

HOW TO SEPARATE GASES WITH SOAP BUBBLES?

LABORATORY : Institut Lumière Matière
IN COOPERATION WITH : LiPhy (CNRS-Univ. Grenoble Alpes), société Teclis

LEVEL : M1 / L3
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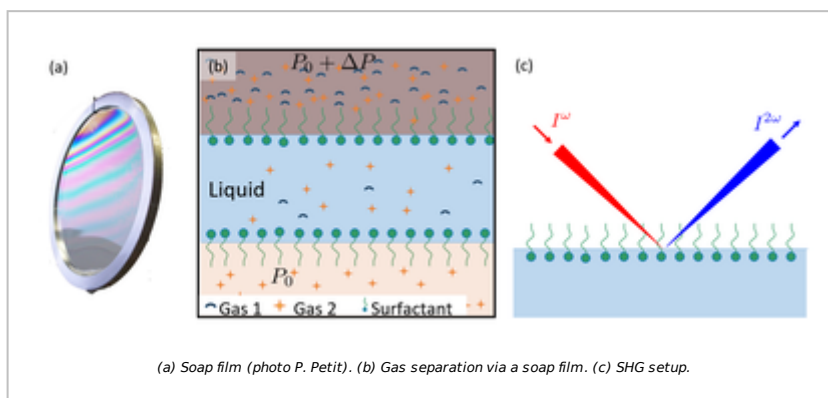
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KEYWORD(S) : soap films / liquid-gas interfaces / non-linear optics

SCIENTIFIC CONTEXT :

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**.



MISSIONS :

The objective of the internship 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. Second, we will consider the case of a soap film with two interfaces. The student will use a **Thin Film Pressure Balance** to explore how the interactions between the facing interfaces are modified by the gas atmosphere.

OUTLOOKS :

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