Centre de Nanosciences et de Nanotechnologies

Soutenance de thèse

Mercredi 7 décembre
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Amphithéâtre

«Graded photonics crystals on SOI platform for near-infrared applications»

Quan YUE

Jury members :

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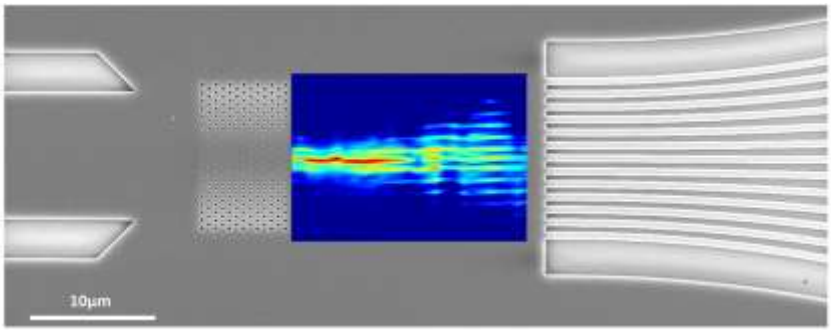
Abstract :

Graded Photonic Crystals (GPC) allow to efficiently control the flow of light thanks to the shape of their photonic bands. But GPC in near infra-red was limited by a lack of easy-to-implement fabrication techniques. Nanotechnology enables us to efficiently fabricate photonic crystals, which we have implemented in this work. The main purpose of this thesis is to explore graded photonic crystals and related gradient index optics in the near-infrared domain for applications on Silicon On Insulator (SOI) platforms. According to the theory of subwavelength electromagnetism, the size of the device should be of the same order of magnitude as the operating wavelength. Thus, a big challenge in the NIR field is the fabrication and characterization of the corresponding devices.



A significant part of this work is focused on the fabrication and characterization process of gradient photonic crystals in the NIR field. We have focused on nanofabrication technology as well as SNOM characterization. SOI was chosen as the processing platform for this work, considering the good compatibility of the silicon-based platform with photonic devices and its ability to integrate well with nanofabrication techniques. In addition, another emphasized aspect of this work is to explore the effect of the variation of the photonic crystal parameters on its effective refractive index. Thus, the case of normalized frequencies in different photonic crystal energy bands has also been studied. We attempt to manipulate the effective refractive index (even negative refractive index) of photonic crystals by changing their parameters. Experimental demonstration of negative refractive index gradient photonic crystal lens and related gradient photonic crystal devices is highlighted.

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