



Membranes for CO₂ Capture

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Overview

- Mixed Matrix Membranes
- Membrane Gas Contactors
- Electrodialysis for Solvent Remediation
- Other Activities

MIXED MATRIX MEMBRANES

Mixed Matrix Membranes



Matrimid



Carbon A



Carbon B



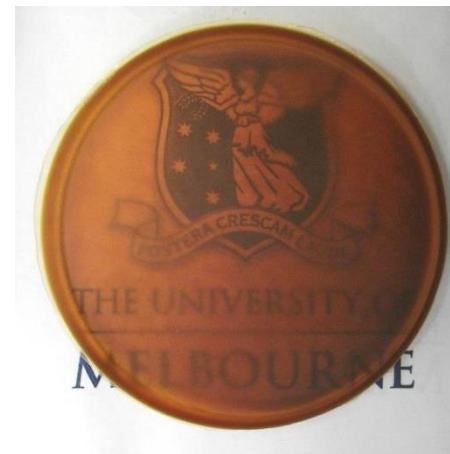
Carbon C



ZIF-8



Cu-BTC

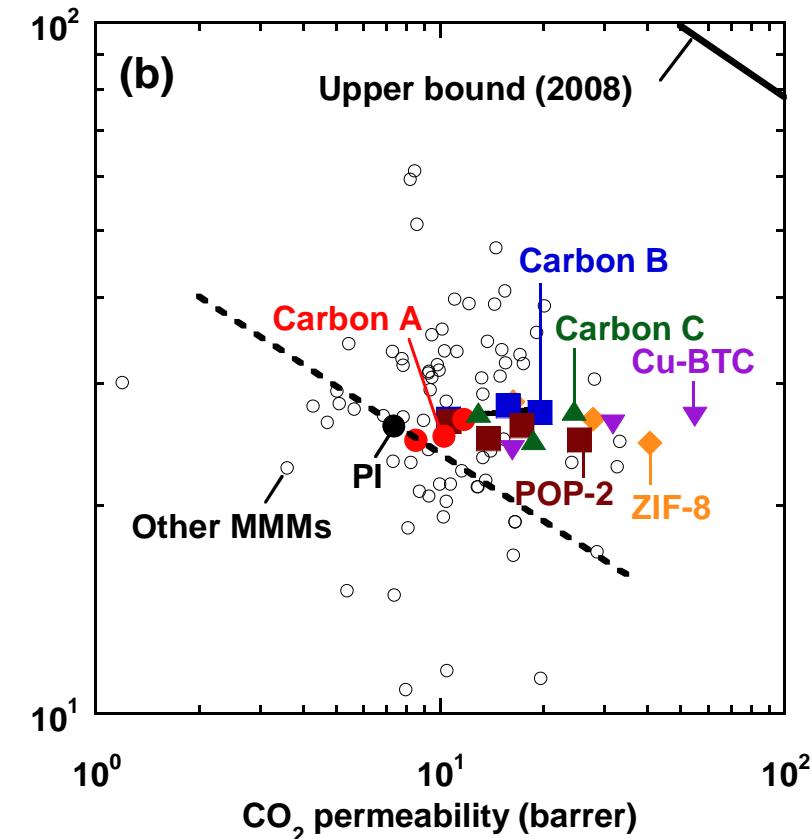
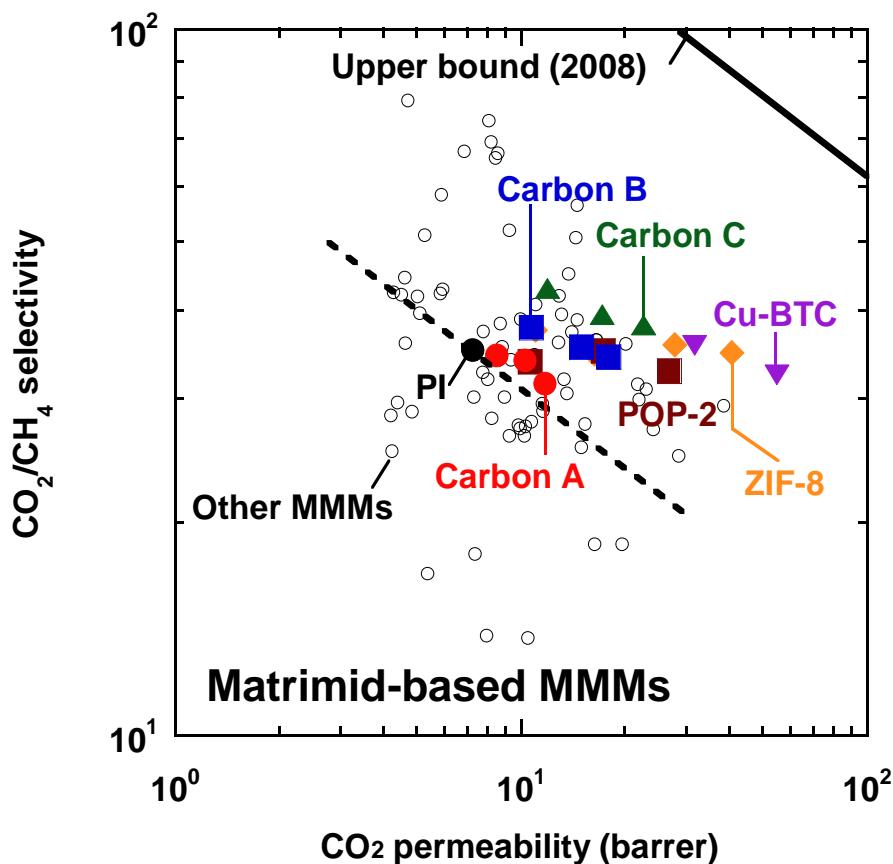


