Erasmus Mundus Master QuanTEEM
Research Project

TITLE	Tellurite microsphere lasers
SUPERVISORS	Aurélien Coillet, Clément Strutynski, Fréderic Désévédavy
INSTITUTION	Université de Bourgogne
LAB / DEPARTMENT / TEAM	ICB / Photonics Department / Team SAFIR
COLLABORATIONS	
TYPE OF PROJECT (theory / experiment)	Experiment

Summary

The aim of this lab project is twofold: manufacture micron-sized resonators (microspheres and microbottles) made of doped infrared-transmitting glass fibers and study their passive and active optical properties.

The initial phase will involve using a Vytran filament fusion splicer to manufacture the microspheres by locally heating tellurite glass fibers or capillaries. The focus will be to determine the influence of various shaping parameters (temperature, heating duration, etc.) on the final geometry of the microbeads (sphericity, diameter). Efforts will be devoted to ensuring that the fabrication process is reproducible.

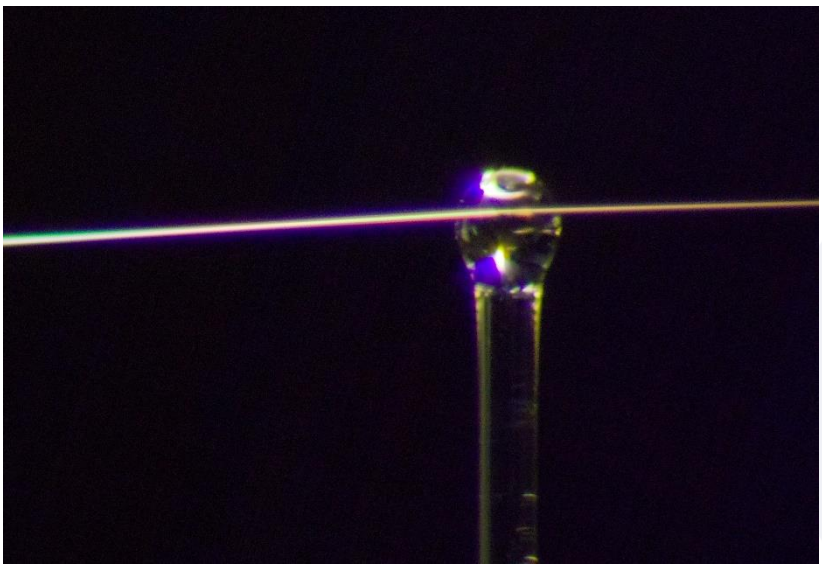

Figure 1. Photograph of a silica microsphere coupled to an input-output microfiber, for optical characterization.

The fabricated resonator will subsequently be optically characterized: using a microfiber to couple light into them, we will excite whispering-gallery modes and measure the quality factor and finesse of the resonator. By adjusting the fabrication process, we hope to improve these characteristics, to reach levels where nonlinear phenomena can be observed.

By using glasses doped with rare-earth ions, we aim at fabricating a microsphere laser: under appropriate conditions, rare-earth ions such as erbium and thulium can emit or amplify light. If light is amplified inside a resonant cavity, such as a microsphere, lasing can be observed once the gain is greater than the losses. In order to observe this laser emission, the micro-resonators need to be improved and the light emission properties of the doped glass need to be investigated. Such tasks entail learning a wide variety of laboratory techniques.

Additional Information

Applications for this lab project must be sent to aurelien.coillet@u-bourgogne.fr with a full CV including undergraduate details, and a transcript of your academic records.

Required skills: knowledge in guided optics, optical materials and lasers, precision and conscientiousness.

Duration: from 13/05/2024 to 21/06/2024.