Movie Captions for: Homogenizing fluid transport in stratified porous media using an elastic flow instability

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Movie S1: Uneven partitioning of flow visualized with a step change in dye concentration in a stratified Hele-Shaw assembly. The fluid is the polymer solution injected at $Q = 3$ mL/hr, corresponding to $\mathrm{Wi}_I = 1.4$, below the onset of the elastic flow instability in any stratum. The video is sped up by 900×.

Movie S2: Uneven partitioning of flow visualized with a step change in dye concentration in a stratified Hele-Shaw assembly. The fluid is the polymer-free Newtonian solvent injected at $Q = 35$ mL/hr. The video is sped up by 100×.

Movie S3: Partitioning of flow is less uneven than at $\mathrm{Wi}_I = 1.4$, as visualized with a step change in dye concentration in a stratified Hele-Shaw assembly. The fluid is the polymer solution injected at $Q = 25$ mL/hr, corresponding to $\mathrm{Wi}_I = 2.7$, above the onset of the elastic flow instability in the coarse stratum. The video is sped up by 100×.

Movie S4: Partitioning of flow is more uneven than at $\mathrm{Wi}_I = 2.7$, as visualized with a step change in dye concentration in a stratified Hele-Shaw assembly. The fluid is the polymer solution injected at $Q = 45$ mL/hr, corresponding to $\mathrm{Wi}_I = 3.3$, above the onset of the elastic flow instability in both strata. The video is sped up by 100×.

Movie S5: Visualization of fluid streamlines using confocal microscopy of twenty randomly-chosen pores, half in the coarse stratum (top, scale bar 100 μm), the other half in the fine stratum (bottom, scale bar 50 μm), of a stratified microfluidic assembly ($\tilde{k} \approx 9$, $\tilde{A} \approx 1$) at $\mathrm{Wi}_I = 2.7$—for which some pores in the coarse stratum are unstable, while all pores in the fine stratum are stable. Black circles are sections through the beads making up the solid matrix, white lines are time projections of the tracer particle pathlines that closely approximate the instantaneous flow streamlines. Imposed flow direction is from left to right. Red line demarcates pores labeled stable or unstable identified by clear crossing of streamlines over time. Videos are sped up by 25×.

Movie S6: Visualization of fluid streamlines using confocal microscopy of twenty randomly-chosen pores, half in the coarse stratum (top, scale bar 100 μm), the other half in the fine stratum (bottom, scale bar 50 μm), of a stratified microfluidic assembly ($\tilde{k} \approx 9$, $\tilde{A} \approx 1$) at $\mathrm{Wi}_I = 3.3$—for which an appreciable fraction of pores in both strata are unstable. Black circles are sections through the beads making up the solid matrix, white lines are time projections of the tracer particle pathlines that closely approximate the instantaneous flow

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streamlines. Imposed flow direction is from left to right. Red line demarcates pores labeled stable or unstable identified by clear crossing of streamlines over time. Videos are sped up by 25×.