Internship M2 PPN

from 2026 April 1st to 2026 July 31th

Title of the project:

Development of microfluidics on glass for the confinement of photopolymer resin droplets around a fiber in a two-photon polymerization 3D lithography setup.

Supervisor(s): Laurent MARKEY

Laboratory / Department / Team : ICB Dijon / Nanosciences and platform ARCEN-CARNOT

Collaborations: Johnny Moughamès (ICB Sévenans, plateforme TITAN)

Summary:

3D microfabrication by two-photon polymerization (TPP) onto the tip of a fiber optic requires a fine management of the liquid environment. The stability of the liquid photopolymer is key to achieving a good writing repeatability and a good quality of the 3D microstructures.

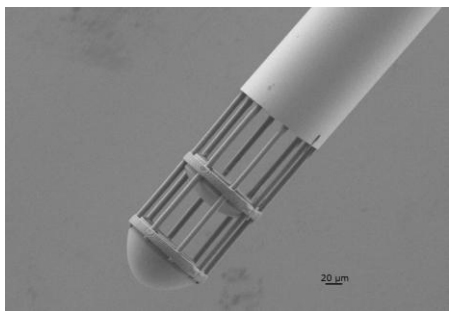
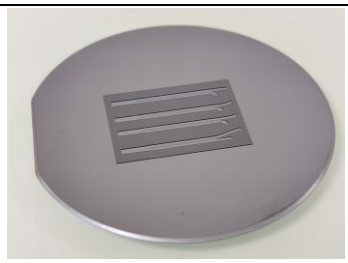


Figure 1: *Microlens array on an optical fiber tip for transceiver coupling, fabricated via microFAB3D using Microlight3D TPP technology.*

The objective of the internship is to develop a microfluidic setup to manipulate the droplets of different photopolymers and control their localization around the fiber. To define a stable writing zone on the glass substrate, microfluidic structures made in SU-8 will be designed and fabricated, comprising channels and lateral walls with an aperture for the fiber and capable to canalize the resin between an inlet and an outlet. Maskless UV lithography will allow to explore different designs and sizes. Depending on surface wettability by the photopolymers, additional surface functionalization may be required, which could be either chemical functionalization or thin film deposition with another material.

A robust SU-8 based process will be established and the fabricated structures will be characterized (size measurement, surface state, leak-tightness, wettability). Fluid ports will be designed for the connection to feeding tubing. The performance of the developed system under flow will be evaluated (pressure, flow rate, stability, reproducibility) and validated by testing TPP in the MicroLight equipement (@ platform TITAN in Sévenans).

To correlate microfluidics with the writing performance (stability, defects, repeatability) deliverables will include a documented fabrication protocol, a library of tested designs and a microfluidic demo system integrable on the Microlight TPP equipment.



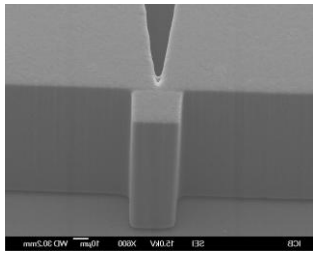


Figure 2: *Example of SU8 structures realized on platform ARCEN-CARNOT from another project*

Type of project (theory / experiment): experimental

Required skills: Knowledge in Micro-nanofabrication (lithography, thin films)