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Fingering Instability During Debonding: From a Viscous Liquid to a Soft Elastic Solid JULIA NASE, PPMD-ESPCI, ANKE LINDNER, PMMH-ESPCI, COSTANTINO CRETON, PPMD-ESPCI — We investigate the fingering instability during debonding of a confined viscoelastic layer in a circular lifted Hele-Shaw cell.[1] We use PDMS with different degrees of crosslinking, ensuring a continuous transition from a viscous liquid to a soft elastic solid. During debonding, a fingering instability with characteristic initial wavelength λ evolves. When going from a liquid to a solid, we observe a transition from bulk to interfacial mechanisms. We predict this transition from linear viscoelastic and surface properties. We show that for the interfacial mechanism, λ depends solely on the film thickness, whereas for the bulk mechanism, λ depends on the material parameters. *lambda* is in both cases in quantitative agreement with linear stability analysis. For a Newtonian oil, we discuss in detail the coarsening of the pattern during debonding. Adapting a recent 3D technique, we visualize for the first time in situ the contact line between viscoelastic material and air in three dimensions, providing direct access to the boundary conditions.

[1]J. Nase, A. Lindner, C. Creton, PRL **101**, 074503 (2008)

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