PhD OFFER

Eco-design and development of innovative sustainable methods for the fabrication of efficient optically active systems

Location of PhD project:

HOST Laboratory : LGP2 Laboratory – *Laboratory of process engineering for biorefinery, bio-based materials and functional printing - FunPrint ResearchTeam*
461 rue de la Papeterie - Domaine Universitaire - 38 400 St Martin d'Hères
https://lgp2.grenoble-inp.fr/en

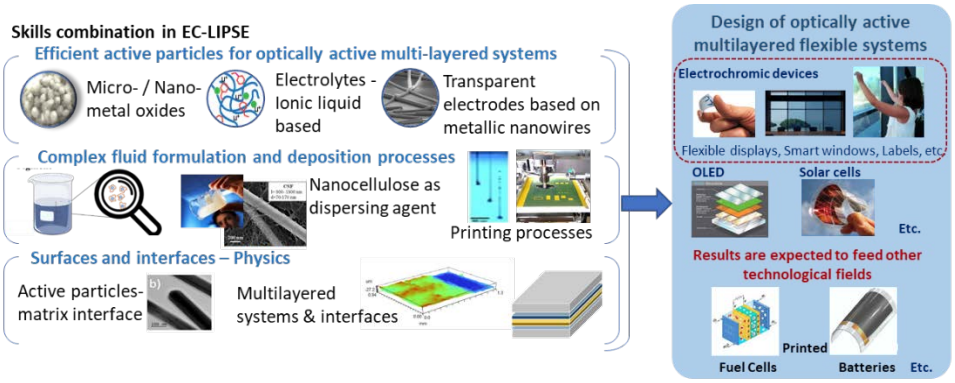
PARTNER Laboratory : LMGP Laboratory - *Laboratory in Materials Science and Physical Engineering - FunSurf Research Team*
3 Parvis Louis Néel (bâtiment Grenoble INP – Phelma) – 38000 Grenoble
https://lmgp.grenoble-inp.fr/en

Duration of the Thesis: 36 months: Possible Start date: From February 2025 to October 2025 at the latest start date

PhD Supervisors: Aurore Denneulin (LGP2)– Daniel Bellet (LMGP)– Julien Bras (LGP2)

Background and objectives of the project:

Optically active materials and devices are found in numerous applications related to energy, environment or health, with multiple examples of semiconductors, photovoltaics, catalysts, sensors, etc. Many optical and/or electronic applications still require non-toxic processing media (non-volatile solvents), low-temperature and additive deposition techniques such as coating/printing to meet the needs of large-scale continuous production on flexible substrates. Numerous developments have already been carried out and allowed the emergence of **functional fluids** (inks) to produce thin multi-layered active system (solar cells, OLEDs, sensors, displays, antennas, etc.). Regarding optically active systems, efforts are still needed to develop more eco-designed and easy-process approaches. Indeed, in order to foster an eco-designed and manufacturing strategy towards the production of low energy consumption systems, it is essential to promote the processing of aqueous functional fluids integrating highly-efficient particles, so to propose a full-printing approach of the architecture. In that purpose, the National ANR project ***EC-LIPSE*** (2025-2029, coordinated by Aurore Denneulin) proposes to address the eco-design and development of innovative sustainable methods for the fabrication of efficient optically active systems (with a first concrete focus on electrochromic devices (ECDs)).



The development phases of the thesis work will focus on the:

1/ Efficient selection of active material (micro- and nano-sized) for each layer of the optical multilayers system;

2/ Formulation of the aqueous functional complex fluids required in the multilayered system (For ECDs: metal oxide-/electrolytic-/metallic nanowire based inks);

3/ Thin film deposition process identification and optimization for the production of active thin layers;

4/ Understanding of the cross correlation between the characteristic of the printed thin layers involved in the optically active structure and the optical, electrochemical and electrical performances;

5/ Integration of sustainable strategic choices and assessment of specific impacts of the proposed solutions.

Required skills:

A taste for multidisciplinary projects, as well as motivation will be important selection criteria. The desired skills for the candidate are:

- ⊃ Autonomy / Rigor
- ⊃ Interest in applied research, and innovation
- ⊃ Taste for experimental work
- ⊃ Materials Science Knowledge
- ⊃ Fluid Formulation and characterization Knowledge
- ⊃ Fluid deposition processes
- ⊃ Fluency in English

An interest in the printed electronics sector is an asset.

For any further information and to apply for this offer, please send a CV with a cover letter to aurore.denneulin@grenoble-inp.fr, Daniel.bellet@grenoble-inp.fr and Julien.bras@grenoble-inp.fr