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Dynamic display of biomolecular patterns through an elastic creasing instability of stimuli-responsive hydrogel surfaces JUNGWOOK KIM, RYAN HAYWARD, University of Massachusetts, Amherst — Swelling a soft hydrogel film attached to a rigid substrate generates a lateral biaxial compressive stress within the gel. For sufficiently large stresses, the free surface of the gel undergoes a mechanical instability to form sharp creases on its surface. We have taken advantage of this process using temperature-responsive hydrogels to fabricate dynamic scaffolds that reversibly hide and display biomolecular patterns. Desired bioactive ligands are grafted to polyelectrolytes, which are then selectively deposited to pattern the hydrogel surface. The shapes of the patterns are directed by topographic features of the underlying substrate. At room temperature, the functionalized areas of the surface are hidden within creases, but as the temperature is raised, dehydration of the gel leads to unfolding of creases and exposure of the biomolecular patterns. By switching on and off the patterned functionalities, we could engineer dynamic interactions between our scaffolds and target objects such as microscopic beads or cells.

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