



Carbon Capture and Sequestration (CCS) Services

An industry collaboration between
Petricore & GeoMark Research



Company Overviews



GEOMARK

About Us

GeoMark Research is a full-service Geochemistry and PVT company established in 1991. With a passion for subsurface fluid characterization, we've successfully served exploration and production companies across the globe, helping them enhance their subsurface knowledge and goals.

Mission

Our mission is to provide quality geochemical & PVT data and knowledge from a source you can trust. Science, done right.

Vision

Our vision is to have GeoMark Research data used and valued by all companies with geochemical and PVT needs.

33+

Years of operations

3

Offices worldwide

200+

Happy clients

35+

Employees

40+

Years of operations

3

Offices worldwide

60+

Happy clients

250+

Employees



About Us

Petricore is an oil services company serving national and international energy companies. Petricore has established a strong global presence in rock and fluid analyses, wellsite and digital rock analysis service lines. The company has become a technical leader in the energy industry within its segment.

Mission

Maximize the value of the laboratory and wellsite services that we provide to operating and service companies in the energy industry, based on a sustainable, safe, reliable and profitable operation; executed with professionalism, spirit of service, passion and the expertise of our associates.

Vision

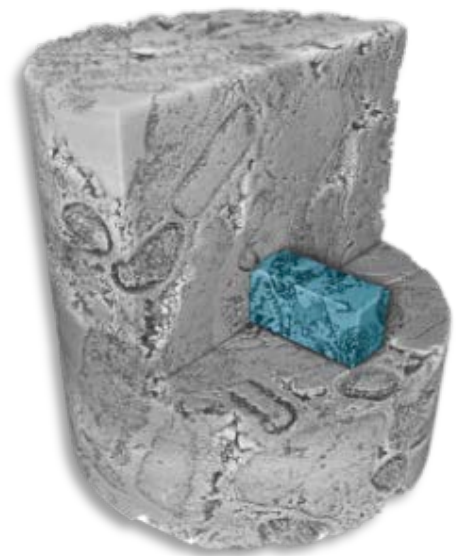
Position Petricore as a worldwide standard for quality, efficiency and promptness in petrophysical and geological laboratory and wellsite services in the energy industry, living its corporate values and constantly raising the technical and technological capacity in all its operations.



Two Companies, One CCS Offering

Laboratory Analyses

- Routine Core Analysis - Rock property measurements
- Special Core Analysis - Multiphase flow behavior & electrical properties
- Digital Rock Analysis - Reservoir characterization & host mineral reactivity
- Wellsite Services - Sample collection & preservation
- Fluid & Rock Geochemistry - Reservoir fluid characterization & correlation
- PVT - Fluid phase behavior & connectivity
- CO2 Plume Monitoring - Time-lapse geochemistry (Plumeview™)



Consulting Services

- Analytical Program - Assistance with the selection of samples and analytical procedures
- Petrophysics - Reservoir properties, characterization & correlation
- Global Rock & Fluid Database - RFDbase for CCS site screening and selection

Research

- Commitment to research for joint industry and academia collaborations



Reservoir presence, connectivity and continuity

- Petrophysics
- PVT
- Chemostratigraphy
- Fluid characterization
- Fluid correlations
- Rock & fluid database (RFDbase)



Reservoir composition and quality

- XRD & XRF
- SEM/SEM-EDS
- Micro CT
- Porosity
- Permeability (absolute & relative)
- Capillary pressure
- Multi-phase flow properties



