

PhD Position

Optical properties of helical multilayered nanocellulose-based assemblies

This PhD project, recently funded by the Jean-Marie Lehn foundation, aims at developing bio-inspired multifunctional nanocomposite materials with complex anisotropies (e.g. helical superstructures) combining steel-like mechanical properties and optical properties of interest (selective optical filtering). The present PhD work will focus on (i) the fabrication of hierarchical helical architectures made of cellulosic nanofibers and (bio-)polymers with tunable structural features (pitch, handedness) by combining layer-by-layer assembly and grazing incidence spraying and (ii) their structural and optical characterization using advanced characterization tools (e.g. SEM, UV-Vis spectroscopy, circular dichroism, Muller matrix polarimetry). Products that could be developed during this project are damage resistant optical filtering thin films, which will be competitive for future applications (e.g. counterfeiting protection, flexible displays).

Requirements and qualifications

This multidisciplinary thesis work, at the frontier between chemistry, nanoscience, materials science and optics will involve thin film fabrication, structural characterization and physicochemical characterization. The candidate should hold a master degree with a strong background in physical chemistry, material science or nanoscience. Skills in MATLAB coding for data analysis would be an asset. He/she will work in a dynamic environment, in which collaboration with other team members will be encouraged. Excellent communication skills (both written and oral) in English are expected, while knowledge of French is not mandatory.

Additional information

This 36-months full-time PhD is funded via the Jean-Marie Lehn foundation and will start on October 1st, 2024. The net salary is 1688 €/month. The work will take place at the Institut Charles Sadron (Strasbourg, France) under the supervision of Dr. Olivier Félix and Dr. Matthias Pauly. The project will be carried out in close collaboration with Dr. Bruno Jean (CERMAV, Grenoble) and Prof. Yann Battie (LCP-A2MC, Metz). Interested candidates should e-mail a CV, a brief motivation statement, a copy of the of M1 and M2 transcripts and two letters of recommendation at olivier.felix@ics-cnrs.unistra.fr.

References:

- [1] Blell R. *et al.*, Generating in-plane orientational order in multilayer films prepared by spray-assisted layer-by-layer assembly. *ACS Nano* **2017**, *11*, 84.
- [2] Merindol R. *et al.*, Assembly of anisotropic nanocellulose films stronger than the original tree, *ACS Nano* **2020**, *14*, 16525.
- [3] Mujica R. *et al.*, Macroscopic mapping of the linear in-plane anisotropy of nanocellulosic thin films by Mueller matrix polarimetry. *Compos. Sci. Technol.* **2023**, *233*, 109889.