UNIVERSITÉ CÔTE D'AZUR

INPHYNI
INSTITUT DE PHYSIQUE DE NICE

cnrs

Master internship position

Direct-laser-writing of glass photonic integrated circuits for mid-IR applications

Internship location: Institut de Physique de Nice (INPHYNI)
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https://inphyni.univ-cotedazur.fr
Waves in Complex Systems team – https://inphyni.univ-cotedazur.eu/sites/wacs

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Salary: ~ 650 €/months

PhD thesis possibility after internship: Yes — Thesis funding: via Doctoral School competition

Project description

Photonic integrated circuits (PICs) are microchips containing photonic components that work together to detect, generate, transport, and process light. One notable fabrication technique, direct-laser writing (DLW) of PICs in glass, consists in tightly focusing an ultrashort-laser inside the chip to modify its refractive index at the microscale. DLW offers a unique advantage by enabling the rapid prototyping of complex, high-precision 3D photonic waveguide-based structures. DLW has been widely used to produce PICs with low-loss and high-fidelity optical components for classical and quantum information processing.

Most of the DLW photonic systems are currently designed for the visible and telecom range. Nowadays, there is a crucial need to develop integrated photonic components operating in the mid-IR (2–5 μm) especially for astronomical instrumentation [1] and advanced nonlinear quantum sensing [2] where compact, stable and flexible PICs offered by DLW [3] are of major importance.

In this master project, the main goal is to design, fabricate by DLW and characterize PICs components, from single waveguide to directionnal couplers and interferometers, integrated in a borosilicate glass chip and operating at 2 μm. The candidate will work on the laser inscription workstation and will be mainly in charge of the development of the laser beam shaping technique that will be used to optimize the energy deposition in the substrate and thus the guiding properties of the PICs.

[1] N. Jovanovic *et al.*, J. Phys. Photonics 5, 042501 (2023).
[2] A. V. Paterova *et al.*, Light Sci. Appl. 9, 82 (2020).
[3] A. Le Camus *et al.*, Opt. Exp. 29, 8531 (2021).

Profile

We are looking for first or second year master students with a broad outlook and a strong interest in **light-matter interaction physics**, **experimental optics** and/or **glass science**. At INPHYNI, the candidate will work within the *Waves in Complex Systems* team in close collaboration with the *Complex photonic systems and materials* and *Quantum photonics and information* teams. The candidate will have the opportunity to apply for a PhD grant at the Doctoral School.