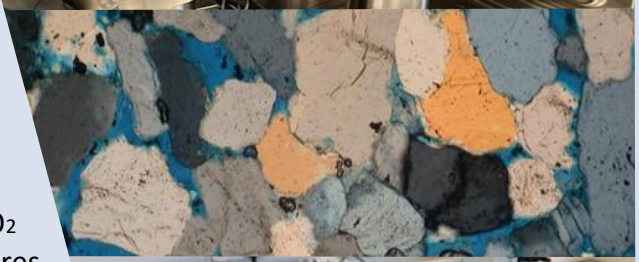
Edinburgh Applied Geoscience Laboratory



The **Edinburgh Edlmann Applied Geoscience Laboratory** provides specialised experimental investigations into the secure and sustainable use of the subsurface for low carbon energy applications including hydrogen energy storage, CO_2 storage, CAES and geothermal systems.

Facilities include:

High PT Geochemistry Reaction Vessels

- Multi-phase geochemical reactions for hydrogen and CO_2 at in-situ elevated temperatures, fluid types, and pressures.
- Constant pressure monitoring, with fluid and gas sampling supported by full rock, gas and fluid analysis.

THMC Multiphase Flow Rig

- Multi-phase flow through 38mm diameter rock samples over a range of reservoir temperatures, fluid types (including hydrogen and $scCO_2$), brine chemistries, fluid pressures and confining stress, equivalent of up to 4km depth.
- Constant pressure and permeability monitoring with fluid and gas sampling pre- and post- rock contact, supported by full rock, gas and fluid analysis.
- Relative permeability and wettability measurements.

1m Hydrogen Gas Flow Rig

- Gas flow through a 1m long sandstone core at elevated temperatures and pressures combined with a Hiden HPR20 mass spectrometer to characterise breakthrough curves for hydrogen (and other gasses).
- Breakthrough curves can be used to determine: advective velocity; mechanical dispersion; molecular diffusion and sorption of hydrogen during mass transfer through porous reservoir sandstones.

Unconfined Loading Rig

- Designed to look at creep and deformation in large (200mm diameter) rock samples, in particular the creep of salts for hydrogen storage in salt caverns and determine Uniaxial Compressive strength (before and after gas exposure).

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https://www.ed.ac.uk/geosciences/facilities/applied-geosciences-laboratory

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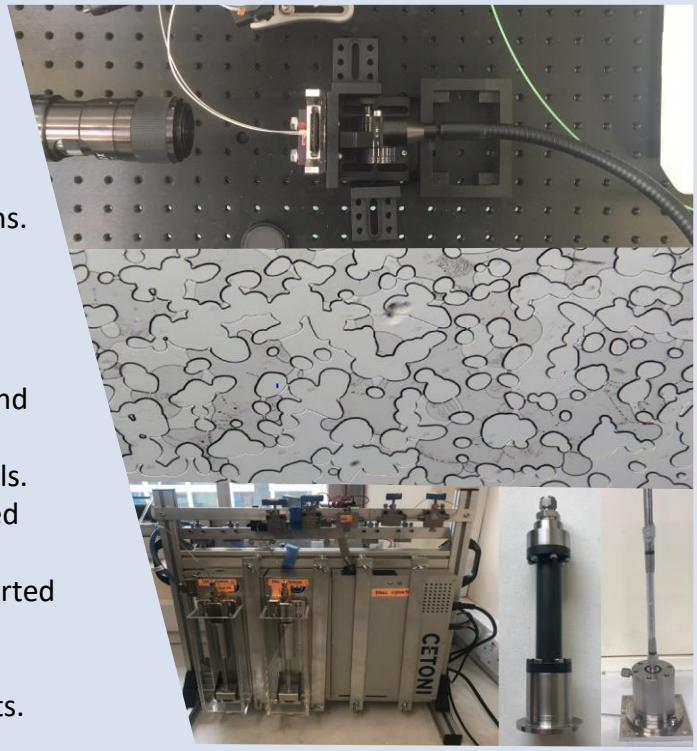


