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 CDRAAs that maintain CO2 below 2630 ppm
• **Phase II:** Integrate with other support systems and utilize CO2 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 CO2 solubility in the membrane
• Build high surface area modules to maximize CO2 adsorption capacity and rate

Potential Impact
Improved longevity, and thermomechanical performance/stability

• Reduce cost, weight for efficient CO2 removal to enable deep space operations
• Adaptable module design enables integration into other life support systems
• Membrane design allows for CO2 adsorption or capture, the latter can be fed into catalytic systems to manufacture CH4, HCOOH, and others with great efficiency