

Specialty optical fibres at INPHYNI

Bernard Dussardier, Mourad Benabdesselam, Wilfried Blanc, Franck Mady, Michèle Ude

*Université Côte d'Azur, CNRS, Institut de Physique de Nice (INPHYNI), UMR 7010, Nice, France
Bernard.dussardier@unice.fr*

Abstract: At the *Institut de Physique de Nice*, the research activities of the Fibre Optics and Applications team and the technological expertise of its Specialty Optical Fibres manufacturing facility have a great potential as a facilitator for the community in non-linear and laser optics.

The “*Institut de Physique de Nice*” (INPHYNI)¹, is a Joint Research Unit (UMR) of *Université Côte d'Azur* (UCA) and CNRS. The research axes are: Waves and Quantum Physics, Photonics, and Nonlinear Physics Complex Fluids and Biophysics. The research are theoretical, fundamental and experimental, as well as applicative, benefiting from the capacities and support of high-performance technological platforms. At the start of 2023, the teams and platforms of the two sites (Valrose-Nice and Sophia Antipolis) will be brought together in a new building in Nice.

The **Fibre Optics and Applications (FOA)** team manufactures and studies specialty optical fibres useful in applications such as telecommunications, metrology, laser sources for industry, biomedical or environmental monitoring. To optimize the performance of these components and subsystems, we study the properties of the fibre materials and their modifications resulting from nano-structuring or active doping operations. The properties of the dopants in these materials depend on their environment and can be modified by the radiation to which they are subjected (ionizing such as X-ray, gamma rays, or femtosecond laser). These modifications are also studied in aging experiments (degradation under irradiation), sensitivity to optical density (optical damage, photo-induced attenuation). The team relies on the **Specialty Optical Fibres (FOS) technology platform**² dedicated to the manufacture of innovative optical fibres for research projects. Optical fibres are silica-based, with a variety of core compositions, structures and optogeometric properties, as well as a variety of cladding shapes.

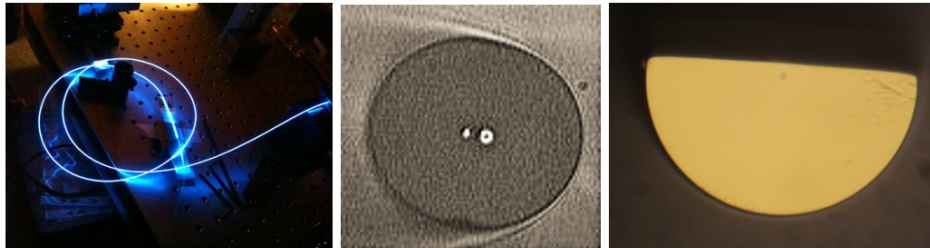


Figure 1 : Typical examples of fibres that can be produced at INPHYNI: amplifying (rare earth doped), saturable absorber (rare earth or transition metal doped), multi-core (linear or non-linear coupler, spectral filtering), cladding geometries (D-shaped for chemical sensors, hexagonal for lasers and amplifiers, double or triple core, etc.), fibres resistant or sensitive to ionizing radiation (sensors), scattering fibres (sensors), nanoparticles in the core (sensor, amplification), etc.

The FOS facility is a very versatile structure, open to collaborations and services. It is particularly focused on the doping of fibres with optically active elements (rare earths or transition metal elements), on the nanostructuring of the core material, and on specific modal properties (chromatic dispersion, modal sieving, multicore fibres, “chaotic” cladding, etc.). A recent funding awarded from the Equipex+ program (*Programme d’Investissement d’Avenir* PIA 3, projet *Add4P*) and from *Région SUD* (project *ALFO*) will make it possible to further develop the platform and introduce the manufacturing of original structures within fibres, by implementing laser-assisted additive manufacturing. The FOS facility is member of the GIS *GRIFON*³.

¹ <https://inphyni.univ-cotedazur.eu/>

² <https://inphyni.univ-cotedazur.eu/technology-platforms/optics-and-photonics>

³ Groupe d’Intérêt Scientifique du CNRS « GGroupement d’Initiatives pour les Fibres Optiques Nouvelles »
<https://grifon.xlim.fr/>