

Grafted Kynar® PVDF towards proton exchange membrane applications

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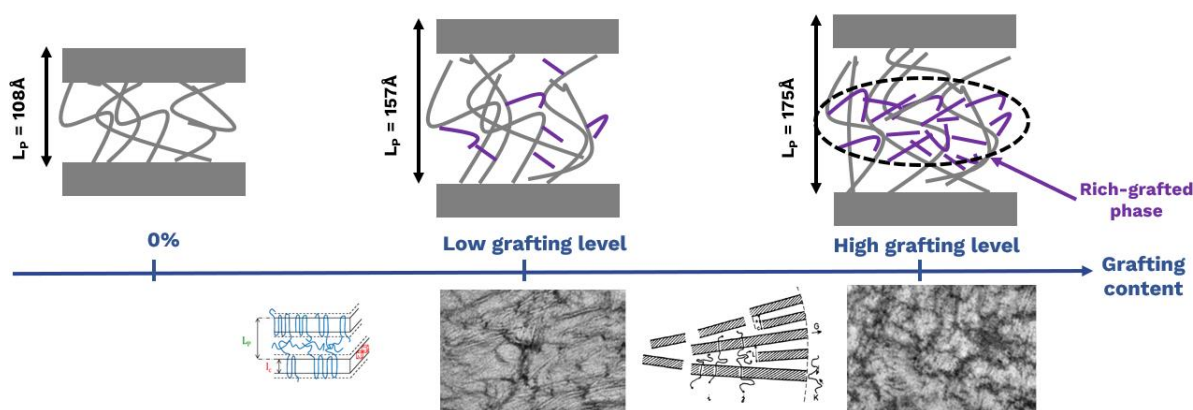
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Mots-clés : PVDF, grafting, ionomers, membrane, electrolyzers

Résumé :

Among the different technologies of hydrogen-based fuel cells and electrolyzers under development, proton exchange membranes fuel cells and electrolyzers seem to be one of the most promising and mature ones [1,2]. Their operating conditions are quite demanding for the different materials constituting both the fuel cells and electrolyzers, especially for the proton exchange membrane which is the core of those systems. Well-known in batteries, the polyvinylidene difluoride (PVDF) is a good candidate to ensure those drastic conditions thanks to its oxidative resistance as well as its thermal and chemical stabilities. That the reason why Arkema had been interesting in developing PVDF based proton exchange membrane for fuel cells and electrolyzers.

This project consists in grafting two monomers onto an irradiated PVDF films allowing to bring proton conductivity while maintaining the PVDF inherent properties. The grafting level had been optimized first. Then, the role of PVDF crystallinity on the monomer grafting had been also studied. It had been showed that PVDF crystallization under spherulites enhance the nanostructuration of the grafted pendant chains, leading to thin channels of proton conductive pendant chains. That leads to enhanced proton conductivity with limited water uptake which is promising for electrolyzer applications.



Grafted pendant chains nano-organization in the semi-crystalline PVDF structure

Références :

- [1] N.A.A Qasem, G.A.Q Abdulrahman, *Internal Journal of Energy Research*, 2024, 34
- [2] M. Chatenet, H. Schafer, *Chem Soc Rev*, 2022, **51**, 4583