

Stability and performance of commercial membranes in high-temperature organic flow batteries

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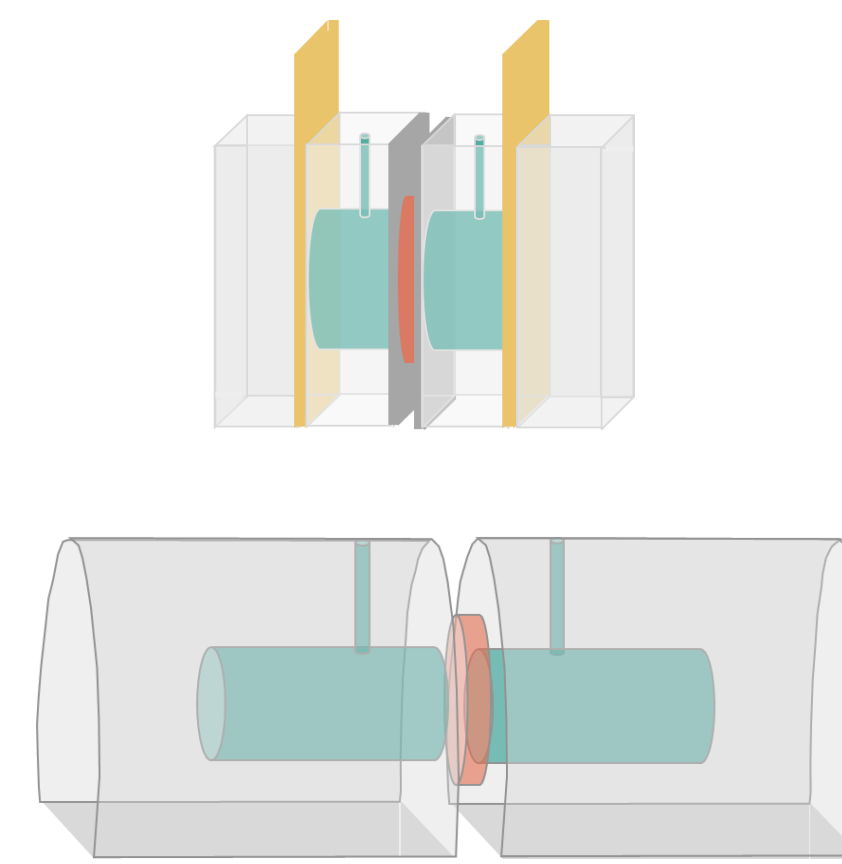
1 Introduction

Recently, increased interest in flow batteries in warmer climates → flow battery operates at higher temperature

