Master 2 internship offer
2019-2020

Hybrid integration of crystalline oxides for silicon photonics

Laboratory: Centre for Nanoscience and Nanotechnology (C2N), Palaiseau, France.
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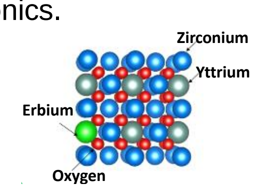
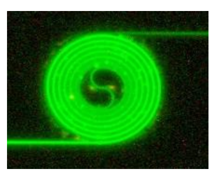
Keywords: Functional oxides, epitaxy, silicon photonics, nonlinear optics

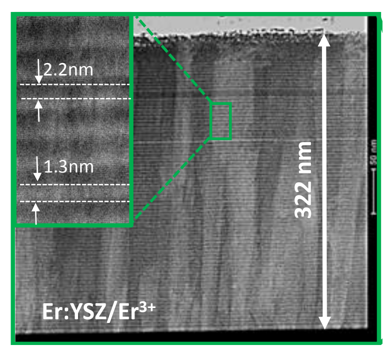
Scientific description

Silicon photonics, i.e. the use of Si for integrated circuits, has emerged industrially more than a decade ago and is now a well-established technology. Currently, the main application addressed is data-communication, providing optical transceiver cables for datacentres. For future communication networks, new challenges have to be considered in terms of speed, power consumption, flexibility, and reliability. Thus, radically new solutions are required. At C2N, we are currently exploring a new paradigm for advanced photonic circuits based on the hybrid integration of crystalline oxides in the silicon photonics platform for the telecom wavelength range (1.3µm-1.55µm). The core concept is to exploit the giant nonlinear optical coefficients and rare-earth doping (e.g. Erbium) of functional oxides to realize groundbreaking devices such as a multi-wavelength amplified emitter for Si photonics.

This internship will explore the properties of rare-earth doped oxide thin films, and in particular the tuning of their oxygen content. We focus on yttria-stabilized zirconia (YSZ) as oxide matrix, having recently obtained first results in terms of light amplification and nonlinear effects with YSZ waveguides. The work will take place in the framework of a national research project, with available expertise on materials design, thin film growth, photonic devices, and advanced optical characterizations.







Experimental techniques

Epitaxial growth of oxide thin films by pulsed laser deposition (PLD), photoluminescence, micro-fabrication processes in cleanroom.

Applicant profile: Gifted and willing for experimental physics, well-disposed towards infrared electromagnetic waves, with a background in materials science and/or solid state physics.

Possibility for a doctoral thesis: Yes, funded by French ANR (FOIST project, 2019-2023).