Synthesis of luminescent heteroaromatic compounds

for Polymer Electroluminescent Diodes (PLEDs)

The aim of the work proposed in this thesis is to develop novel luminescent heteroaromatic compounds, suitable for integration in Organic Light Emitting Diodes (OLEDs) and/or Polymeric Light Emitting Diodes (PLEDs). The development of new organic luminescent materials is currently attracting a great deal of interest at both academic and industrial levels. Applications include innovative display, lighting and signaling devices.

More specifically, the aim is to design new thermally stable materials that emit in the deep blue region, which is currently a technological lock. The project's originality lies in the design, synthesis and characterization of non-conjugated aromatic and heterocyclic luminescent macromolecular structures.

The challenge of this work is to incorporate various fluorophore units into the structure of precursors which can be polymerized by polycondensation, and to develop a suitable synthesis process to obtain polymers with a variable level of fluorophore units.

Based on our experience with aromatic and heterocyclic polymers, thin solvent-processed films of these fluorescent polymers will be used to study their properties.

The optical properties (UV and fluorescence) of these luminescent materials will be studied. Solid-state properties associated with photoluminescence, such as internal and external quantum yields, emission wavelength, half-value width and chromatic coordinates, will also be characterized. The study of structure-property relationships will enable us to assess the potential of this new class of fluorescent compounds and materials for the realization of high-performance OLEDs or PLEDs.

The transdisciplinary nature of this study will have several aspects.

An important organic synthesis work (synthesis of small organic molecules, model molecules, monomers) will involve the setting up and validation of different synthesis schemes for the design of specific fluorophores, and the integration of these fluorophores into the monomer structure.

Different polymers will be prepared by polycondensation. These polymers will be synthesized either thermally or using a non-conventional process (microwave irradiation).

The final part of the project will involve the processing of these polymers (as thin films) and their physico-chemical (structural, thermal and optical) characterization.

We're looking for a motivated candidate with a good experience of laboratory techniques, who likes organic synthesis and wants to get involved in a multi-disciplinary project.

The challenge will be to design and synthesize organic molecules and monomers, polymerize them... and finally to implement these polymers and characterize their optical properties! .... An exciting program!

The work will be carried out at IMP (Ingéniérie des Matériaux Polymères - UMR 5223), at INSA Lyon (Campus de la Doua, Villeurbanne), under the supervision of Catherine Marestin. This thesis will be funded by the French Ministry of Research (MESR). The doctoral scholarship will be awarded after a candidate selection organized by the Ecole Doctorale des Matériaux de Lyon.

For further information or to submit your application, please send your CV, covering letter and transcript of your Master's grades (or engineering school grades) to: Catherine.marestin@insa-lyon.fr