SAND2019-14446C

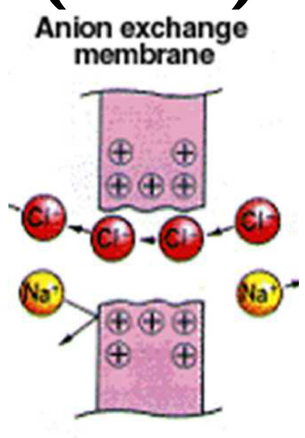
Sandia National Laboratories

Advanced Membranes for Flow Batteries

Cy Fujimoto

Anion Exchange Membrane (AEM):

1. Polymer that contains bound positive charges.
2. ***Alkaline stable*** AEM allows for new electrochemical applications.
3. There is no accepted ***alkaline stable*** "state of the art" AEM.



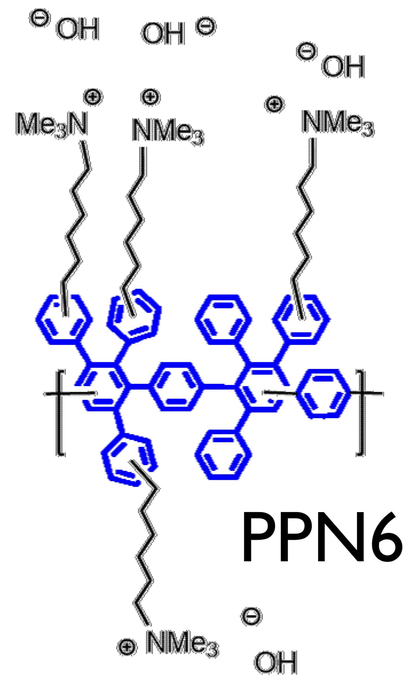
Handful of small AEM companies

ecoLECTRO

Dioxide Materials™ The CO_2 Recycling Company™

IONOMR

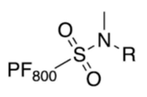
ORION POLYMERS



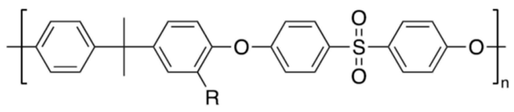
Third Party Durability Study:

Investigate IEC/Conductivity Loss and Mechanical Loss in 1M KOH at 80 °C for 1000hrs.

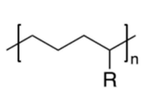
Perfluoro (PF)



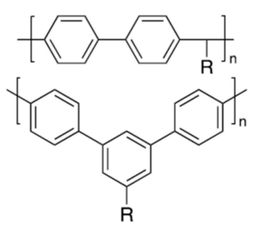
Poly(aryl ether sulfone) (PAES)



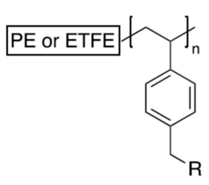
Polyethylene (PE)



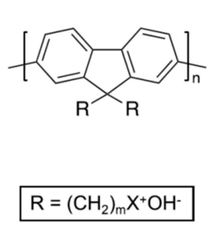
Polyphenylene (PPN)

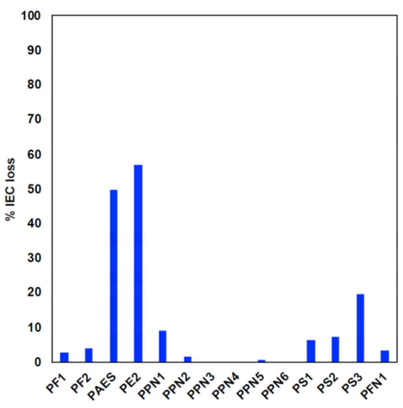


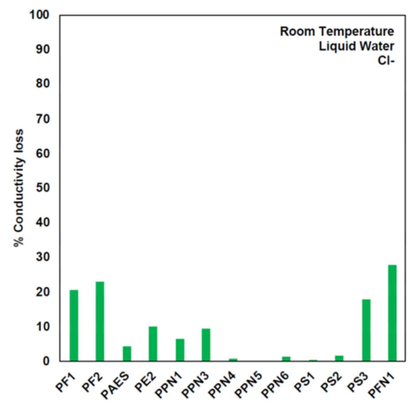
Polystyrene (PS)

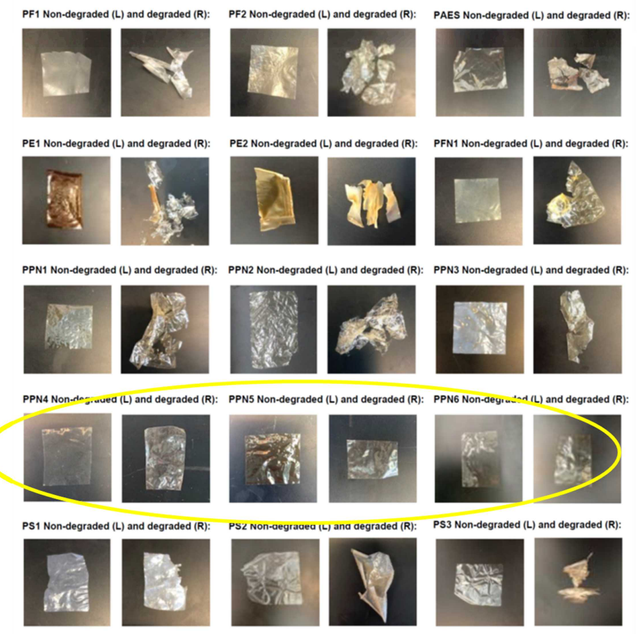


Polyfluorene (PFN)



