Electronic Supplementary Information

An island of stability in a sea of fingers: emergent global features of the viscous-flow instability

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The Electronic Supplementary Information consists of two movies.

The movies show fingering patterns resulting from the displacement of a more viscous fluid by a less viscous one for two different viscosity ratios of the inner to the outer fluid, η_{in}/η_{out}.

Movie 1: $\eta_{in}/\eta_{out} = 0.0033$ ($\eta_{out} = 296.7$ mPa s, $\eta_{in} = 0.99$ mPa s)
Movie 2: $\eta_{in}/\eta_{out} = 0.42$ ($\eta_{out} = 530.3$ mPa s, $\eta_{in} = 224.4$ mPa s)

For both experiments, the colorless outer fluid is a silicone oil and the dyed inner fluid is a glycerol-water mixture. In both cases the viscosity difference $\Delta\eta \equiv \eta_{out} - \eta_{in}$, the plate separation b, the volumetric flow rate q and the interfacial tension σ are the same: $\Delta\eta = 300\pm6$ mPa s, $b = 254$ μm, $q = 10$ ml/min, $\sigma = 26.5\pm2.5$ mN/m. The obvious difference, the length of the fingers compared to the radius of the inner region of complete displacement, is due only to the change in the viscosity ratio: η_{in}/η_{out}.

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