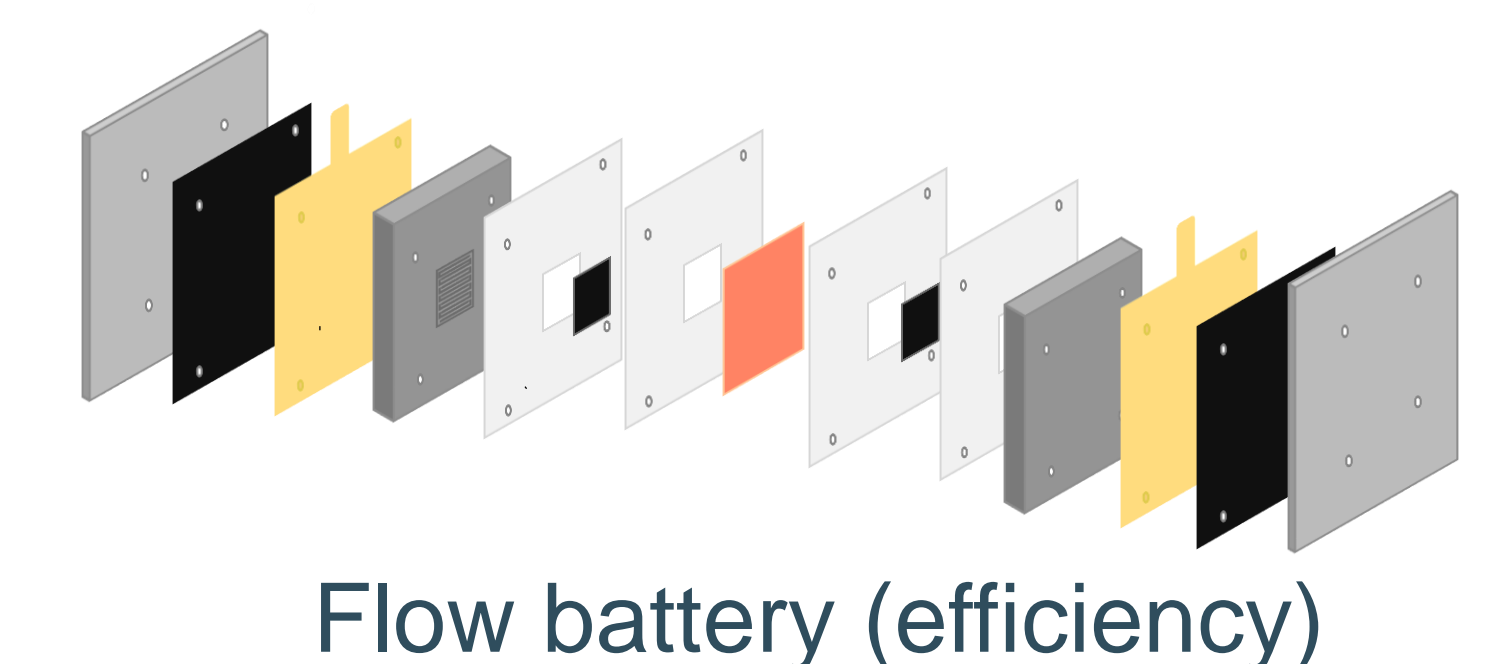
How do commercial membranes uphold at high temperature conditions and what is their performance for organic flow batteries?
 → Recommendation based on end use

2 Characterisation methods

Impedance (ohmic resistance & ionic conductivity)



