

Séminaire

Mardi 12 mai 2026 à 10h30
Amphithéâtre Henri Benoît

Benjamin Dollet

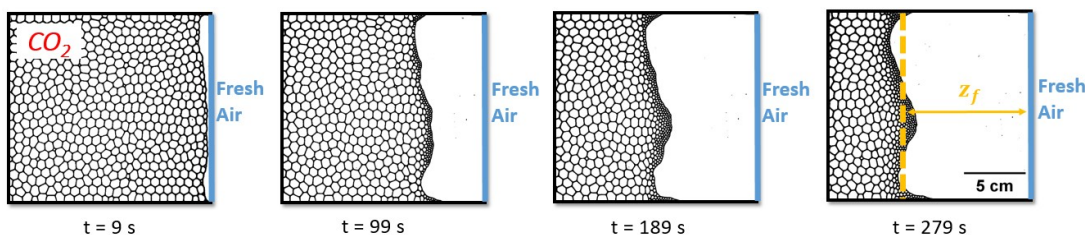
LiPhy, Université Grenoble

Transfer of Gas Mixtures in Foams in One, Two and Three Dimensions

Environmental concerns are an increasing driving force to develop new processes for carbon dioxide capture, which must be cheap and consume little energy. Liquid foams are good candidates for such processes, because of their easy production, small weight, and high specific surface, but this requires a thorough understanding of gas transfer through foams. In this talk, I will show our fundamental studies on this topic with foams in one, two and three dimensions.

To study gas transfer, I will start showing how a one-dimensional foam, constituted by a train of bubbles made of a gas insoluble in the liquid phase of the films, evolve in time when put into contact with a soluble gas. The bubbles display spontaneous swelling, which we rationalise with a model based on gas transfer across single films separating two bubbles of different gas composition. We show that this leads to a transport in terms of an effective nonlinear diffusion, in excellent agreement with data [1]. I then show our recent experimental studies on the evolution of a two-dimensional foam initially made of carbon dioxide, and put into contact with air through an initially straight front. Gas exchanges lead to the shrinkage of the foam, which we quantify at the level of each individual bubble. We show that the evolution of the bubble size can be captured by an adaptation of the effective diffusion model, but that the bubble rearrangements, absent in 1D but present in 2D, must be accounted for to understand the dynamics of the front [2].

In a final part, I will show our recent experiments in a three-dimensional foam column, where the gas within the foam can be switched between air and air/carbon dioxide mixtures. I will present the evolution of the concentration of carbon dioxide in the column, and allude to our experimental and modelling perspectives towards carbon dioxide capture using this column.



Snapshots of a two-dimensional foam, initially made of carbon dioxide, and put into contact at an initial time $t = 0$ with the atmosphere (on the right side of the snapshots).

[1] B. Dollet, *Langmuir* (2023). [2] C. Aprili, G. Coupier, E. Lorenceau, B. Dollet, *Proc. Natl. Acad. Sci.* (2025).

Les personnes souhaitant rencontrer l'orateur sont priées de prendre contact avec Aurélie Hourlier-Fargette.