Anion Exchange Membranes - Transport/Conductivity

- Fundamental understanding

- Driving membranes towards applications

High Priority

- A need for a standard/available AEM (similar to Nafion in PEMs)
- Define standard experimental conditions and protocols
- A need for much more fundamental studies in transport mechanisms and mechanical properties
- A need to develop much more new AEMs with alternative chemistries (new cation and backbone chemistries)

Fundamental Studies

- **TRANSPORT**
- Conductivity (pure OH^- hard to measure)
- Water content, λ
- Diffusion coefficients, NMR
- Drag coefficients
- Transference
- Solubility
- Fundamental transport mechanisms for anion and water transport
- Computational Modeling
- **MORPHOLOGY/CHEMISTRY**
- Vibrational Spectroscopy: FTIR, Raman
- Scattering: SANS, SAXS
- Crystallinity WAXS/XRD
- Microscopy
- Structure-property relationships
- Structure-property-processing relationships
- New experimental techniques and protocols
- Effect of current density on transport properties and concentration of species in AEM

Standard Experiments/Conditions:

- OH^- conductivity: suggested optimal conditions: EIS 4-pt, in-plane, > 90%RH, 80 °C in clean air (< 0.1 ppm CO_2) – also suggested to measure conductivities solutions with various KOH concentration
- HCO_3^- conductivity: suggested optimal conditions: EIS 4-pt, in-plane, > 90%RH, 80 °C in std air
- ASR
- Water uptake (lamda) as a function of counterion (OH^-, HCO_3^-, CO_3^{2-} ?
- Water swelling (volumetric change)?
- Mechanical properties (what is the mode of failure)
- Water Permeability/Flux – enhanced water transport to stabilize hydroxide
- Fuel Permeability: e.g., hydrogen, air, methanol, ethanol