



ANR ANISOFILM

PhD Student (M/W): Anisotropic cellulosic films tailored by ultrafiltration and UV curing at Laboratoire Rhéologie et Procédés (UMR 5520)

- To apply: <https://bit.ly/3evFPbl>

This thesis is part of the ANR project ANISOFILM that brings together 6 academic partners:

LRP, LGP2, CERMAV, DCM (Grenoble); Phenix (Paris); LPS (Saclay).



Laboratoire
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Procédés



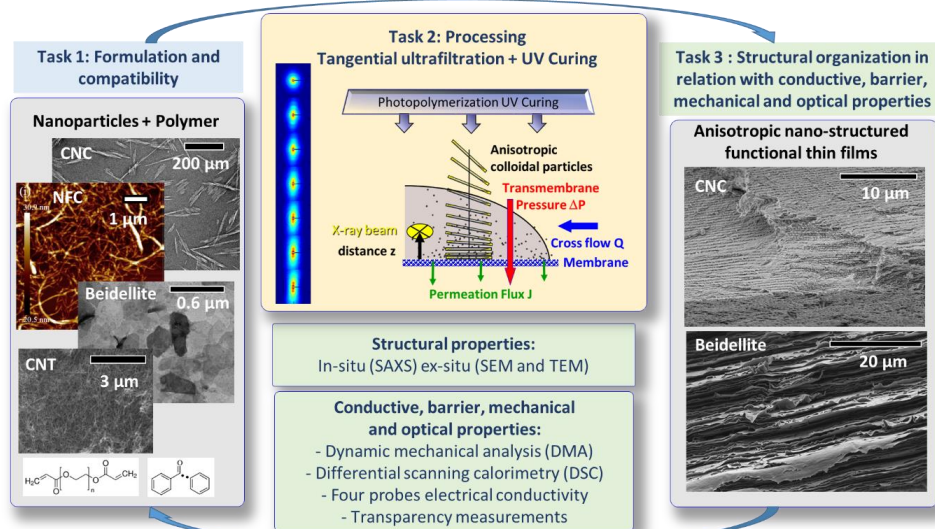
The ANISOFILM project aims at developing a new and scalable method of processing by combining crossflow ultrafiltration with frontal photopolymerization to produce innovative cellulosic composite films with controlled anisotropic textures from nanometric to micrometric length scales.

Industrial applications in the areas of microelectronics, packaging or optics are targeted.

Description of the subject thesis:

The PhD student's role will be to develop these films and optimize their structural organization properties in relation to their functional properties (mechanical, electrical, optical or barriers). To do this, he/she will implement nanocrystals or nanofibrils celluloses in a UV-curable polymer matrix. In order to confer additional functional properties, some particles of interest will be added, such as multiwalled carbon nanotubes for improved dielectric and conductivity properties or nanofillers like natural clays to induce enhanced oxygen or water vapor barrier properties.

Implementation will be carried out by a tangential ultrafiltration process combined with UV cross-linking. One of the objectives of his work will be to understand the organizational mechanisms involved. For this purpose he/she will use either in situ characterizations during the processing by in situ small-angle X-ray and light scattering (SAXS-USAXS and SALS) or direct ex situ observations of composite films made, by electron microscopy (SEM and TEM) and X-ray diffraction (WAXS).



In parallel, the PhD student will be assisted by two post-docs, working on characterizing functional properties in order to establish the relationships with the textures of the cellulosic composite films made.

Profile of the PhD expected:

The candidate must hold a Master 2 with skills in fluid mechanics, soft matter and/or processes. Experience in structural and/or mechanical characterization of colloids and polymers, and possibly in membrane separation processes, would be appreciated.

References:

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- Pignon, F. et al. Carbohydrate Polymers, 260, 117751 (2021). doi.org/10.1016/j.carbpol.2021.117751
- Rey, C. et al. ACS Sustainable Chem. Eng. 7, 10679–10689 (2019). doi.org/10.1021/acssuschemeng.9b01333
- Gicquel, E. et al. Cellulose, 26, 7619–7634 (2019). doi.org/10.1007/s10570-019-02622-7
- Jin, Y. et al. Carbohydrate Polymers, 124, 66–76 (2015). doi.org/10.1016/j.carbpol.2015.01.073