Abstract Submitted
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Quasi-2D foam: Rheology and fracture[1] SHEHLA ARIF, Mechanical Engineering, Northwestern University, J.-C. TSAI, Institute of Physics, Academia Sinica, Taiwan, SASCHA HILGENFELDT, Mechanical Science and Engineering, University of Illinois at Urbana-Champaign — A single layer of acqueous foam bubbles captured between parallel plates in a Hele-Shaw rectangular-channel geometry is a system with many desirable qualities: the foam can be observed over the entire width and length of the channel and interpreted as effective medium, but at the same time all information about every single bubble (size, shape, deformation) is readily available. We show that a proper modification of Bretherton's single-bubble theory allows for a quantitative description of foam rheology in this quasi-2D set-up, both for the general flow resistance of the foam and for the motion of individual bubbles. For the latter, the viscous flow resistance can be related to pressure and stress distributions in the foam when it is driven by imposed external pressure. Such a foam ultimately undergoes fracture in two modes aptly described as "brittle" and "ductile," and the rheology measurements yield a criterion for the transition point between these two behaviors.

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