Mechanical response of foams : elasticity, plasticity, and rearrangements

Deen, M.S. van

SUPPLEMENTAL MATERIAL

accompanying the thesis

Mechanical Response of Foams: Elasticity, Plasticity, and Rearrangements

Available on-line at `https://zenodo.org/record/57013`

S1, S2 (Fig. 4.1)
: Two examples of foam under shear, $\phi = 0.85$ (S1) and $\phi = 1.25$ (S2). The foam is sheared from $s_{CD} = -0.2$ to $s_{CD} = +0.2$ at $\dot{\gamma} = 3 \times 10^{-5}/\text{s}$. Time and a scale bar are indicated in the top right; the video is sped up 250×.

S3,S4 (Fig. 4.5)
: Difference imaging for direct (top) and affine-corrected (bottom) images, for the same systems as in S1 and S2. Both the real space (left) and difference images (right) are shown. The direct difference images are dominated by the affine deformation, while the affine-corrected difference images highlight the nonaffine motion in the system.

S5,S6 (Figs. 4.7(a) and 4.7(b))
: Tracked particle trajectories for the same systems as in S1 and S2. Particle trajectories are indicated using white curves. Left: direct tracking data, right: affine-corrected tracking data.

S7 (Fig. 4.11)
: Compression of a foam from $\phi = 0.77$ to $\phi = 1.41$ under $\dot{\varepsilon} = -3 \times 10^{-5}/\text{s}$. (left) Real space image; (right) from top to bottom: flame graph and $\log_{10} A$ and β from the power law fit Eq. (4.21). Time is indicated on the top left, ϕ is indicated at the bottom left. With increasing confinement, we observe a transition from fully smooth to fully intermittent behavior.

S8,S9 (Fig. 4.14)
: Two examples of foam under shear, $\phi = 0.9$ (S8) and $\phi = 1.5$ (S9). The foam is sheared from $s_{CD} = -0.2$ to $s_{CD} = +0.2$ at $\dot{\gamma} = 3 \times 10^{-5}/\text{s}$. At low density, $A \approx 10^{-6}$ and $\beta \approx 1.6$ are fairly constant, while we can clearly distinguish the quiet and active periods for the high density foam.