ADSORPTION RESEARCH AT THE SCHOOL OF ENGINEERING

MEMBRANES

OVERVIEW

Membranes offer the **following advantages:**

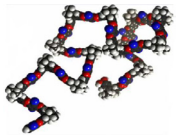
- A smaller footprint on the plant layout
- Modular operation: flexibility and linear scale-up costs
- No need for solvent or regeneration
- Fewer waste disposal issues

Membrane processes have the potential to reduce the overall cost of CO_2 separations, which account for 75% of the costs for the complete CCS process. Research into new materials with higher permeability and selectivity is being conducted worldwide. At UoE, we are looking at ways to optimise membrane processes for carbon capture.

MEMBRANE MATERIALS

Organic

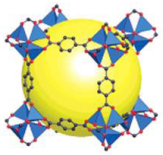
- Polymers of intrinsic microporosity (PIMs)
- Thermally rearranged polymers



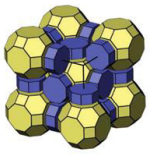
PIM-1

Inorganic

- Zeolites
- Metal-organic frameworks (MOFs)



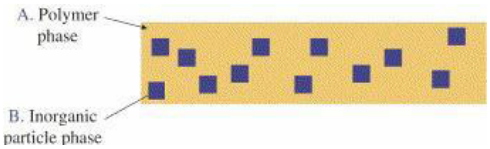
MOF



Zeolite

Combination

- Mixed-matrix membranes

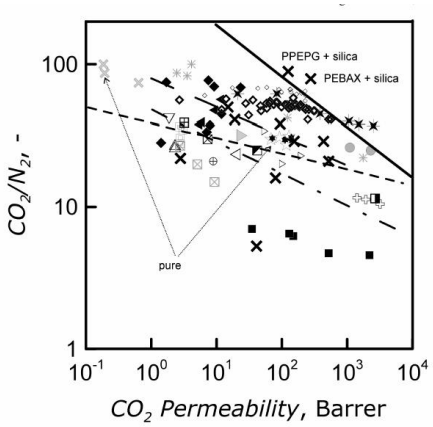


INSTRUMENTATION

The **Porometer 3G zh** allows for:

- Pore size measurement of flat membranes and membrane modules
- Direct measurement of pure gas permeability

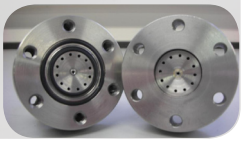
Quantachrome INSTRUMENTS



Robeson plot shows the trade-off between permeability and selectivity Bernardo et al., Ind. Eng. Chem. Res. 2009 , 48, 4638

Permeation Cell

- Measures single component gas permeability and diffusivity.
- Can be integrated with mass spectrometer to measure binary mixture permeability.
- Measures permeability changes in mixtures.



PEOPLE/COURSES

Dr Maria-Chiara Ferrari is the Science & Innovation Award Lecturer in Membranes for Carbon Capture. She is developing a new MSc course called “Gas Separation Using Membranes”.

Main topics:

- Industrial application of membranes
- Membrane types and transport phenomena
- Module configurations and separation process layout

For further information, please contact:
m.ferrari@ed.ac.uk
www.eng.ed.ac.uk/carboncapture