Novel Membranes for CO_2 Removal

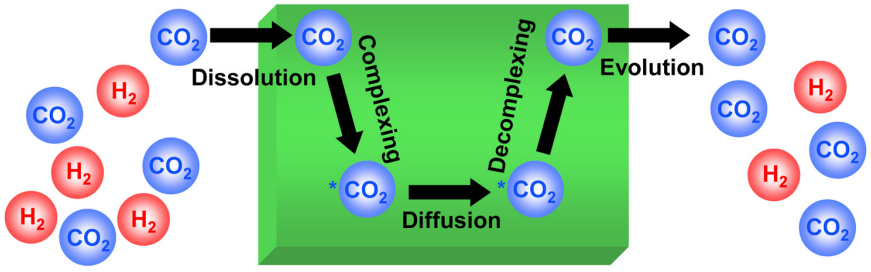
Background

As the stabilization of CO_2 concentrations in the atmosphere becomes increasingly important, the capture and sequestration of CO_2 emissions from advance power generation systems will become a necessity. In the current carbon sequestration concept, separation and capture represent the greatest expense in the overall capture and storage process. Improvements in capture and separation have the greatest potential to affect the cost of CO_2 mitigation, and membrane technology holds signi f cant promise in this area.

Membranes have a number of innate advantages over other separation techniques, including simple design with no moving parts, limited maintenance, lower energy requirements due to lack of phase transitions, single-step separation, and exceptional reliability. These advantages have allowed membranes to make signi f cant commercial advances in other CO_2 removal applications, such as natural gas sweetening. In fuel gas streams where pressures and CO_2 concentrations are high, membranes seem a natural choice for carbon capture.

Primary Project Goal

This research is aimed at developing robust membranes capable of selective CO_2 removal in reducing environments, such as those found in integrated gasi f cation combined cycle (IGCC) power plant fuel gas streams or natural gas sweetening (NGS). Capture in gasi f cation systems will most likely take place after the low-temperature water gas shift reaction. It is necessary that CO_2 technologies for the shifted fuel gas work at elevated temperatures approaching 260 °C to maximize the e f ciency of the power generation process and also function well in the presence of fuel



In facilitated transport di usion, the CO_2 dissolves into the membrane, reacts with the ionic liquid to form a complex, di uses across the membrane, decomplexes, then desorbs into the gas phase.

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