Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Beyond deformation: Foam fracture SASCHA HILGENFELDT, ESAM and Mechanical Engineering, Northwestern University, ADRIAN STAICU, Applied Physics, University of Twente, The Netherlands — When a flow of air is driven into a quasi-2D layer of ordered foam in a rectangular Hele-Shaw cell, the foam reacts in a fashion reminiscent of processes in both liquids and solids. On the macroscopic scale of the entire cell, an air finger analogous to that in non-Newtonian fluids develops. On the microscopic scale of single bubbles, elementary structural transitions (T1s) parallel the rearrangement of atoms around a crack tip in a solid. Above a critical air flow rate, the finger propagation abruptly changes to a fast cleavage process based on the rupture of successive films in the foam. We show that the interplay of surface tension and drag forces accounts for the transition and that this foam experiment allows for a detailed observation of both quasistatic and dynamic fracture processes.

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Date submitted: 11 Aug 2005 Electronic form version 1.4