PCN-2

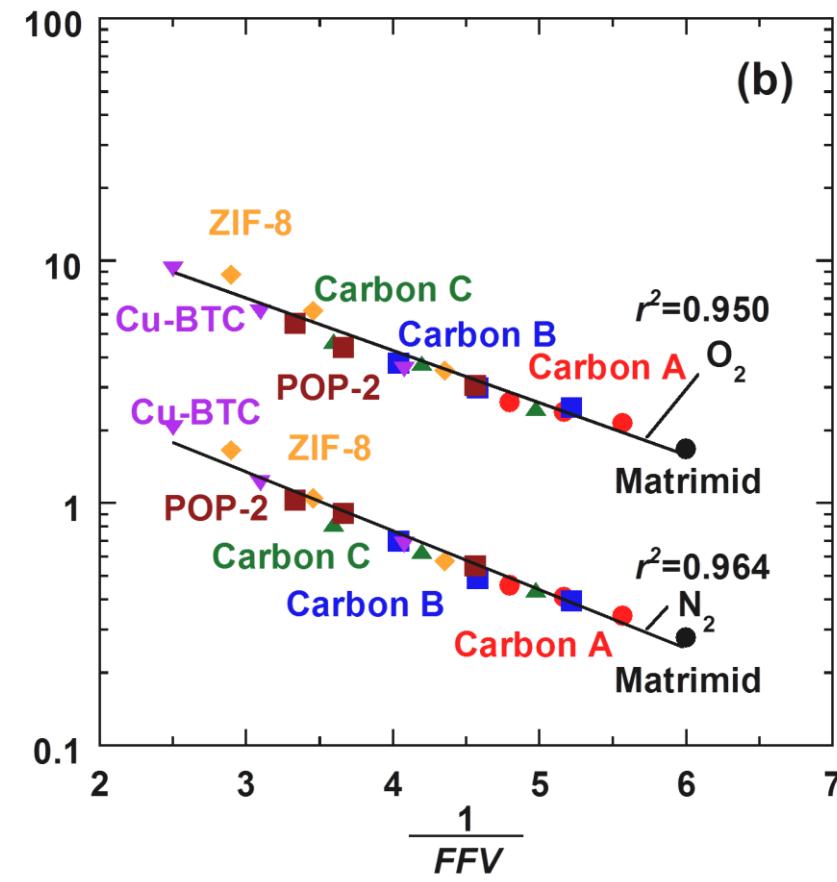
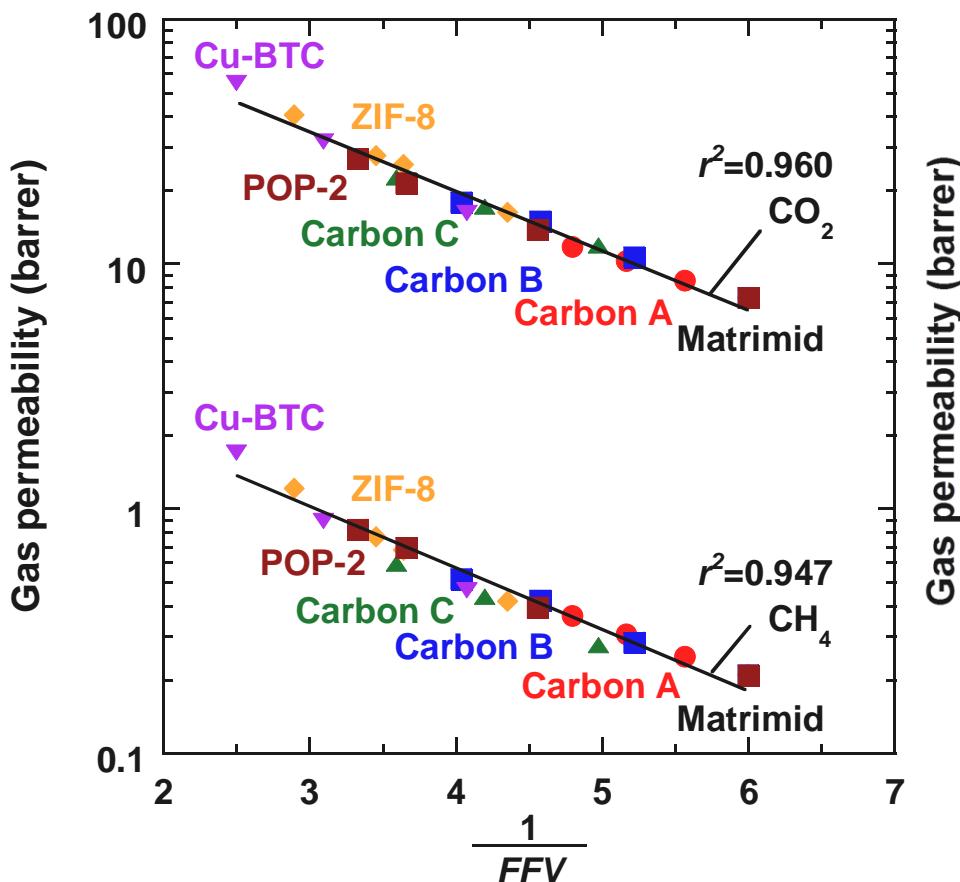


