Abstract Submitted
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Surfactant-Driven Fracture Formation in Soft Gels[1] MARK SCHILLACI, Dept. of Physics, NC State University, JOSHUA BOSTWICK, Dept. of Mathematics, NC State University, KAREN DANIELS, Dept. of Physics, NC State University — The formation of fractures in gels well above the solid-liquid transition has been previously shown to initiate through a Poisson process, indicating that thermal fluctuations play a significant role. Here, we present experiments quantifying fracture formation in gels close to the solid-liquid transition. We utilize a spreading surfactant droplet to apply small forces to the surface of the gel. Fractures form along the contact-line and propagate outward in a star-burst pattern. By varying the droplet surface tension and gel modulus, we are able to tune the fracture formation and control the mean number of fractures formed. We interpret the number of fractures formed in the context of a linear elastic model for the uncompensated, Young-Dupré (out-of-plane) force acting at the contact-line. However, we also observe that there is an inherent variability in both the number of fractures formed and the delay for fractures to form. In the regime where single fractures form, we observe a range of delay times consistent with a Poisson distribution. In the regime where multiple fractures form, we observe that all fractures appear simultaneously and the long delays are suppressed.

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