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The effects of elastocapillary length on the surface creasing instability of hydrogels TETSU OUCHI, Univ of Mass - Amherst, QIHAN LIU, ZHIGANG SUO, Harvard University, RYAN HAYWARD, Univ of Mass - Amherst — Creasing is a mode of surface instability induced by compressing elastomers or gels. Formation of creases is known to proceed by a nucleation and growth process, and the critical nucleus size is thought to be determined by the elastocapillary length (defined by the ratio of surface tension to elastic modulus). Here, we vary the elastocapillary length over the range of 0.008 to 0.4 mm by preparing a series of soft hydrogels with different compositions and contacting them with humidified air. By rapidly applying compression, we are able to achieve strains that exceed the Maxwell strain (where creases become favorable compared to a flat surface) by more than 0.10, and which approach Biot's prediction for linear instability of a compressed half-space. Regardless of the conditions, however, we observe formation of creases only by nucleation and growth, although the density of nucleation sites is found to be sensitive to elastocapillary length. Interestingly, fast propagation of creases (at velocities similar to the speed of sound in the material) are found at strains approaching Biot's point.

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