

Author's Accepted Manuscript

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PII: S0376-7388(17)32757-6
DOI: <https://doi.org/10.1016/j.memsci.2017.12.054>
Reference: MEMSCI15825

To appear in: *Journal of Membrane Science*

Received date: 25 September 2017
Revised date: 13 December 2017
Accepted date: 18 December 2017

Cite this article as: Liang Wang, Fan Zhang, Zhenxing Li, Jiayou Liao, Yingda Huang, Yinlin Lei and Nanwen Li, Mixed-charge poly(2,6-dimethyl-phenylene oxide)anion exchange membrane for diffusion dialysis in acid recovery, *Journal of Membrane Science*, <https://doi.org/10.1016/j.memsci.2017.12.054>

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Mixed-charge poly(2,6-dimethyl-phenylene oxide)anion exchange membrane for diffusion dialysis in acid recovery

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ABSTRACT

In order to achieve high H^+ dialysis coefficients and highly selective of anion exchange membranes (AEMs) for diffusion dialysis (DD) in acid recovery applications, a series of mixed-charge PPO AEMs with quaternary ammonium(QA) and carboxylic acid groups were synthesized quantitatively via Cu(I)-catalysed “click chemistry”. In diffusion dialysis, using an acidic solution (HCl, 1mol/L; FeCl₂, 0.2mol/L) as a simulated waste solution indicated that the as-obtained mixed-charge PPO AEMs displayed higher H^+ dialysis coefficients and a higher H^+/Fe^{2+} selectivity over that of typical AEMs despite their increased water uptake and lower volumetric IEC_v values. The highest H^+ dialysis coefficients, 20.37m/h, and H^+/Fe^{2+} selectivity 34.52, membranes were achieved with PPO-X35Y20 at 30°C. These values were much higher than that of the PPO-X40 membrane without carboxylic acid groups. Importantly, unlike previously reported AEMs for DD in which the H^+/Fe^{2+} selectivity decreased as the IEC_w increased, (i.e., a trade-off effect between the U_{H^+} and selectivity), the high IEC_w of the mixed-charge PPO AEMs tended to result in not only high H^+ dialysis coefficients but also high H^+/Fe^{2+} selectivities. It is assumed that the carboxylic acid

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