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Surfactant-driven fracture of gels: Initiation JOSHUA BOSTWICK, MARK SCHILLACI, KAREN DANIELS, NC State University — A droplet of surfactant spreading on a gel substrate can produce fractures on the gel surface, which originate at the contact-line and propagate outwards in a star-burst pattern. Experiments show that the number of arms is controlled by the ratio of surface tension contrast to the gel's shear modulus. To further understand the mechanism behind crack initiation, we model the gel as a linear elastic solid and compute the state of stress that develops within the substrate from the uncompensated contact-line forces. The elastic solution yields an effective metric to predict the number of fractures. We also show that the depth of the gel is critical parameter in the fracture process, as it can help mitigate large surface tractions. This observation is confirmed in experiments.

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