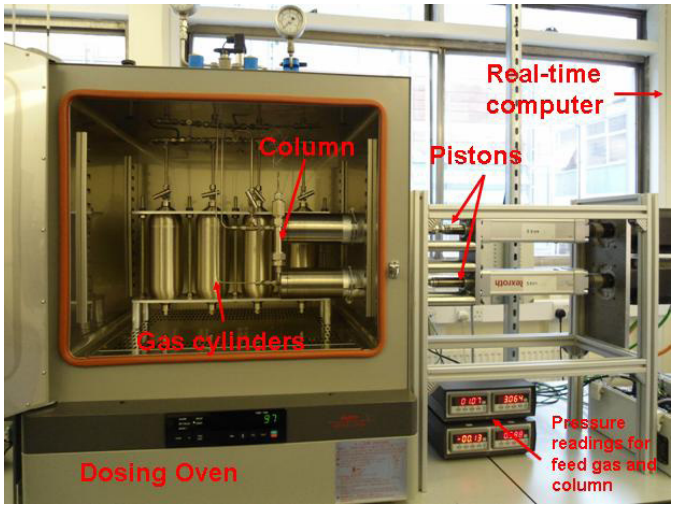
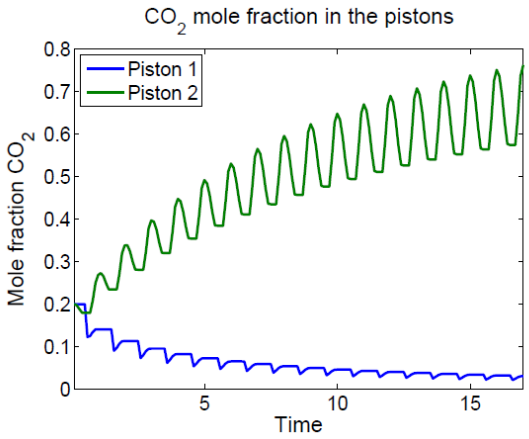
DUAL PISTON–PRESSURE SWING ADSORPTION SYSTEM (DP-PSA)

THE SYSTEM

The Dual Piston-Pressure Swing Adsorption apparatus is a unique system for testing novel adsorbent materials for the separation of CO_2 from flue gas. The adsorbent material preferentially adsorbs CO_2 under high pressure and releases it under low pressure. The control and automation of the DP-PSA's setup is carried out by a real-time computer with a Labview interface.





VARIABLE OPERATING CONDITIONS

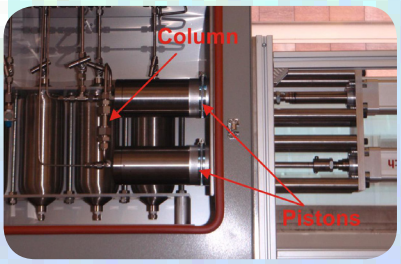
- different piston configurations (stroke lengths, phase angles, cycle shapes, and cycle times)
- different starting pressures (0.1 to 20 bar)
- different temperatures (20 to 200 °C)

BENEFITS

- Can measure the kinetic and equilibrium properties of novel adsorbent materials.
- Only a few grams of adsorbent material required.
- Rapid testing of adsorbent materials for the separation of carbon dioxide from a binary mixture.
- Model system for a large-scale, industrial process.
- Minimal usage of gas due to closed system.
- Many experiments with different conditions can be performed automatically in a short timeframe.

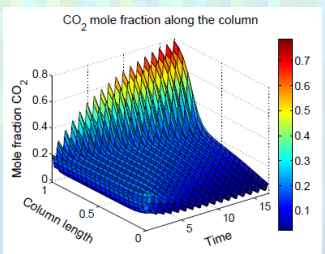
THE PISTONS

The unique advantage of having two pistons is that the binary mixture can be separated out during the experiment, with the strongly adsorbing component accumulating in one piston, and the weakly adsorbing one collecting in the other. There are two main cycle steps: high-pressure adsorption and low-pressure purge.



MODELLING AND NUMERICAL SIMULATION

The aim is to analyse a large amount of experimental data and to estimate the equilibrium and kinetic parameters. The challenge is that it is a dynamic, nonlinear system with many parameters and variables, so long computation times are incurred.



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