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Elastic Suppression of Viscous Fingering GUNNAR PENG, JOHN LISTER, University of Cambridge — Consider peeling an elastic tape or beam away from a rigid base to which it is stuck by a film of viscous liquid. The peeling motion requires air to invade the viscous liquid and is thus susceptible to the Saffman–Taylor fingering instability. We analyse the fundamental travelling-wave solution and show that the advancing air–liquid interface remains linearly stable at higher capillary numbers than in a standard Hele-Shaw cell. A short-wavelength expansion yields an analytical expression for the growth rate which is valid for all unstable modes throughout the parameter space, allowing us to identify and quantify four distinct physical mechanisms that each help suppress the instability. Applying our method to the experiments by Pihler-Puzovic et al. (2012) reveals that the radial geometry and time-variation stabilize the system further.

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