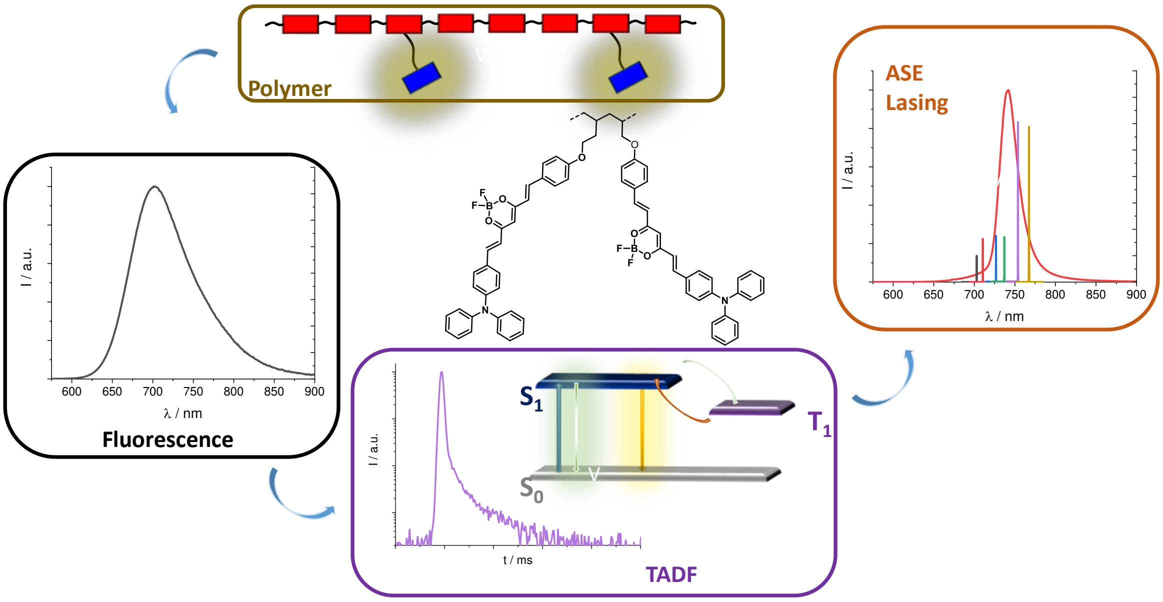
Design & Synthesis of Novel TADF Polymer for Opto-Electronic Application.

PHD SUPERVISORS : ANTHONY D'ALÉO & NICOLAS LECLERC
INSTITUT DE PHYSIQUE ET CHIMIE DES MATERIAUX DE STRASBOURG (IPCMS) & INSTITUT DE CHIMIE ET PROCEDES POUR L'ENERGIE, L'ENVIRONNEMENT ET LA SANTE (ICPEES)
TEL : 03 88 10 70 90 ; E-MAIL : mailto: anthony.daleo@ipcms.unistra.fr & leclercn@unistra.fr.

Organic Light Emitting Diodes (OLEDs) have reached the market by being introduced in our smarthphones and TVs. To date, the dyes that are used in the emitting layer are composed of coordination complexes of iridium for instance. Since iridium is a noble metal that is rare and more and more expensive, a more viable alternative was found by using purely orgnanic dyes. To match the performances of the iridium complexes, a mechanism called Thermally Activated Activated Delayed Fluorescence (TADF) involved in designed organic dyes has been developped and is optimized[1] nowaday (without reaching the commerciallization yet). Following this concept, we have shown that curcuminoid borondifluoride ($CurcBF_2$) as small molecules could be used in an OLED emitting layer showing efficient performances above 720 nm.[2,3] The use of small $CurcBF_2$ molecules blended in host present the disadvantadge to form films that do not show morphological stability.



In this project, we aim at synthesizing and studying polymers containing $CurcBF_2$ for applications in organic electronics. These polymers will present TADF properties allowing to recycle triplet into singlet excited states. Such properties are are indeed of interest and are expected to lead to a technological breakthrough in organic electronic applications.
While TADF properties will be provided by the $CurcBF_2$ moiety, the polymer structure will allow to control the aggregation of the dyes by choosing the quantity of the $CurcBF_2$ entity relative to the other monomer. Such control is not possible to be achieved with small molecule in blend since $CurcBF_2$ tend to form dimeric aggregates. This work will therefore permit to unravel the spin-orbit component of TADF mechanism. Our strategy also aims at improving the morphological stability which constitutes a prerequisite for industrial use.

Expected profile candidate:

We are looking for a highly motivated candidate with chemistry background, good English communication skills and the ability to work in a team. Knowledge in photophysics would be appreiated. The application (CV + motivation letter) should be sent to mailto: anthony.daleo@ipcms.unistra.fr and leclercn@unistra.fr.

[1] Uoyama, H.; Goushi, K.; Shizu, K.; Nomura, H.; Adachi, C.: Highly efficient organic light-emitting diodes from delayed fluorescence. Nature 2012, 492, 234-238.

[2] Kim, D.-H.; D'Aléo, A.; Chen, X.-K.; Sandanayaka, A. D. S.; Yao, D.; Zhao, L.; Komino, T.; Zaborova, E.; Canard, G.; Tsuchiya, Y.; Choi, E.; Wu, J. W.; Fages, F.; Brédas, J.-L.; Ribierre, J.-C.; Adachi, C.: High-efficiency electroluminescence and amplified spontaneous emission from a thermally activated delayed fluorescent near-infrared emitter. Nat Photon. 2018, 12, 98-104.

[3] Ye, H.; Kim, D. H.; Chen, X.; Sandanayaka, A. S. D.; Kim, J. U.; Zaborova, E.; Canard, G.; Tsuchiya, Y.; Choi, E. Y.; Wu, J. W.; Fages, F.; Bredas, J.-L.; D'Aléo, A.; Ribierre, J.-C.; Adachi, C.: Near-Infrared Electroluminescence and Low Threshold Amplified Spontaneous Emission above 800 nm from a Thermally Activated Delayed Fluorescent Emitter. Chem. Mater. 2018, 30, 6702-6710.

Application is possible from the link below:

https://emploi.cnrs.fr/Offres/Doctorant/UMR7504-CATBON-050/Default.aspx