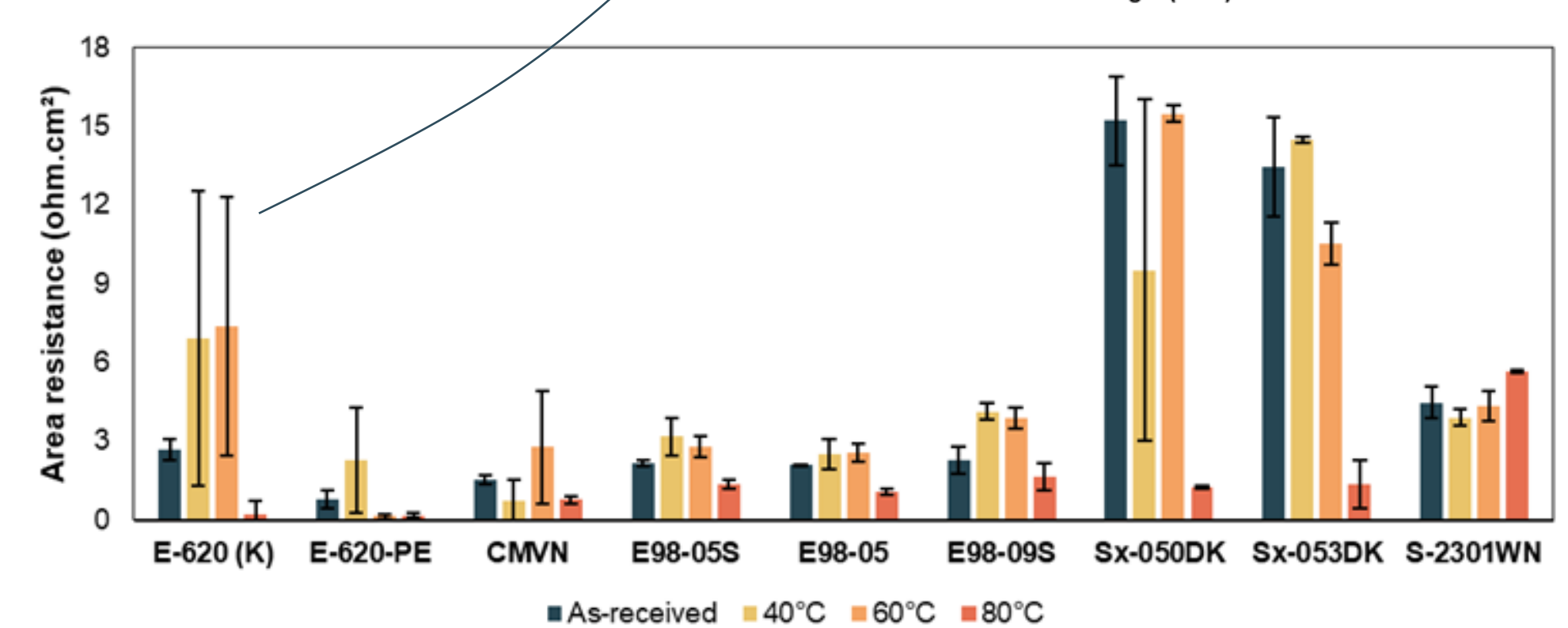
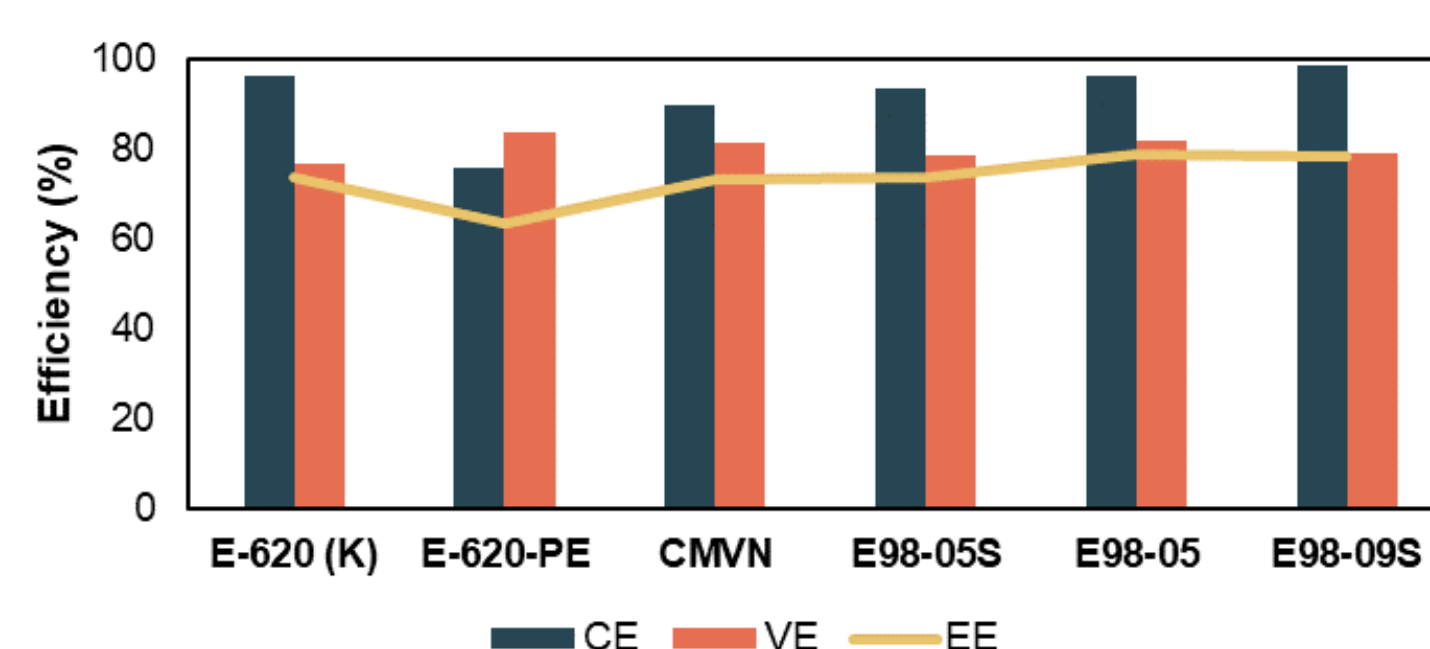
