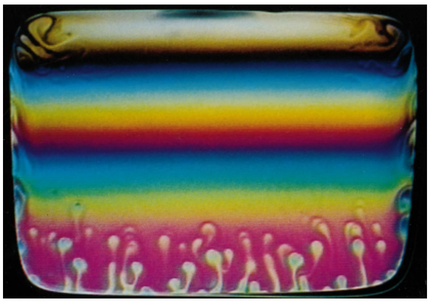
Bachelor or Master 1 internship position

Fast and high resolution spectral imaging of micron-thick soap films



Internship location:
Institut de Physique de Nice (INPHYNI)
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Salary: ~ 650 €/months

Project description

Everyone has seen the colorful interference pattern in a soap film. We see these interference colors because (1) the film is being illuminated with polychromatic light (sunlight light or white light), and (2) the thickness of the film is roughly of the order of a wavelength of light. This interference is strongly wavelength dependent, resulting in certain colors having a high intensity while other colors are absent, depending on the thickness of the film and the angle of observation. Conversely, the thickness of a soap film can be inferred by interferometry by measuring the reflectivity coefficient $R(\lambda)$ for a given spectrum of wavelengths. Can $R(\lambda)$ be measured simultaneously for all (x, y) points of a broad scene ? Traditional multispectral imaging, such as that achieved in color cameras with Bayer-like filters, sacrifices spatial resolution to achieve spectral sensitivity, though the resulting spectral resolution remains limited. A high-resolution alternative consists in structuring the spectrum of the illumination and record N successive images at different wavelengths or different combinations of wavelengths (different vectorial "bases" of the wavelength space). For the latter approach to succeed, both the frame rate of the camera and of the spectral scanning must largely exceed the inverse of the typical time scale of the observed evolving phenomenon, here typically 10 ms for a vertical soap film.

In this project, the main goal is to combine a spectrally-structured supercontinuum laser (450-1 000 nm) with a high-speed camera (25 000 frames/s) to quantify the thickness inhomogeneities inside vertical soap films [1], as observed for instance at the bottom of the above figure.

[1] A. Monier, F.-X. Gauci, C. Claudet, F. Celestini, C. Brouzet and C. Raufaste, "Self-similar and Universal Dynamics in Drainage of Mobile Soap Films", https://arxiv.org/abs/2401.03931. Accepted in Phys. Rev. Fluids.

Profile

We are looking for bachelor or first-year master students with a broad outlook and a strong interest in **soft matter physics,** and **experimental optics**. The candidate will work in collaboration with the *Complex fluids* and *Complex photonic systems and materials* teams.