Centre de Nanosciences et de Nanotechnologies

Soutenance de thèse

Mardi 22 mars
14h00
Centre de Nanosciences et de Nanotechnologies
10 boulevard Thomas Gobert
91120 Palaiseau
Amphithéâtre

«Hybrid integration for on-chip optical emission and amplification in the near infrared»

Zhengrui TU

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Abstract :

One of the main challenges in the field of silicon photonics is to develop integrated optical sources and optical on-chip amplifiers. This thesis provides a contribution to the investigation of Erbium-based on-chip amplifiers and lasers. One main axis of the work carried out is to seek miniaturization of the active waveguides (<1mm, or even <<1 mm) and systematically consider a silicon integration perspective by favoring 1480 nm pump wavelength scheme.
Active SiN waveguides coated with Erbium-doped Al_2O_3 layers at more than 10^{21} cm^{-3} and deposited by the ALD technique at Aalto university are the basis for the experimental demonstrations in this work. Modal gains of 10-20 dB/cm are demonstrated in these waveguides. Capitalizing on these results, theoretical and simulation work is further carried out in the purpose of investigating aggressive designs in terms of active structure lengths. Different types of single and double resonant cavities and resonators are studied and designed for the realization of integrated sources using the measured properties of experimentally studied active waveguides. As a whole, the carried out works contribute to the realization of compact light sources in silicon photonics exploiting recent advances in the growth of rare-earth doped active layers and the design of multiply resonant resonators.