High PT Visual Geochemistry Reaction Vessels

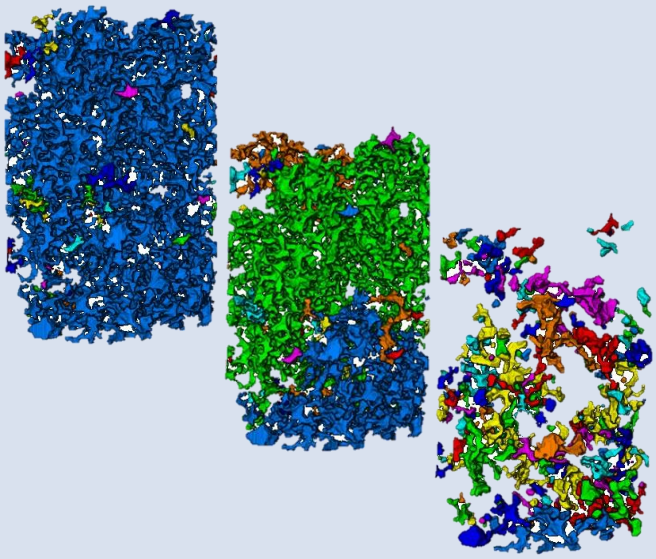
- Imaging of multi-phase surface geochemical reactions for hydrogen and CO_2 at in-situ conditions.
- Constant pressure monitoring supported by image analysis, with gas and fluid analysis.

High-Pressure Micromodel Experiments

- Glass micromodels with different pore networks and wettability.
- Possibility to use real rock thin section micromodels.
- Multi-phase of hydrogen and CO_2 at in-situ elevated pressures, and multiphase flow.
- Constant pressure and flowrate monitoring, supported by image analysis.
- Contaminant transport investigations.
- Microbial activities and biofilm growth experiments.
- Evaluation of effect of fluid properties on the multiphase flow (Viscosity, Density, Salinity)
- Evaluation of Surface properties on fluid flow properties (Wettability).
- Micro-scale evaluation of surface interactions of different fluids.

Micro-CT Investigation of Fluid Flow through Rock

- Multi-phase of hydrogen and CO_2 at in-situ elevated pressures, and multiphase flow.
- Constant pressure and flowrate monitoring, supported by 3D image analysis.
- Digital rock experiments.
- Evaluation of effect of various 3D structures on flow properties.



Rock, Gas and Fluid Analysis

- Quantitative whole-rock analysis, including:
  - X-ray Fluorescence (XRF)
  - X-Ray Diffraction (XRD)
  - Inductively Coupled Plasma Spectrometry
  - Organic Geochemistry
- Thin Section and Sample Preparation
- Imaging, microscopy and photo-microscopy
  - Optical Microscopes
  - X-ray microCT
  - Scanning Electron Microscope (SEM)
  - Electron Probe Microanalysis (EPMA) Facility

https://www.ed.ac.uk/geosciences/facilities/applied-geosciences-laboratory

Edinburgh Applied Geoscience Laboratory

The **Edinburgh Applied Geoscience Laboratory** team of expert academics and researchers will work with you to determine the most appropriate solution for your technical, budget and timing requirements. **Example services provided include:**

Geochemical Reactivity

- Static and dynamic geochemical reactivity of reservoir rock / formation fluids / hydrogen (and/or CO_2) under reservoir conditions, etc.
  - Timescale: weeks to months
  - Indicative cost: ~ £3,000 for 1 rock type

Advanced Reservoir Multiphase Fluid Flow

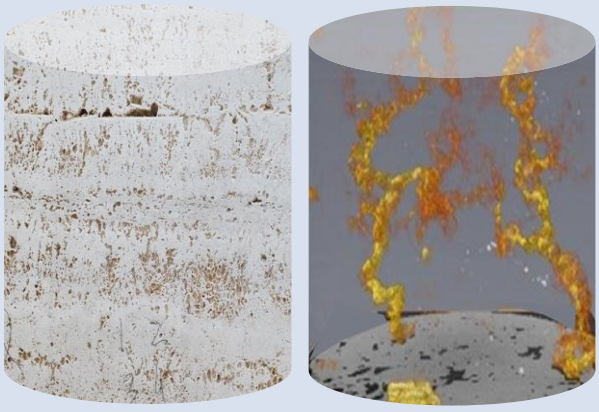
- In-situ permeability, relative permeability, recovery efficiencies, residual trapping, water saturation, cyclic injection..
  - Timescale: weeks to months
  - Indicative cost: ~ £5,000 for 1 rock type

Advanced Rock / Reservoir Fluid Properties (with hydrogen / $scCO_2$)

- Fracture conductivity, geomechanics, petrophysics, caprock analysis, formation damage, cement integrity, fluid compatibility, well cement integrity, casing integrity, etc.
  - Timescale: weeks to months
  - Indicative cost: ~ £5,000 for 1 rock type

Advanced Reservoir Fluid Properties / Flow Imaging (with hydrogen / $scCO_2$)

- Microbial activity and biofilm growth, evaluation of effect of fluid properties on the multiphase flow (viscosity, density, salinity), evaluation of surface properties on fluid flow properties (wettability, contact angles), contaminant transport, etc.
  - Timescale: weeks to months
  - Indicative cost: ~ £5,000 for 1 rock type



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