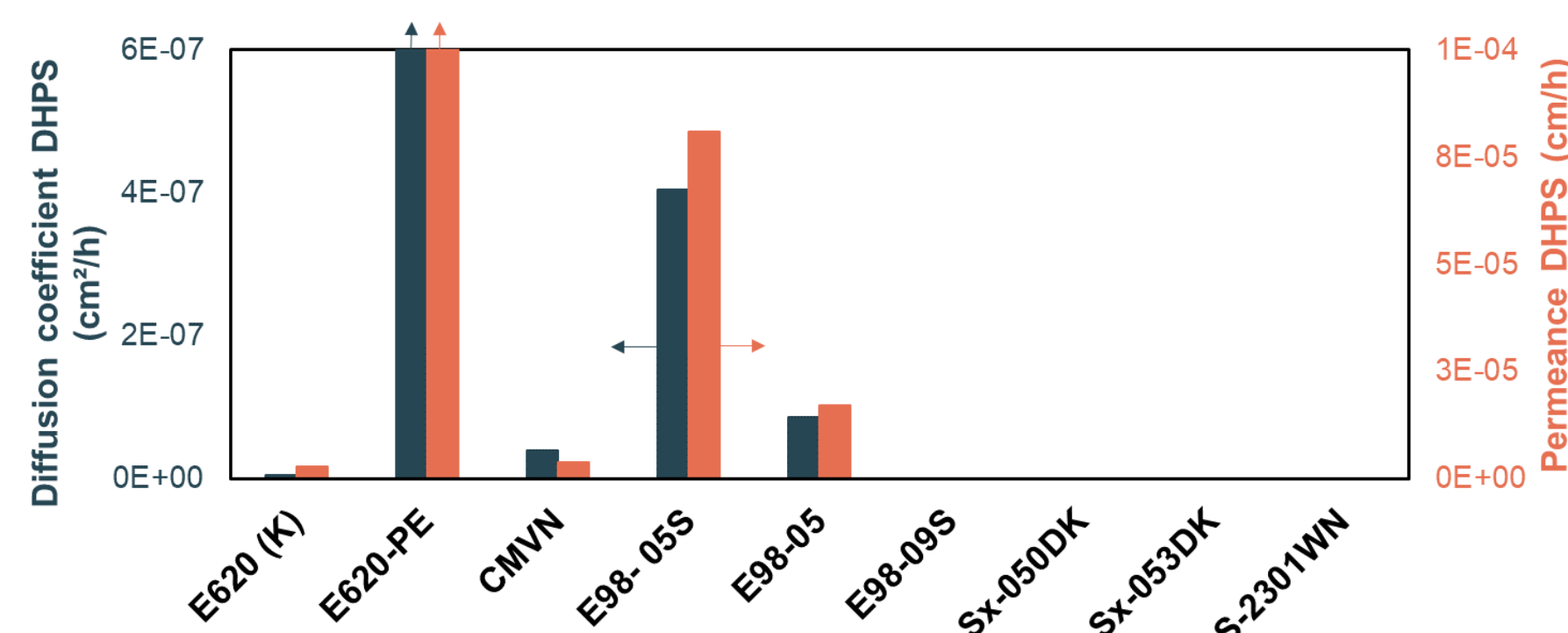