UiO-66

Mixed Matrix Membranes



Mixed Matrix Membranes



$$\text{Total FFV} = \text{FFV}_{\text{polymer}}(\phi_{\text{polymer}}) + \text{FFV}_{\text{filler}}(\phi_{\text{filler}})$$

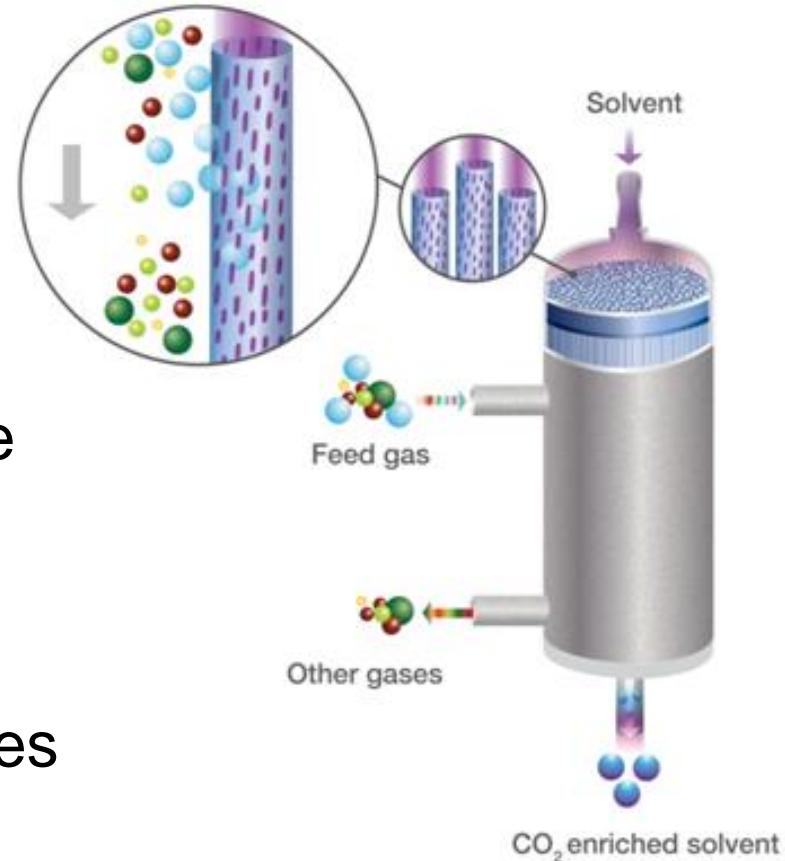
MEMBRANE GAS ABSORPTION

Gas-solvent Membrane Contactors

Take advantage of both membrane and solvent technology

