Abstract Submitted
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Pressure driven foam flow rheology C.D. JONES, K. NORDSTROM, D.J. DURIAN, University of Pennsylvania — We probe the complex rheology of 3d foams by flowing them through a narrow column. The foam flows upward through one of two vertical rectangular columns with a 4:1 cross-sectional aspect ratio, by bubbling gas through a soapy solution at the base of our apparatus. One column is clear acrylic sheet on all sides, which is slippery to the foam, and results in plug flow. The other column has the narrow surfaces covered with sandpaper, giving them a sticky surface, which creates shear due to the zero velocity boundary condition. As expected, the flow profile between the slippery broad faces is flat, however the profile between the narrow, sticky faces exhibits a curved velocity profile that is strongly dependent on flow rate. We are able to analyze a 2d velocity profile from a 3d bulk system, whereas other recent foam rheology work has been constrained to the 2d system. We employ particle image velocimetry to measure the strain rate, and compute the stress from the pressure drop along the channel, to investigate the local stress-strain relationships in a flowing foam.

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