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Microfluidic flow-stabilized solids: formation and deformation CARLOS ORTIZ, ROBERT RIEHN, KAREN DANIELS, North Carolina State University — The spectrum of non-affine cooperative rearrangements of amorphous materials is central to understand its time-evolution, mechanical properties, and dynamic susceptibility. We report experiments on the structure and elastic properties of a flow-stabilized amorphous solid that is subject to thermal fluctuations. We study flow-stabilized (Pe≈2-20) quasi-2D heaps composed of a bidisperse mixture of sterically-stabilized submicron polystyrene microspheres. Using a microfluidic device, we control the fluid stress applied on the quasi-static heap, allowing us to deform heaps to maximum strains of up to 10% and track the real-time propagation of the local deformation. We then reverse the applied stress perturbation to reveal the irreversible non-affine response of the heap. We measure the spatial distribution of the non-affine strain field for deformations of varying amplitude.

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