Solvent – high selectivity for CO₂

Membrane – controlled flow regimes



CO2CRC H3 Project

Post-combustion capture
15 tonne of CO₂ per annum
from flue gas

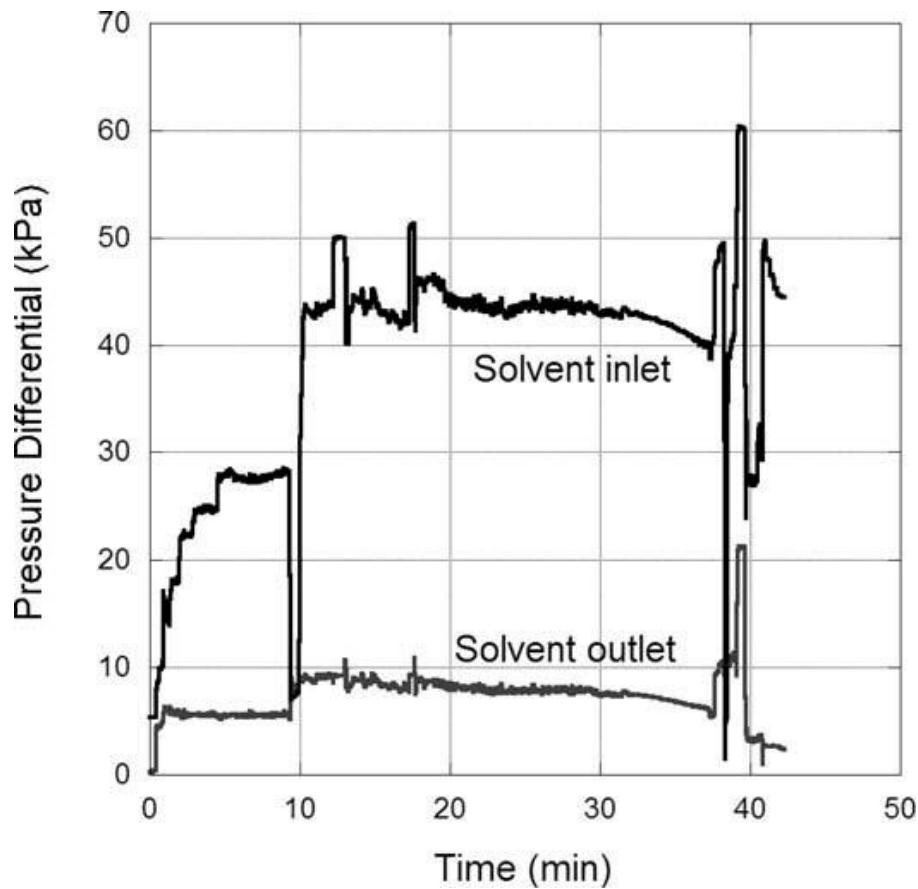
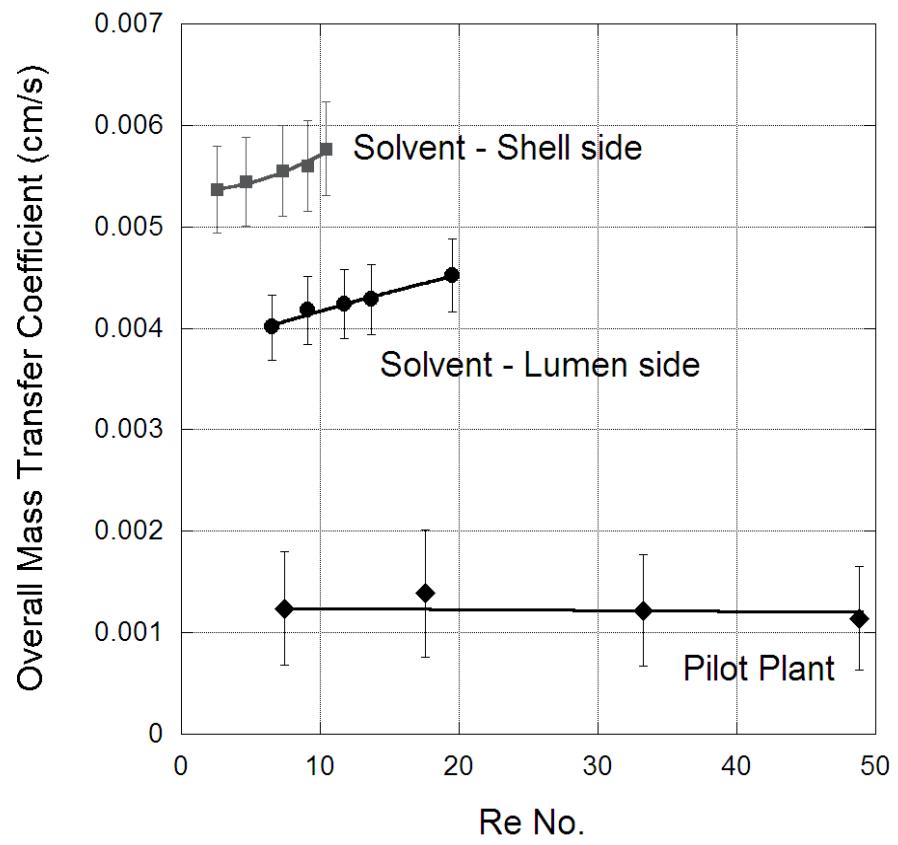
Pressure ~10 kPag
Temperature 50 °C

Composition (mol%)

