gel. These studies provide important insights into the mechanism of crease formation and how to control the onset and disappearance of creases.

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