Scalable Membrane-supported IL CO2 capture and removal systems

Early Career Faculty Award (ECF): Topic 2 – MOF and Ionic Liquids/Membrane Technologies for Advanced CO2 Removal Applications

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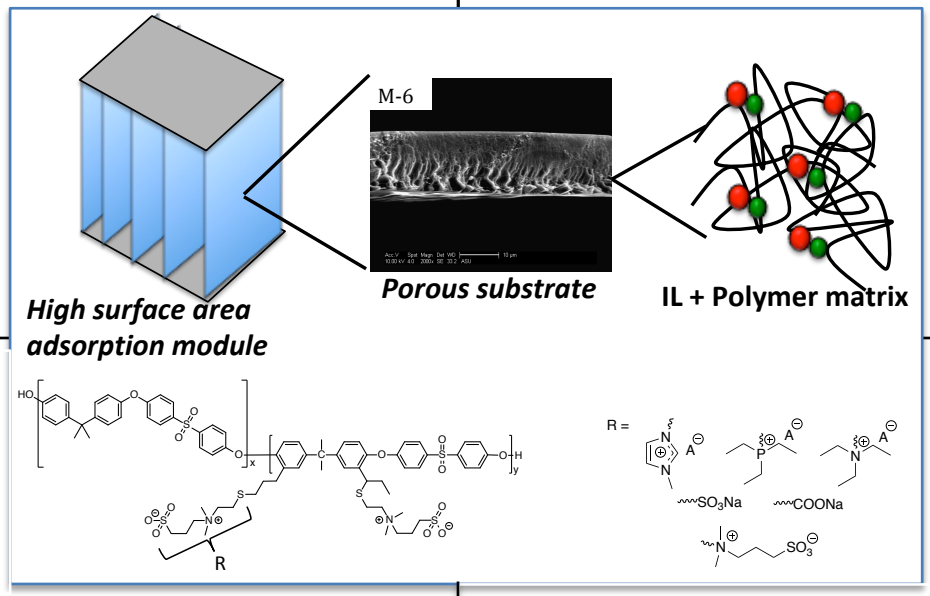
Research Objectives

- *Goal: Phase I: Integrate macromolecular design with precision synthetic protocols to produce low maintenance CDRAs that maintain CO_2 below 2630 ppm*
- *Phase II: Integrate with other support systems and utilize CO_2 as a feedstock*

Start at TRL1 (design and synthesis of polymers and IL pairs) and end at TRL3 (deployable CDRA modules)



Approach

- Utilize charged, high Tg, porous polysulfones to encapsulate ILs
- Control charge density on polysulfone and optimize polymer-IL interactions to maximize IL loading capacity
- Tailor IL and polymer charge to yield selective CO_2 solubility in the membrane
- Build high surface area modules to maximize CO_2 adsorption capacity and rate

Potential Impact

Improved longevity, and thermomechanical performance/stability

- Reduce cost, weight for efficient CO_2 removal to enable deep space operations
- Adaptable module design enables integration into other life support systems
- Membrane design allows for CO_2 adsorption or capture, the latter can be fed into catalytic systems to manufacture CH_4, HCOOH, and others with great efficiency