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Measuring mechanical properties of thin hydrogel sheets by elasto-capillary origami. JINHYE BAE, RYAN HAYWARD, Univ of Mass - Amherst — Characterizing the mechanical properties of soft elastic materials is critical for understanding their fundamental behaviors, as well as for their use in applications as biomaterials and stimuli-responsive devices. However, quantitative measurements of soft materials, especially those with micro-scale dimensions, is challenging using conventional methods. We take advantage of the recently developed understanding of the elasto-capillary deformation of thin sheets under conditions where interfacial tension is comparable to elastic bending energy, as a means to characterize the elastic properties of micro-scale gel sheets. We first calibrate the method by studying the relationship between the minimum encapsulation length (L_{crit}) and the elasto-capillary length (L_{ec}) using commercial polymer films with known thickness and modulus, and then apply it photo-crosslinked temperature-responsive hydrogel sheets over a range of temperatures. We anticipate that surface tension will provide a versatile probe for characterizing the properties of soft materials on the micro-scale.

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