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Crosslinked side-chain-type anion exchange membranes with enhanced conductivity and dimensional stability

Chen Xiao Lin, Yi Zhi Zhuo, En Ning Hu, Qiu Gen Zhang, Ai Mei Zhu, Qing Lin Liu*

Fujian Provincial Key Laboratory of Theoretical and Computational Chemistry, Department of Chemical & Biochemical Engineering, The College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, P. R. China

*Corresponding author:

Q.L. Liu, E-mail: qlliu@xmu.edu.cn, Tel: 86-592-2188072, Fax: 86-592-2184822.

ABSTRACT: Covalent crosslinking is considered to be a promising strategy to balance the dimensional stability and conductivity of anion exchange membranes (AEMs). Nevertheless, crosslinking using diamine crosslinkers would introduce hydrophobic alkyl chains into the ionic domain resulting in a significant decline in hydroxide conductivity and crosslinking via catalyst is discouraged. Herein, we presented a strategy for preparing crosslinked AEMs without using catalyst and the crosslinked moiety is away from the ionic domain. The crosslinking was carried out by converting the trifluorovinyl groups into perfluorocyclobutane groups via thermal treatment. The designed side-chain structure is responsible for the obvious hydrophilic/hydrophobic phase separated morphology and interconnected ion conducting channels, as confirmed by atomic force microscopy, transmission electron microscopy and small angle X-ray scattering. The obtained membrane exhibited high dimensional stability and a highest conductivity of 77.1 mS cm^{-1} at 80 ^{o}C. Furthermore, the crosslinked AEMs also had robust mechanical properties, good thermal stability and reasonable alkaline stability.

KEYWORDS: *side-chain-type; crosslinking; phase separation; anion exchange membranes; alkaline fuel*