CO ₂	13.0
N ₂	62.2
O ₂	3.5
Water	20.5
Ar	0.8

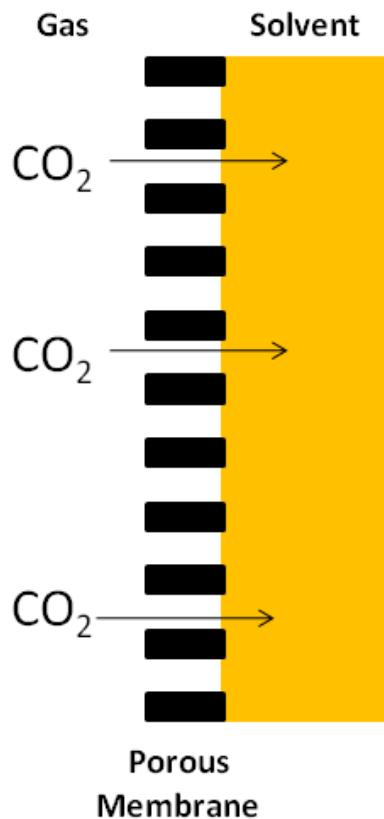


PTFE Contactor – PuraTreat Performance

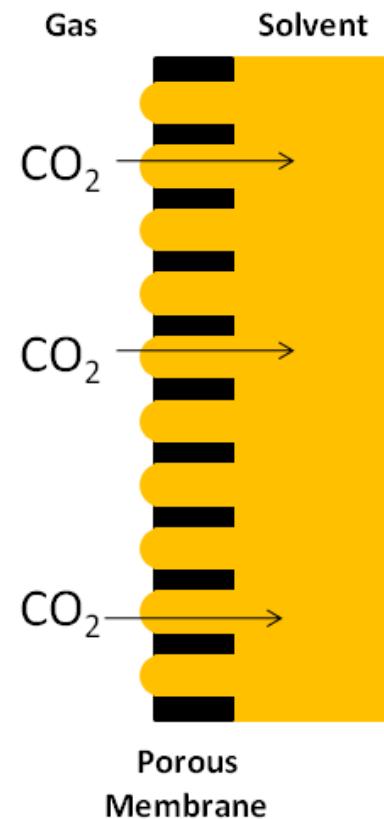


Non-Porous Membrane Contactors

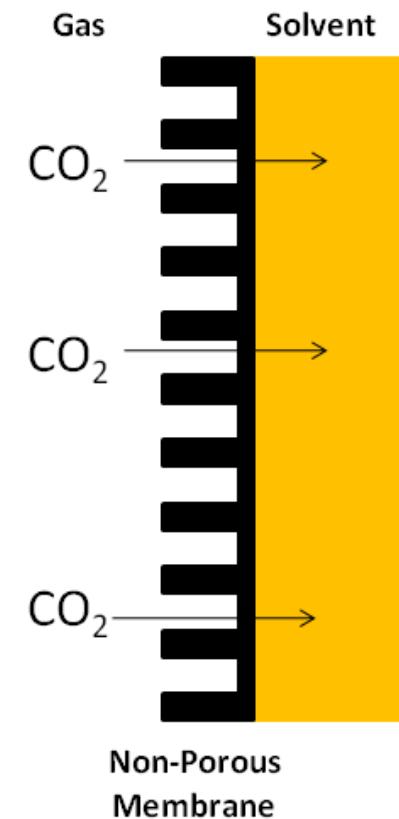
Gas filled Pores



Solvent filled Pores

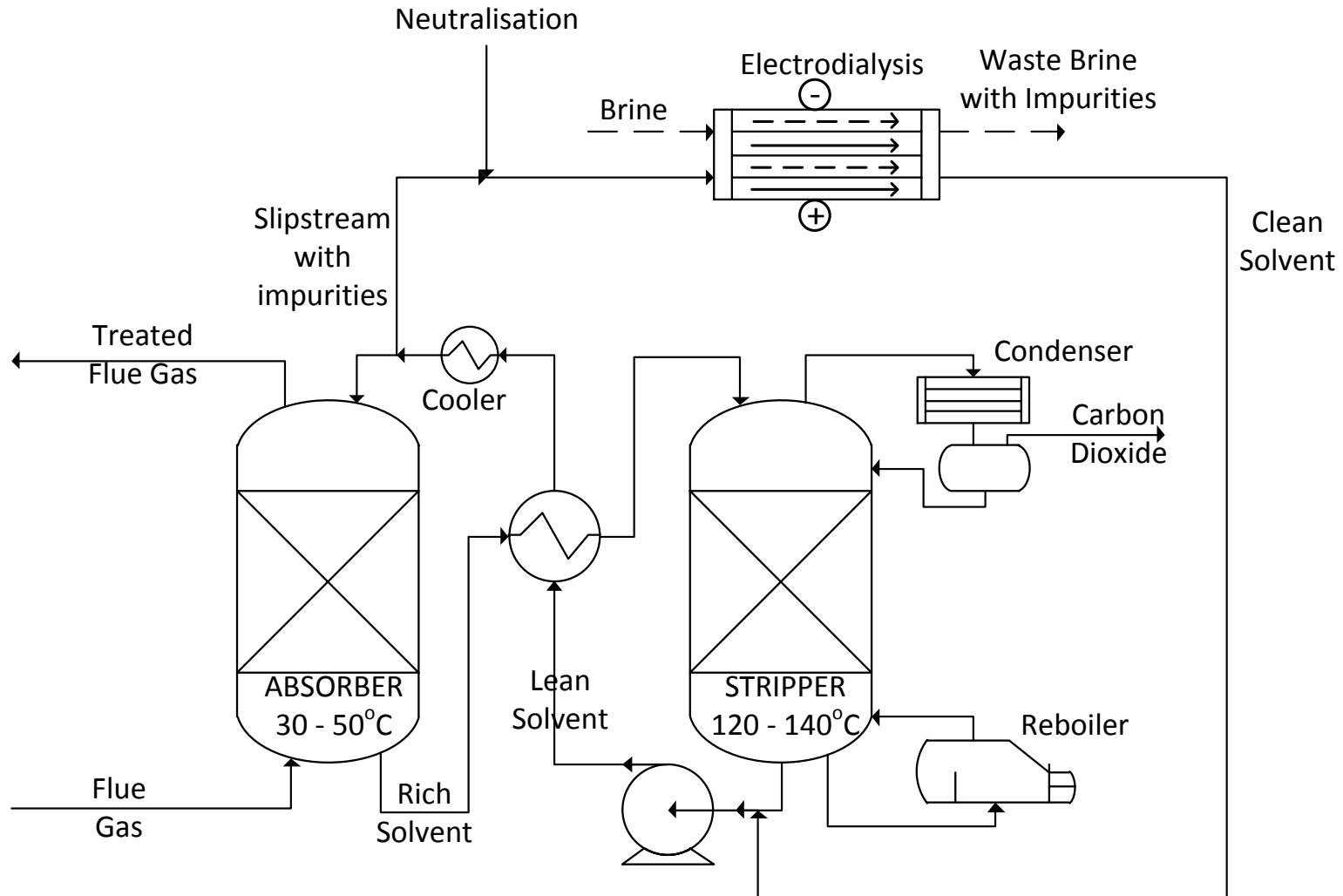


Non-Porous (Gas filled)

