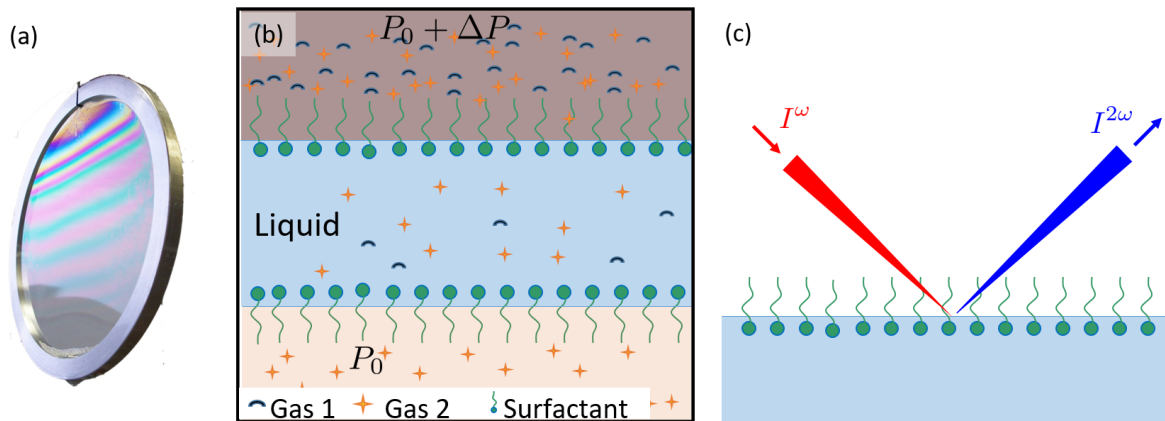


Experimental postdoc in soft matter physics

How to separate gases with soap bubbles?



(a) Soap film (photo P. Petit). (b) Principle of gas separation via a soap film. (c) Principle of non-linear optics to probe interface composition.

A **soap film** (fig. a) is a nanometrically thin water layer, covered by surface active molecules called surfactants (the soap molecules), sandwiched between two gas domains. If well designed, it can act as a **liquid membrane** (fig. b), more or less permeable to the surrounding gas. Their main advantage is that they will never clog contrary to solid membranes. These properties are crucial to new **energy-efficient chemical separation processes**, currently corresponding to 10-15% of worldwide energy consumption. Separation devices have to be selective to one of the gas species, and this can be achieved in soap films thanks to the specific **adsorption of gas species on the surfactant layer**.

The objective of the postdoc is therefore to study this adsorption mechanism, for various gases. Two methods will be used. First, **non-linear optics** (Surface Harmonic Generation, fig. c) will be used to probe a single liquid-gas interface. This technique has the specificity to be highly surface-sensitive, and will allow us to probe gas adsorption and surfactant structure at the interface. **Preliminary experiments have shown the SHG signal to be sensitive to the atmosphere composition**. The SHG setup will be upgraded to allow for phase-resolved measurements to obtain more insight on the structure of the surfactant layer. Second, we will consider the case of a soap film with two interfaces. The postdoc will improve an existing **Thin Film Pressure Balance** and use it to explore how the interactions between the facing interfaces are modified by the gas atmosphere.

Keywords: liquid-gas interfaces / soap films / non-linear optics

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Gross salary from €3021 per month depending on experience.

Postdoc duration : 12-18 months depending on experience and starting date (from April 2025)

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