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SPIM

école doctorale **sciences pour l'ingénieur et microtechniques**

Titre de la thèse : Study of Brillouin scattering and its applications in photonic micro/nano guides.

Laboratoire d'accueil : FEMTO-ST Institute

Spécialité du doctorat préparé : Optique et photonique

Mots-clefs : Brillouin scattering, optical nanofibers, photonic, acoustic

Descriptif détaillé de la thèse :

Introduction / contexte :

Within micro/nano-fibers with a diameter 50 times finer than a hair (or 100 times finer than a standard optical fiber), we have observed a new mode of light scattering induced by surface waves in optical microfibers [1-2]. By reducing the dimensions of optical fibers to nanometric dimensions, it is possible to confine the light in an extreme way. The strong confinement of light generates an acoustic wave that travels at 3400 m/s along the surface of the microfiber and scatters the light back with a frequency shift in the GHz range. These surface acoustic waves are very sensitive to environmental factors such as temperature, pressure or ambient gas and, as we have recently discovered, to the polarization of light.

Travaux envisagés :

The objective of this PhD thesis is to design and fabricate new microfibers of micrometer and nanometer sizes at the FEMTO-ST Institute and to study their behavior in a controlled gaseous environment. In particular, we wish to exploit polarization sensitivity to explore new applications. We aim on the long term at applications for telecommunications (optical memory) and sensors for environmental security (toxic particle detector, gas sensor) or for spectroscopy (reference).

This multidisciplinary thesis will be at the interface between photonics, acoustics, electronics and micro-nanotechnologies. It therefore requires the exploitation of our experimental platform for the fabrication and study of optical microwires but also the design and building of a new experimental setup. This project will be carried out in partnership with the EPFL, the Max Plank Institute and the ICB.

Références bibliographiques :

[1] J.-C. Beugnot, S. Lebrun, G. Pauliat, H. Maillotte, V. Laude, et T. Sylvestre, « Brillouin light scattering from surface acoustic waves in a subwavelength-diameter optical fibre », Nature Communications, vol. 5, n° 5242, oct. 2014.

[2] A. Godet, T. Sylvestre, V. Pêcheur, J. Chrétien, J.-C. Beugnot, and K. Phan Huy, Nonlinear Elasticity of Silica Nanofiber, APL Photonics 4, 080804 (2019).

Profil demandé :

For this thesis, we are looking for a student with knowledge in the field of photonics and signal processing and interested in optical fibers.

Financement : Conseil régional de Bourgogne Franche Comté – Graduate School EIPHI

Dossier à envoyer pour le XXX
Début du contrat : octobre 2021

Direction / codirection de la thèse :

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PhD title :

Host laboratory :

Speciality of PhD:

Keywords :

Job description :

References :

Candidate Profile:

Financing Institution:

Application deadline :

Start of contract : october 2021

Supervisor(s) :