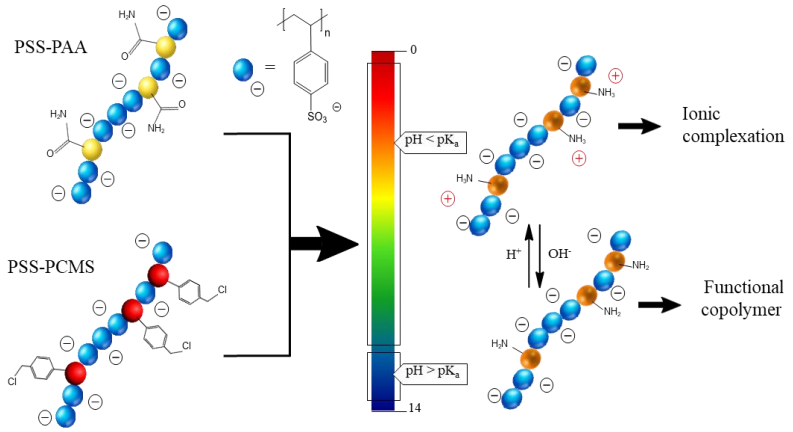
Copolyelectrolyte synthesis for energy applications

2 yrs eng. or post-doc from 2025 – IMP Lyon

Keywords : polyelectrolyte, radical copolymerization, ionic membrane, energy conversion

Context. Ionic membrane are a critical component of several energy conversation technologies (fuel cell, electrolyzer, metal-ion and redox flow battery, reverse electrodialysis (RED)). In the frame of the ANR CELLOSMO, we are interested in the elaboration of hybrid ionic membrane for blue energy conversion, a renewable and non intermittent energy source originating from fresh (river) and salty water (sea, brine) [1]. Our material chemistry strategy relies on using nanocellulose as a biosourced nanostructured scaffold once hydrated, [2] and to graft onto it reactive copolyelectrolytes [3] which can bring the ionic transport properties. The purpose of the present job offer is to develop a library of relevant copolymers.



[1] Jang, J., Kang, Y., Han, J. H., Jang, K., Kim, C. M., & Kim, I. S. (2020). **Developments and future prospects of reverse electrodialysis for salinity gradient power generation: Influence of ion exchange membranes and electrodes**. Desalination, 491, 114540.
[2] Nicolas, M., Serghei, A., Lucas, C., Beyou, E., & Fumagalli, M. (2023). **Grafting of polyamines onto periodate oxidized nanocellulose, and its application to the fabrication of ionic nanopapers**. Polymer, 270, 125760.
[3] Nicolas, M., Beyou, E., & Fumagalli, M. (2021). **Two-step synthesis of polystyrene sulfonate based copolymers bearing pendant primary amines**. European Polymer Journal, 152, 110455.

Goals. Selection of adequate comonomer pairs to have a reactive copolyelectrolyte toward cellulose surfaces and investigation of the influence of their architecture onto the resulting hybrid ionic membrane properties.

Methodology. Synthesis of copolyelectrolyte by radical polymerization (NMR, SEC) while varying their macromolecular architecture (stat or block, Mw, comonomers nature and content) and subsequent evaluation of their solution properties (titration, light and small angle scattering). Their reactivity toward cellulose surfaces will also be considered in collaboration with the CERMAV lab.

Practical informations. 2 years contract (funding ANR CELLOSMO) either for an engineer or a post-doc (scientific programme will be adpated accordingly) which can start as early as January 2025.

We are looking for a chemist with a bakcground in radical polymerization.

To apply please send your CV, a motivation letter and the contact of a reference person to emmanuel.beyou@univ-lyon1.fr and matthieu.fumagalli@univ-lyon1.fr.