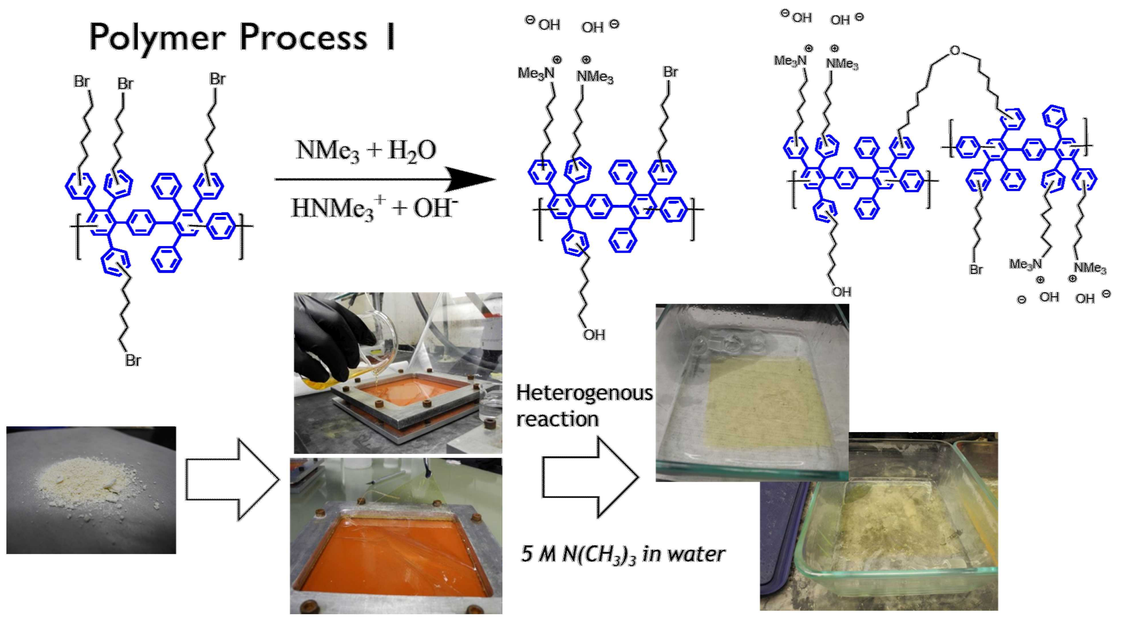


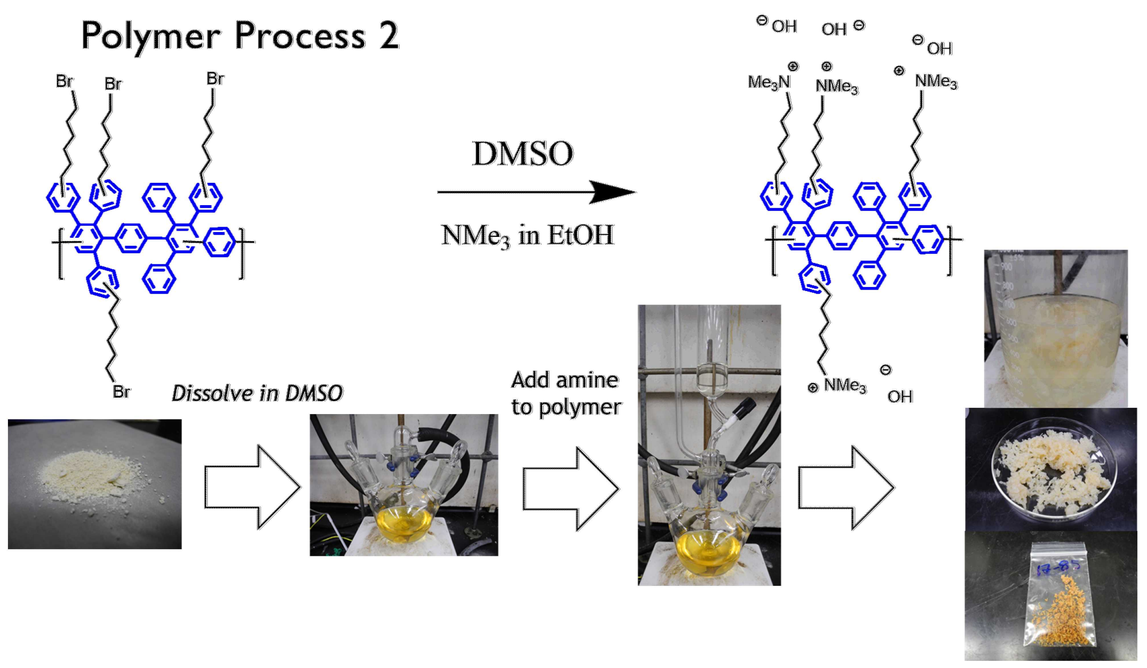




Process of AEM Synthesis:

To increase control of IEC of AEMs, needed to improve the process used in the amination of the halide containing polymer.





Conclusions/Future:

1. Interest in anion exchange membrane high.
2. Various polymers are being investigated, but the SNL polymer has shown promising durability.
3. Issues in controlling polymer IEC which was due to processing conditions.
4. Developed processing procedure that has shown full conversion of alkyl bromide to ammonium; better IEC control.
5. Membrane commercialization
6. Battery testing of new polymer architectures (Travis/Harry), send to collaborators.

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