New materials and structures for solid-state organic lasers: toward continuous operation and electrical excitation.

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As inorganic laser diodes have followed the development of semiconductor LEDs, after the development of organic light emission diodes (OLED), organic solid-state laser diodes (OSLD) have almost become a reality. Since the first and only paper in 2019, proving that an OSLD could effectively work,[1] no other working device has appeared in the literature. This suggests that the technology used for this first demonstration was pushed to its upper limits and that there is a need now to find a new paradigm to make OSLD more efficient and more reliable.

The IPCMS gathers the required skills and knowledge to compete in that field. For this purpose, we have set up a collaboration between chemists and physicists mastering the synthesis and conditioning of the luminescent organic materials, the photophysics involved in light amplification and the characterization techniques. In this framework, we are confident to develop new organic materials and robust devices for solid state laser operation with state of the art performances.

The research program proposed in the framework of this PhD preparation relies mainly on experimental activity. Throughout this work, he/she will actively participate to the development of a new material, going from the molecular design to the preparation and the characterization of a organic solid state laser demonstrator. The student will have to operate and to upgrade the optical characterization setups. Since the basic photophysical characterization devices are already operational, the work will be mainly dedicated to the development and exploitation of time-resolved spectroscopy setups and those used to characterize the operating properties of the laser.

Expected profile candidate:

We are looking for a highly motivated candidate with a strong photophysics and/or optics background with good English communication skills and the ability to work in a team. The application (CV + motivation letter) should be sent to anthony.daleo@ipcms.unistra.fr, loic.mager@ipcms.unistra.fr

[1] Sandanayaka, A.S.D. and al. „Indication of current-injection lasing from an organic semiconductor“, Applied Physics Express, **12**, (6) 061010, 2019
https://doi.org/10.7567/1882-0786/ab1b90