

Abstract Submitted
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Lubrication failure of viscous threads in microfluidic chambers¹

SAMIRA DARVISHI, THOMAS CUBAUD, Stony Brook University — We investigate lubricated transport of high-viscosity fluids in microfluidic systems. Using miscible liquids having disparate viscosities, we produce a viscous core transported within a less viscous annulus, i.e., a viscous thread, in a square microchannel. Downstream, the thread motion is studied in diverging-converging slit microchannels. We describe a variety of flow patterns resulting from the folding instability and examine the relationships between flow morphologies and system parameters including fluid viscosities, mass diffusion coefficient, flow rates, and micro-cell geometry. In particular, we demonstrate that small threads can traverse the extension without lubrication failure while large threads experience a significant dilation due to direct contact with the top and bottom walls. We also investigate the lubrication failure of capillary threads using immiscible fluids and show the possibility to manipulate contact lines.

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