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Surface tension gradient-induced gel fracture[1] CONSTANTINE SPANDAGOS, PAUL LUCKHAM, OMAR MATAR, Imperial College London — The spreading of surfactant-laden droplets on the surface of gels can be accompanied by the fracture of the gel surface and the subsequent formation of crack-like patterns. This intriguing phenomenon has been observed on the surface of different types of gels, and for the spreading of both convectional and superspreading surfactants. Understanding the mechanism behind this crack formation is believed to contribute significantly to the control and improvement of a large number of processes that involve systems of spreading liquids and gel-like materials. It is suggested that Maranagoni stresses generated by surface tension gradients between the surfactant and the gel are responsible for the gel surface fracture. The gel seems to "unzip" in a direction perpendicular to that of the crack propagation. Furthermore, our systematic study reveals that a crack can be formed only within the experimental conditions that allow $S/\Delta w$ to be greater than G', where S is the surface tension difference between the surfactant and the underlying gel, Δw is the change of the width of a crack and G' is the storage modulus of the substrate.

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