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Aging of liquid foam confined in porous media

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One of the key stages in materials recycling is their crushing into finer elements, i.e. granular material or powder to be sorted and re-used. Insofar as the crushing stage is already very energy-intensive, there is an interest in recycling the crushed elements as directly as possible. In a certain number of cases, simple shaping using a binder, and a possible post-treatment of the peripheral surfaces, would make it possible to produce objects with a useful purpose. Complex liquid foam (liquid foam loaded with a binding component) represents a first-choice low carbon binder precursor to be pushed through the voids offered by a packing made with such grains, to give shape to the whole and to confer significant mechanical strength. This strength is expected to depend on the microstructure of the confined foam, the latter being set by the bubble-to-pore size ratio. Controlling this ratio is not obvious as it is set by the competition between the foam aging rate and the hardening rate of the binder. Indeed, the foam ages, mainly through the so-called coarsening mechanism, which consists in the exchange of gas between the different bubbles, due to their capillary pressure differences, leading to an increase in the average size. When confined, it was shown however that this growth eventually stops when the bubbles have become large enough to be in direct contact with the grains surface.
Here, we show results for the coarsening of liquid foam confined into the porosity of granular packings. During these experiments the liquid fraction is maintained uniform in the system by appropriated rotation of the samples in order to counteract the effects of gravity. Deviations observed with the aging of unconfined foams will be revealed.

Participation

In-Person

References

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