Sujet MII: Conception of Bragg mirror and optical microcavity by spin-coating of alternating layers

Scientific context :

Bragg mirrors are **periodic structures** made of alternating layers of materials with different refractive indices, designed to reflect specific wavelengths of light with high efficiency. Their unique interference properties make them essential in photonics, enabling precise control over light propagation. They form the building blocks of **microcavities : optical resonators** that confine light in tiny volumes, enhancing light-matter interactions for trapping light leading to many applications in lasers, sensors, and quantum technologies. These structures are fundamental in modern optoelectronics, pushing the boundaries of light manipulation at the nanoscale but their fabrication requires the use of time-consuming and energy-intensive multi-layer vacuum deposition. This internship is an opportunity to explore a new way of producing these photonic components based on spin-coating of thin films.

Intership:

In a first step, the student will rely on the laboratory's expertise to formulate multilayers of functional resins by spin coating (**Fig1(a)**). Then, he will size, manufacture and characterize the Bragg mirrors in the visible range by optical spectroscopy resolved in polarization and in incident angle (**Fig1(b)**). A statistical study on the impact of the layer thickness error on the optical response of the mirrors will be considered. Finally, he will attempt to integrate a microcavity within two dielectric mirrors containing light emitters adapted to the resonance of the component ((**Fig1(c)**).

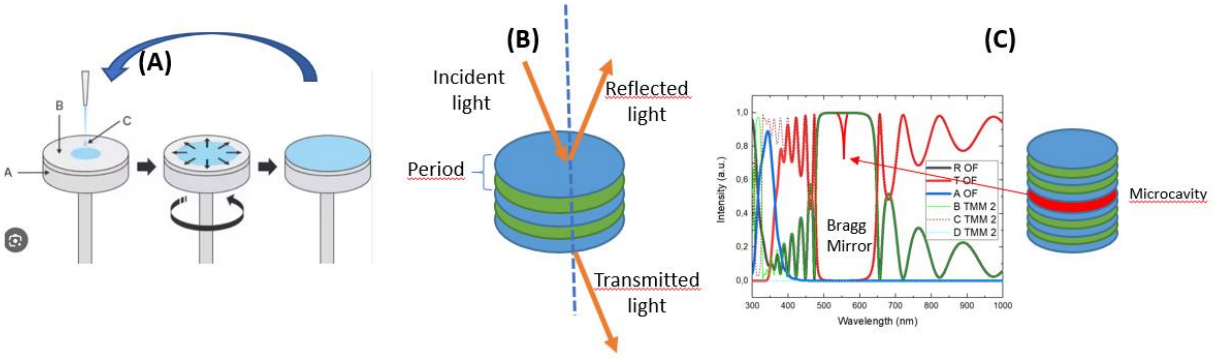

Figure 1. (A) Schematic of spin-coating method **(B)** Bragg mirror **(C)** Optical response model of a Bragg Mirror and a microcavity by transfert matrix method (TMM).

Profil: We are looking for an experimental physicist/physical chemist profile, interested in micronanotechnologies applied to nanophotonics.

Host laboratory :

The internship will be carried out mainly at the Microelectronics Technologies Laboratory (LTM): located on the CEA-LETI-MINATEC site.

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Internship compensation: **yes**
Possibility of continuing with a PhD: **yes**