INTERNSHIP PROPOSAL

Laboratory name: Sciences et ingénierie de la matière molle
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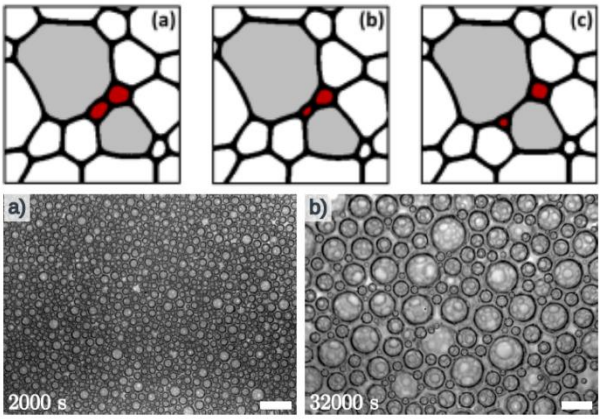
Thesis possibility after internship: YES
Funding: Yes If YES, which type of funding: ESA/CNES

Coarsening-driven bubble dynamics in wet foam

Aqueous foams are dispersions of gas bubbles in a liquid. These out of equilibrium systems will evolve towards disappearance through several ageing mechanism. Surface tension drives the growth of bubble size, as gas diffuses from smaller bubbles to larger ones due to differences in Laplace pressure. As the bubbles grow (or shrink) they will push (or pull) on their neighbours pulling the structure out of equilibrium. At a critical energy the bubbles will rearrange. They change neighbours as shown in the photographs in the top row of the figure below, where the red bubbles shrink and between images b and c the bubbles change places. The resulting dynamics of the bubbles is characteristic of many soft systems (colloidal glasses, concentrated emulsions etc), and still the object of many studies.



The experimental internship will probe bubble dynamics in wet foams, and in particular the role of attractive interactions between the bubbles on this process. In three dimensional samples this is impossible on Earth because gravity leads to the liquid flowing out of the foam changing the gas volume fraction (resulting in dry foams). To get around this we have two solutions, we will carry out experiments on the coarsening of thin layers of bubbles and work with data obtained aboard the International Space Station in microgravity. Examples of images obtained aboard the ISS are shown the bottom row in the figure above. The experiments consist of making foam, taking images and treating the images, while the microgravity data only requires image treatment and finding a description the underlying physical mechanism. We are looking for an enthusiastic experimentalist, who is happy to spend time on data analysis and interpretation.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: YES
Quantum Physics: NO Theoretical Physics: NO