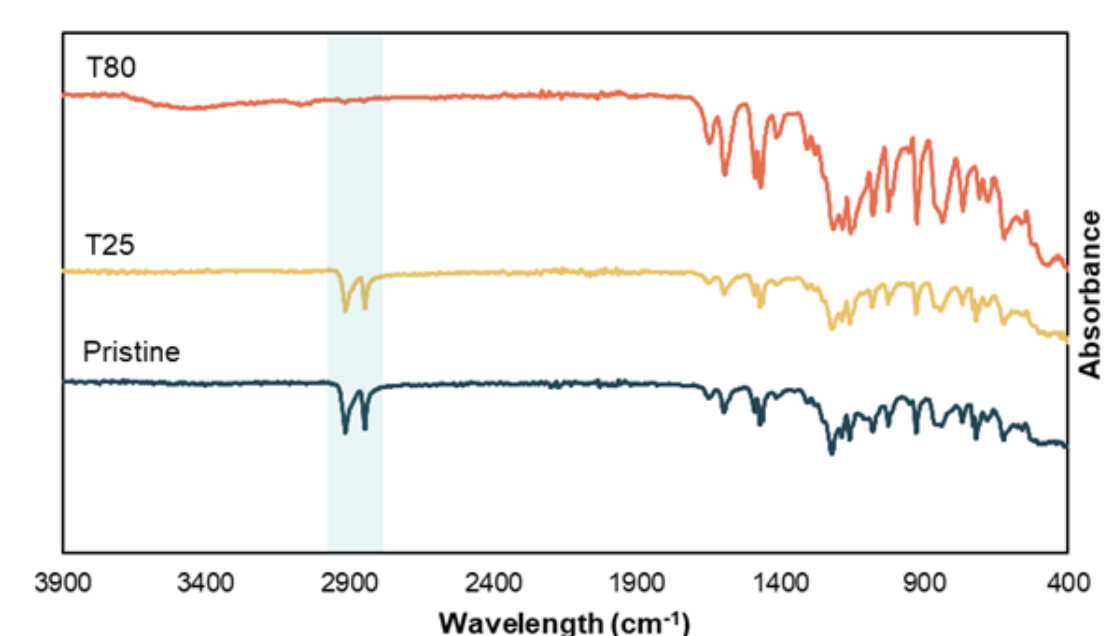
Diffusion (diff. coeff & permeance)



