Dynamics in foams near the jamming transition: a microgravity experiment

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ABSTRACT

Local rearrangements of bubble packings accompany the coarsening process of liquid foams, and they are also the elementary events of plastic flow. For moderately wet foams, it has been shown that the time scale on which the bubble packing settles into a new configuration of minimal interfacial energy is set by a balance of surface tension and a combination of bulk and interfacial viscous forces [1]. This time scale also plays a key role in the constitutive law governing wet foam flow [2]. We investigate how foam rearrangement dynamics evolve in the limit of liquid fractions so large that the foam loses its solid-like resistance to static stress. This jamming transition has been the subject of many theoretical and numerical investigations [3], but a comparison with foam experiments is so far missing. Very wet foams are indeed hard to study on earth since they rapidly lose their liquid content due to drainage. We report a pioneering study of rearrangement dynamics in foams near the jamming transition, carried out in the International Space Station where drainage is absent. Multiple light scattering is used to detect and characterize rearrangement events [1], and we focus in particular on the behavior of the rearrangement time scale in the so far unexplored critical regime.

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