Master degree internship position

Femtosecond laser tuning of nanoparticles in optical fibres

Laboratory name: Institut de Physique de Nice (INPHYNI), Université Côte d'Azur & CNRS
Internship supervisors:
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PhD thesis possibility after internship: YES *Granted funding:* YES

Context. – The growth of optical fibres has always been supported by the development of new manufacturing processes. This project aims at developing a new process for optical fibres containing nanoparticles (NPs). The potential of this new generation of fibres as lasers and sensors has already been demonstrated [1]. Their development remains limited due to the lack of reliable processes to control the nanoparticles, in particular their size and structure, in the fibres. Based on preliminary results, we propose to develop an innovative femtosecond laser bench to modify the characteristics of nanoparticles for fibre lengths ranging from µm to km, with possible variations in the characteristics of nanoparticles over micrometric fibre lengths. This control relies on the ability of such a laser to heat at high temperature with very high spatial resolution (µm^3) as nanoparticles can be altered though thermodynamic processes (see figure 1).

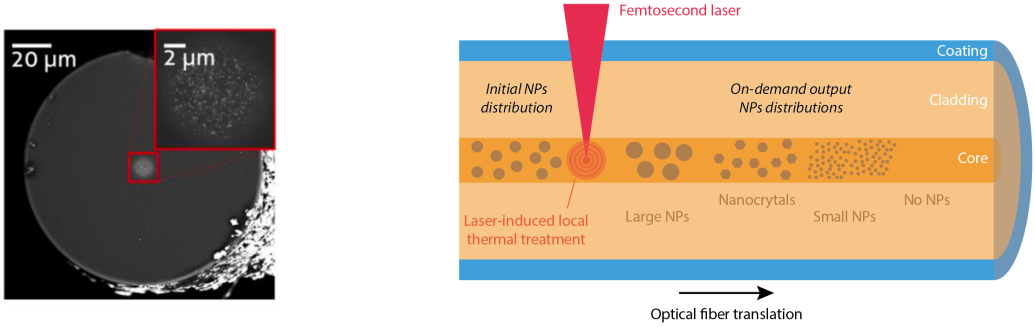

Fig. 1. Left. SEM image of the transverse section of a fiber containing NPs in the core. The core is surrounded by the optical cladding. Right. Illustration of the approach. The NPs characteristics are obtained by varying the laser parameters.

Objectives. – The main goal of this internship is to offer an innovative solution for real control of the characteristics of nanoparticles in optical fibres. During this project, the student will upgrade the existing femtosecond laser workstation to the next level in order to open up a new manufacturing avenue that has never been explored before. By varying the laser parameters, she/he will determine the optimized conditions to grow or reduce the nanoparticle sizes in the optical fiber. Electron microscopy will be used to control the morphology of the nanoparticles.

Profile. – We are looking for candidates with a broad outlook and a strong interest in experimental optics and/or material/glass sciences. The candidate will have the opportunity to work in collaboration with different teams from various laboratories and technology platforms including INPHYNI, CEMEF (Sophia-Antipolis) and CP2M (Marseille). The internship gratification is about 600€ net/month. This internship project is part of the FESTNOS ANR project with a granted funding for a PhD.

[1] W. Blanc *et al.*, Nanoparticles in optical fiber, issue and opportunity of light scattering. Opt. Mat. Exp. 12, 2635 (2022).