RING RESONATOR WITH RARE EARTH INTEGRATED ON WAVEGUIDES

LABORATORY : Institut Lumière Matière
IN COOPERATION WITH : inl

LEVEL : M2
TEAM(S) : MNP

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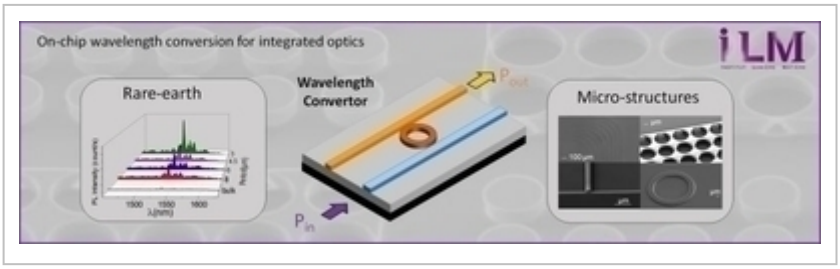
KEYWORD(S) : integrated optics / photonics / rare earth

SCIENTIFIC CONTEXT :



Photonic Integrated Circuit aims at miniaturizing and combining several optical devices onto a planar substrate to create power efficient and complex functionalities on-chip for many applications like sensing or telecommunication[1]. Many building blocks are already available for passive devices (filter, coupler, modulator…) as well as active components (source, detector…). For these functions, the ring resonator is a well spread design for both passive[2] and active[3] devices. However, the manufacturing of such components to reach high quality factors is usually complex and costly, in particular for the etching process. It consists in the partial erosion of a surface through a mask (e.g. photoresist) adding a difficult, pollutant and expensive processing step which can also induce extra losses due to the degradation of materials along etched sidewalls which potentially reduce the performance of photonics devices [4], [5]. Furthermore it is difficult to couple a ring resonator to a waveguide with a different materials at the same level [6]. Pulsed Laser Deposited (PLD) based lift off processing permits to overcome those limitations [7].

MISSIONS :

In this project, we want to devellop ring resonators made by pulsed laser deposition and liftoff processing [7-9]. The doped microrings will be coupled to undoped waveguides for lasing applications.

The student will work on the micro-devices fabrication (PLD and lithography in cleanroom) and the optical characterizations (measurements of the micro-devices and associated modeling).

OUTLOOKS :

A PhD is planned after the M2 intership (ANR IDEAL project 2025-28).

BIBLIOGRAPHY :

[1] Baets et al., APL Photonics, 2016

[2] Kazanskiy et al. Micromachine 2023

[3] Li et al., Nat. Commun 2022

[4] Megalini et al. Phys. Status Sol. 2016

[5] Takenaka et al., Opt. Express 2012

[6] Bradley et al., Opt. Express 2014

[7] Gassenq et al., Opt. Express 2021

[8] Gassenq et al., Appl. Phys. A, 2023

[9] Gassenq et al., Opt. Lett. 2023

published on 29/08/2024