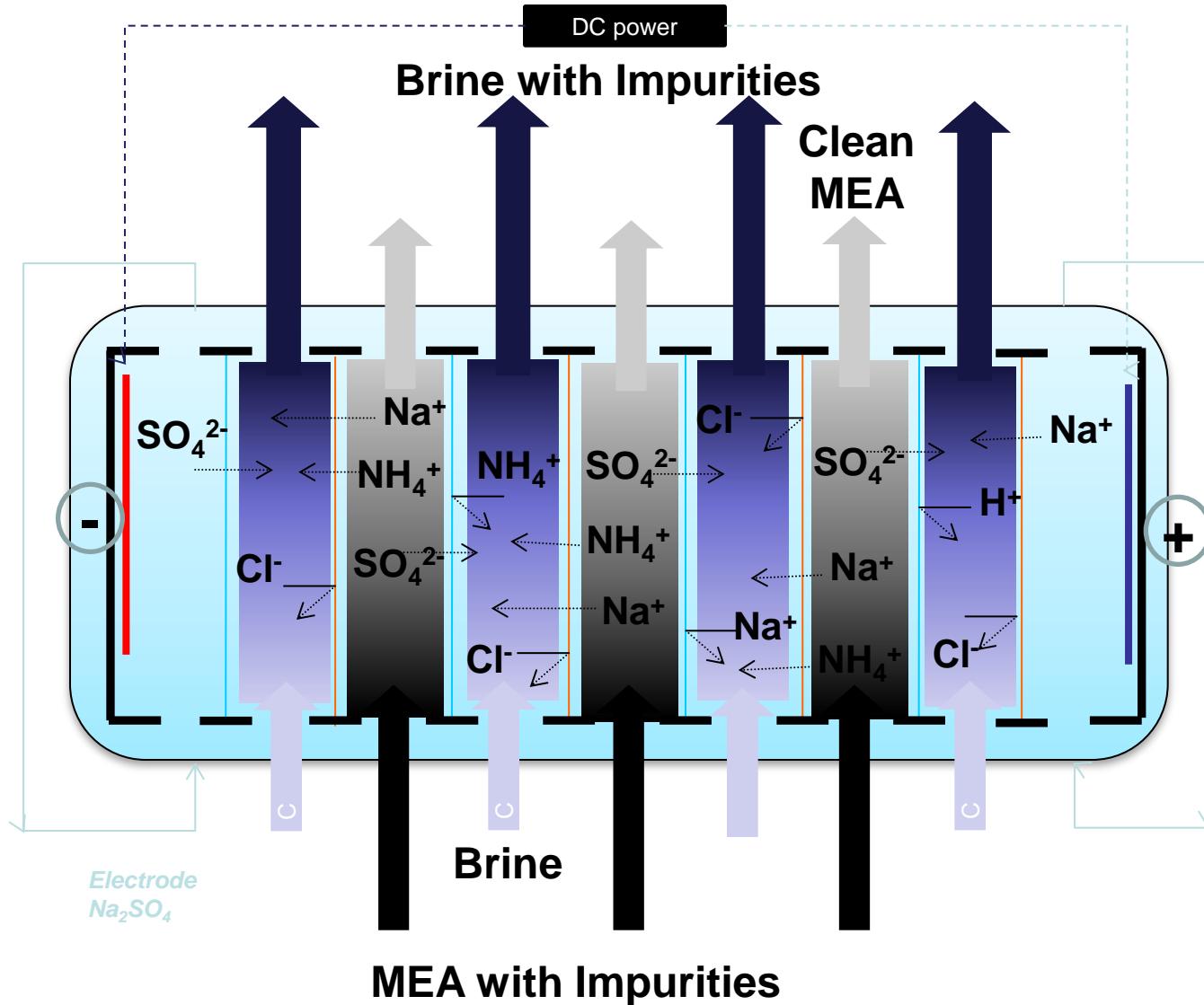


ELECTRODIALYSIS

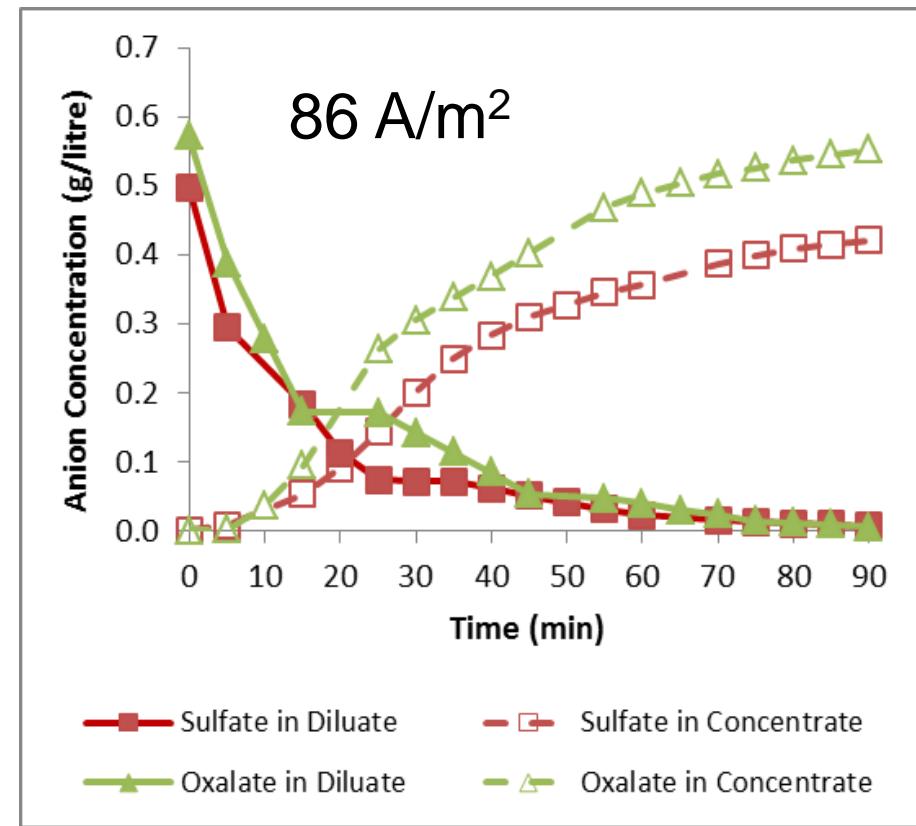
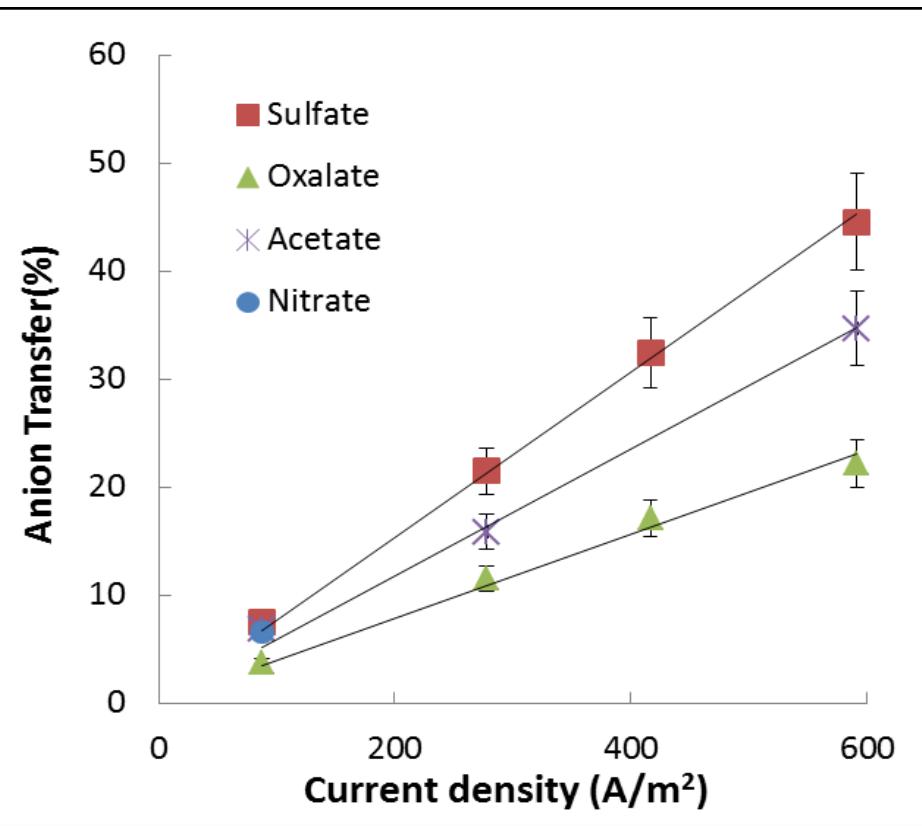