Flow battery (efficiency)

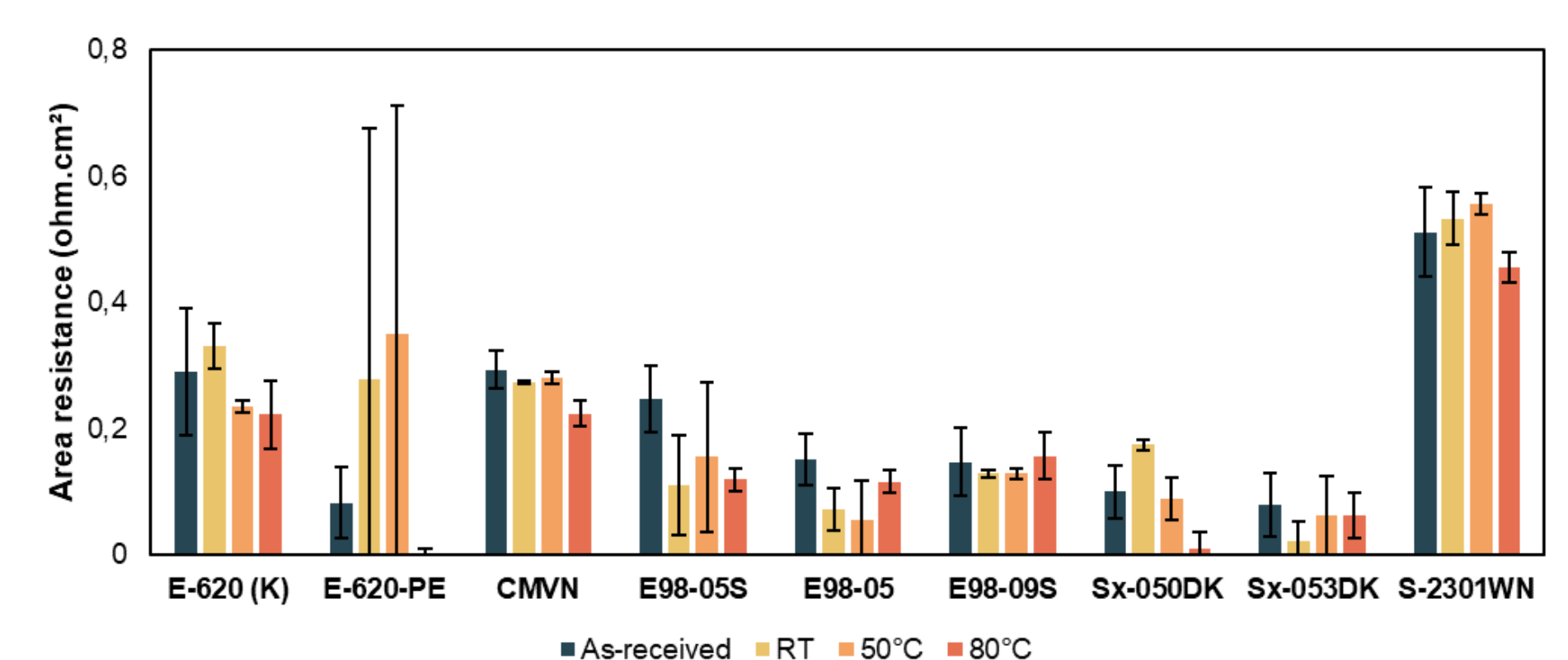
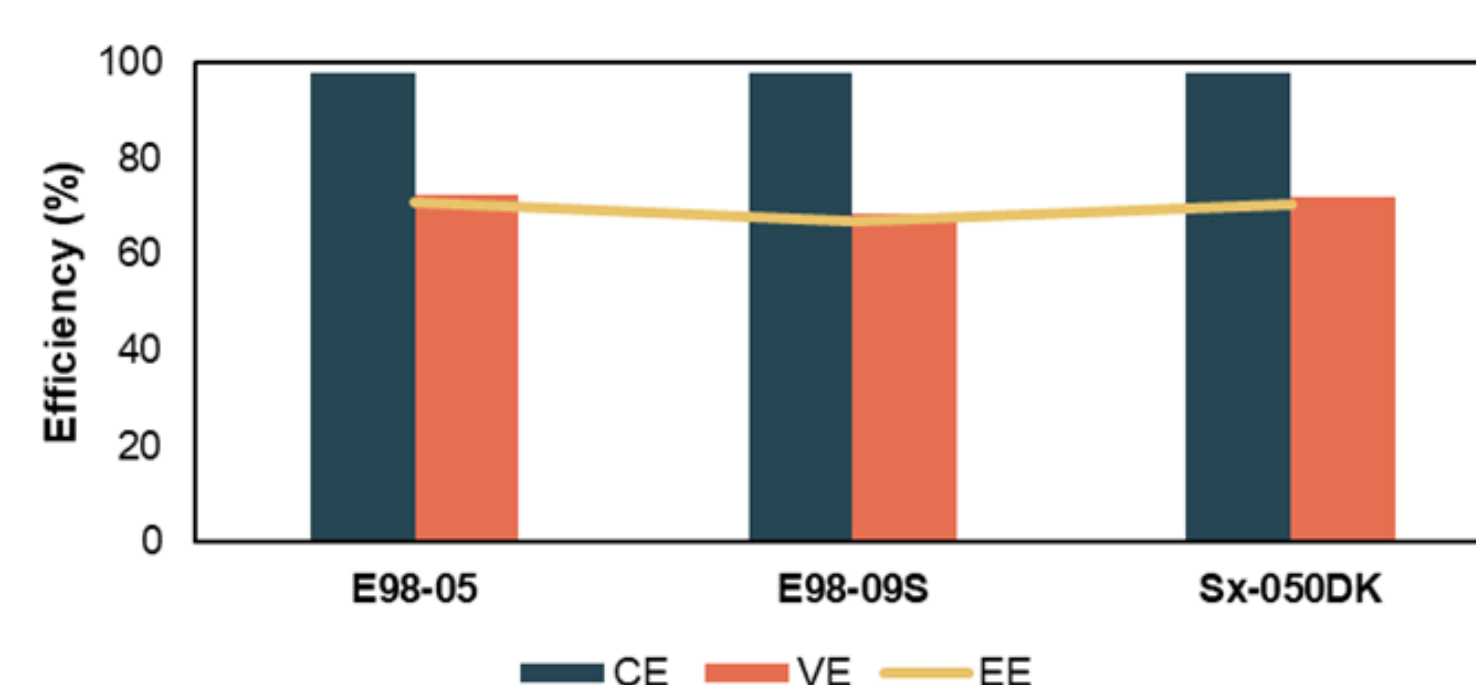
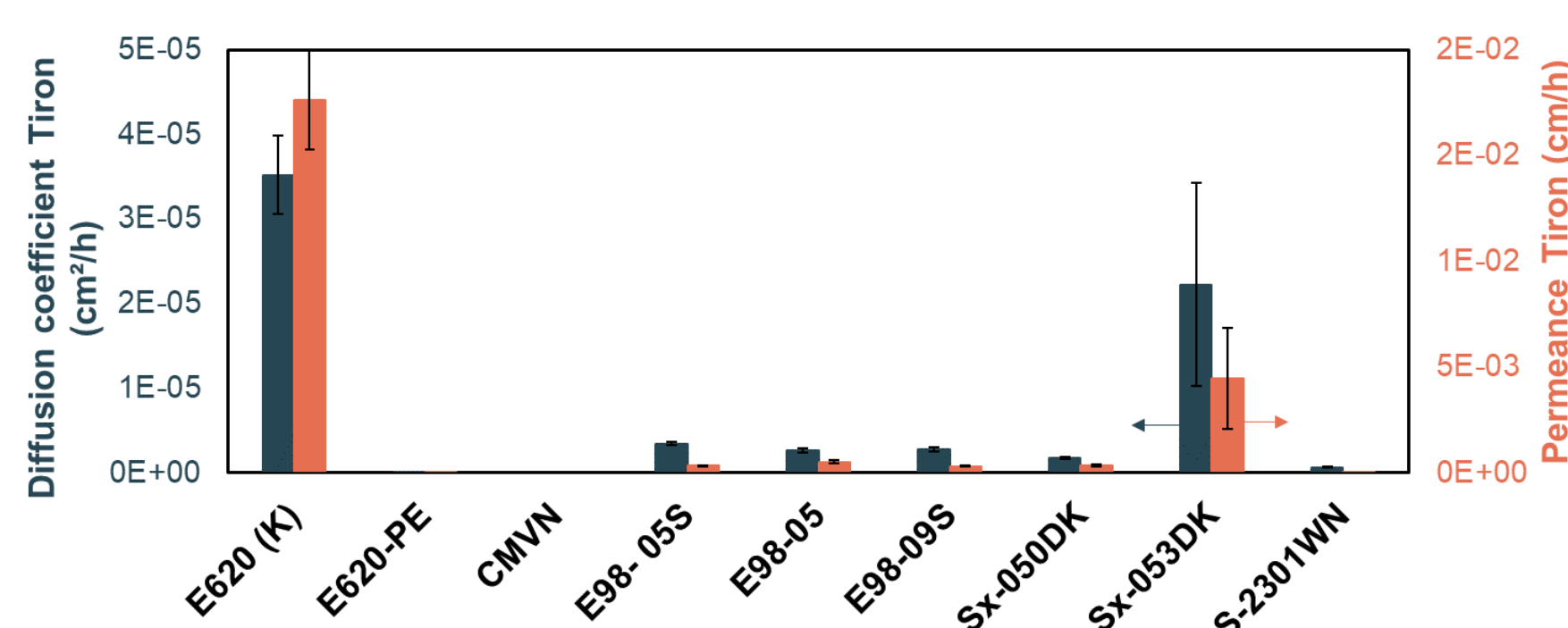
3 Alkaline results

- Zero crossover could be seen in several membranes
- Trade-off visible
- Interesting membranes selected for battery had mostly similar efficiencies
- Stability of most membranes in high temperature pH 14 was decent, with a few exceptions



4 Acid results

- Zero crossover seen in one membrane and low crossover seen in several membranes
- Trade-off visible
- Interesting membranes selected for battery had mostly similar efficiencies
- Stability of most membranes in high temperature pH ≤ 0 was decent, with a few exceptions



5 Conclusion

Alkaline: E620-PE lowest resistance ; E98-09S, Sx-050DK, Sx-053DK and S-2301WN negligible crossover of DHPS; E98-05 best energy efficiency ; 7/9 membranes considered stable at 80° C

Acid: E620-PE and Sx-053DK lowest resistance ; CMVN negligible crossover of Tiron ; E98-05 best energy efficiency ; 8/9 membranes considered stable at 80° C