

Research Topic for the ParisTech/CSC PhD Program

Field: Chemistry

Title: Luminescent materials with controlled emission

ParisTech School: Sciences Chimiques : Molécules, Matériaux, Instrumentation et Biosystèmes (2MIB).

Advisor(s) Name: Gaël ZUCCHI

Advisor(s) Email: gael.zucchi@polytechnique.edu

(Lab, website): <https://portail.polytechnique.edu/lpicm/en>

Short description of possible research topics for a PhD:

We have developed in the last years a series of polymeric materials that show emission in the visible range. The interest in such materials is motivated by the possibility to tune their emission color thanks to a judicious molecular design and their easiness of processing. A family of new monomeric units that had not been employed before have been introduced and their chemistry has been developed. Very promising preliminary results have been obtained, as we have shown that they could lead to polymers with efficient controlled luminescence and increased photostability.

Not only the synthesis of the materials will be done, but their photophysical (absorption and emission) properties will be studied and the polymers will also be investigated as a new generation of phosphors for LED lighting. They will be coated on near-UV LEDs (see figure) and the performance of the resulting lighting systems will be studied in terms of efficiency, color quality, and photo- and thermal stability.

This pluridisciplinary project will give the selected candidate a strong knowledge in chemical synthesis, spectroscopy, elaboration and characterization of lighting systems. He/she will have a broad overview on the design and synthesis of innovative materials and how they can be processed and used in real applications thanks to their specific properties.



Figure. Near-UV LEDs coated with luminescent polymers.

Required background of the student: The expected candidate will hold a Master Degree in organic/molecular chemistry and will show a strong interest in developing a multidisciplinary project.

A list of 5(max.) representative publications of the group:

- S. Feuillastre, M. Pauton, L. Gao, A. Desmarchelier, A. J. Riives, D. Prim, D. Tondelier, B. Geffroy, G. Muller, G. Clavier, G. Pieters, *J. Am. Chem. Soc.*, **2016**, *138*, 3990–3993.
- X. Huang, G. Zucchi, J. Tran, Robert B. Pansu, A. Brosseau, B. Geffroy, F. Nief, *New J. Chem.*, **2014**, *38*, 5793-5800.
- A. Sergent, G. Zucchi, M. Chaigneau, R. Pansu, D. Tondelier, B. Geffroy, M. Ephritikhine, *J. Mater. Chem. C* **2013**, *1*, 3207-3216.
- G. Zucchi, V. Murugesan, D. Tondelier, D. Aldakov, F. Yang, P. Thuéry, M. Ephritikhine, B. Geffroy, *Inorg. Chem.* **2011**, *50*, 4851-4856.