Solvent Remediation



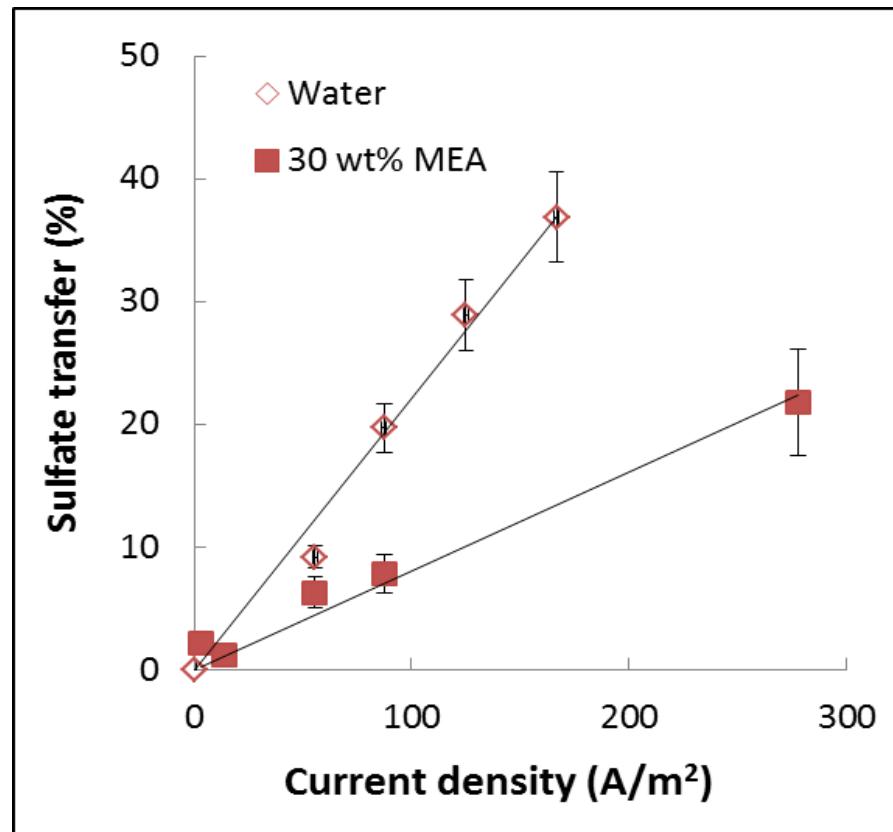
Electrodialysis Removes Charged Impurities



