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Aging of liquid foam 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. Those crushed granular materials can be mixed and reshaped using binders which will make it possible to reproduce solid objects with useful purposes. Mainly, the major practical difficulty in the implementation of these granular assemblies, whether recycled or not, is the dispersion of the binder at the contacts between the grains in order to produce binder bridges that will ensure the cohesion of the whole.
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 controlled by the bubble-to-pore size ratio “r” [1]. However, as the liquid foam undergoes the so-called coarsening mechanism, which consists in the exchange of gas between the different bubbles, the size ratio increases as function of time.
Here, we study 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 (see Figure 1). We show that coarsening is faster whenever we increase the initial confinement parameter r0 at constant liquid saturation. We find the result known from the literature for which the bubbles eventually reach pore size, which marks the end of coarsening, but we also highlighted that before stopping, there exists a regime of self-accelerated coarsening. The main deviations with respect to the coarsening of unconfined foams will be presented.

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References

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