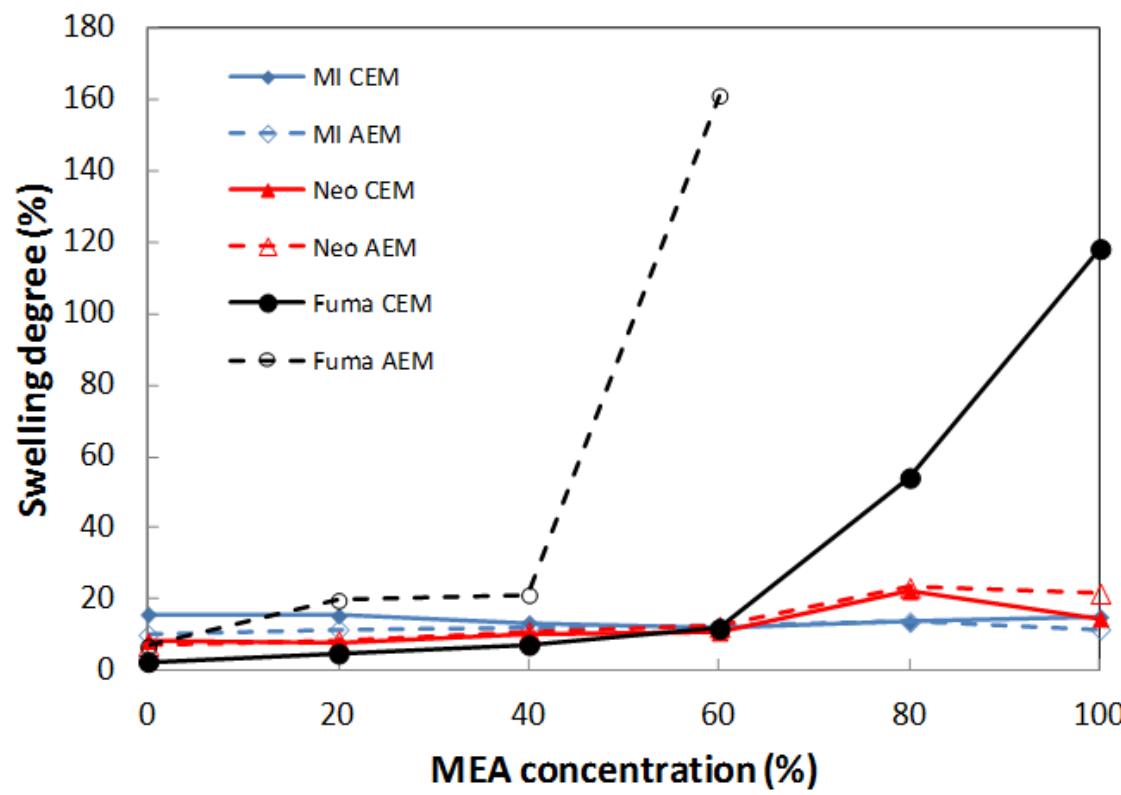
Stronger acids Transfer better when Current Density is High



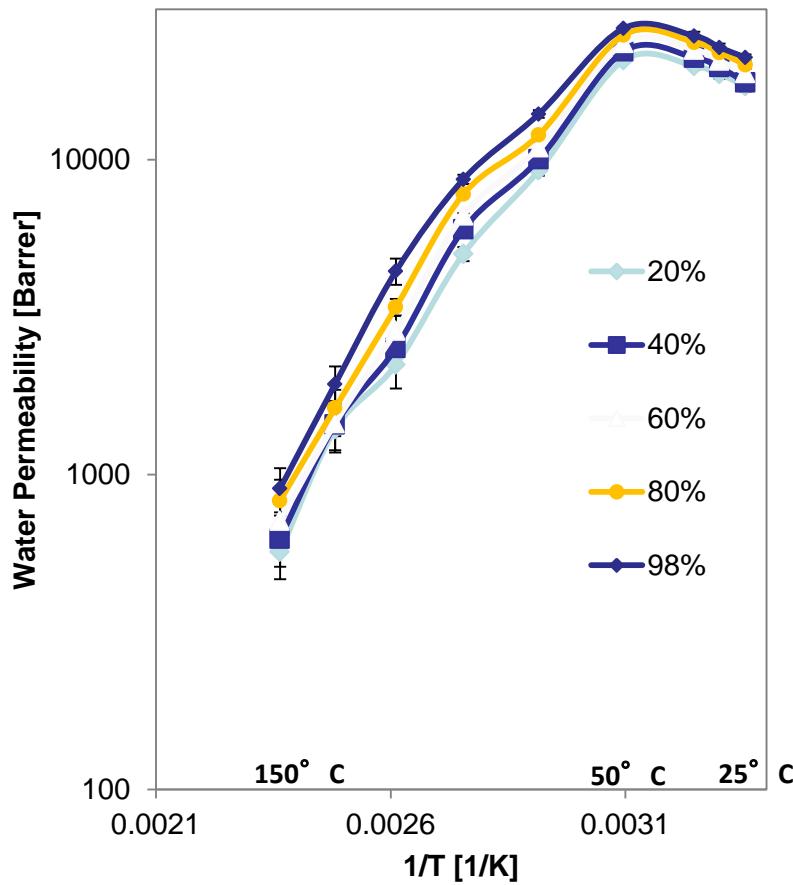
Performance falls in the MEA system



Some membranes fail in strong MEA concentrations



Membranes – Other Projects



- Impact of water and other impurities upon cellulose acetate performance
- Recovery of water vapor from hot flue gas streams
- Effective delivery of CO_2 to algal ponds
- Development of membrane process flowsheets using simulation
- Mixed matrix membranes for catalytic applications



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