Caprock integrity

- Rock strength
- Stress
- Ductility
- Mineral reaction risk



Reservoir and CO2 plume surveillance

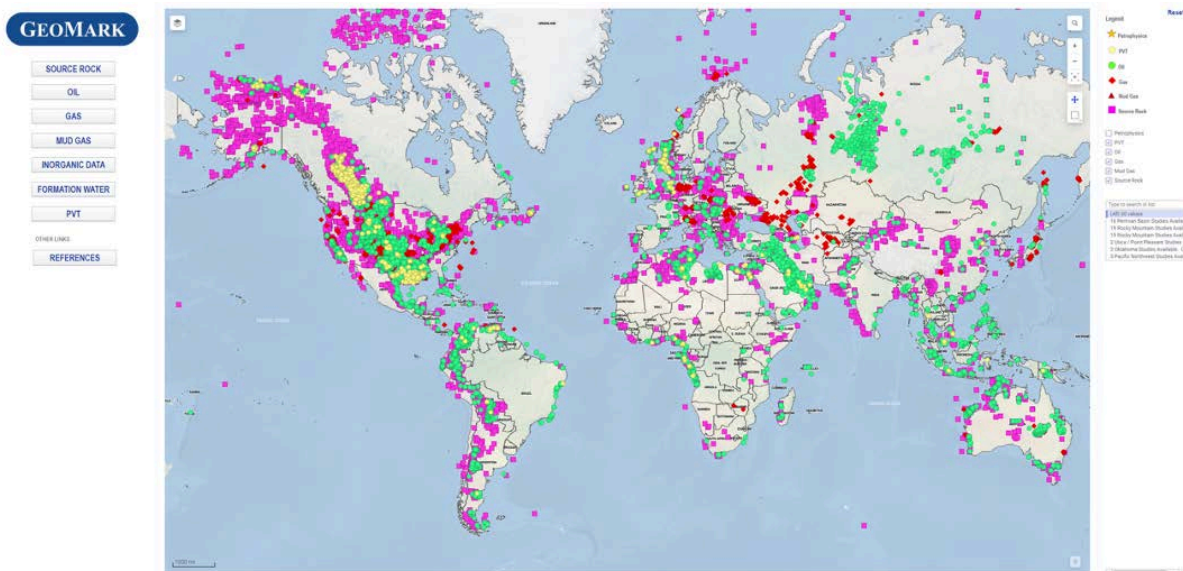
- Time-lapse geochemistry
- PVT



Location Assessment: Capturing CO2 Opportunities

RFDbase - Global Rock & Fluid Data Insights

GeoMark's RFDbase provides statistically significant calibration data for pressure, temperature, chemistry and maximum thermal stress across the globe, which is essential for modeling CO2/brine/seal interactions.



Map highlighting GeoMark's global distribution of rock, fluid, pressure and temperature data

This invaluable information forms a crucial part of the screening and risk assessment phase for any CCS project and critical data inputs for subsurface models.

RFDbase also provides a data platform for the development of a proprietary subsurface database.

Reservoir Properties, Connectivity and Continuity

Reservoir Properties

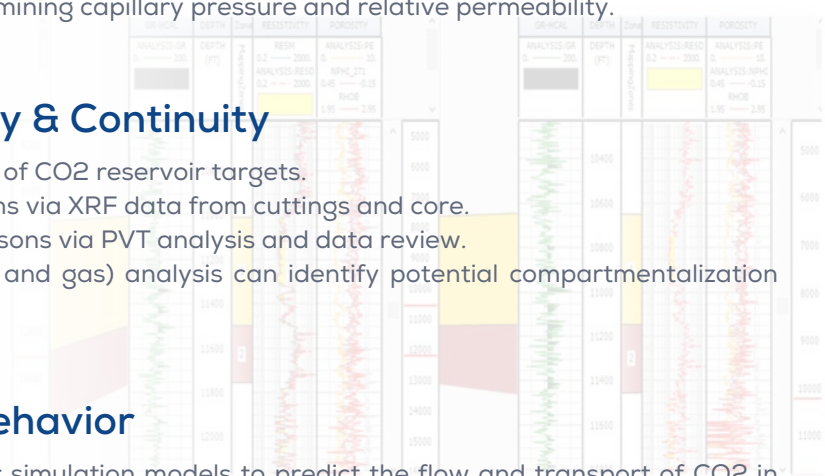
- Identification of potential CO₂ reservoir targets via petrophysical evaluations to deliver porosity, fluid type & saturation and rock composition.
- Petrophysical assessments of geomechanical properties for caprock integrity and wellbore stability.
- XRF and XRD data can be used to validate petrophysical models.
- PVT data to assist in the determining capillary pressure and relative permeability.

Reservoir Connectivity & Continuity

- Petrophysical well correlations of CO₂ reservoir targets.
- Chemostratigraphic correlations via XRF data from cuttings and core.
- Well-to-well pressure comparisons via PVT analysis and data review.
- Fluid geochemistry (water, oil and gas) analysis can identify potential compartmentalization within reservoir targets.

Fluid Phase & Flow Behavior

- PVT data as input to reservoir simulation models to predict the flow and transport of CO₂ in the subsurface.
- PVT analysis to evaluate the phase behavior (gas, liquid or supercritical) of CO₂ under varying pressure and temperature conditions. Time-lapse PVT analysis can help monitor phase behavior during the injection cycle.
- Fluid geochemistry aids in the identification of potential reactions between injected CO₂ and formation fluids and/or minerals.



Reservoir Assessment: Storage Capacity & Rock-Fluid Interactions

Core Analysis - Laboratory Measurements



Porosity
Absolute permeability

The combination of Petricore and GeoMark's laboratory services, brings a wealth of expertise and tools to deliver the data needed to investigate, de-risk and monitor your CCS project.

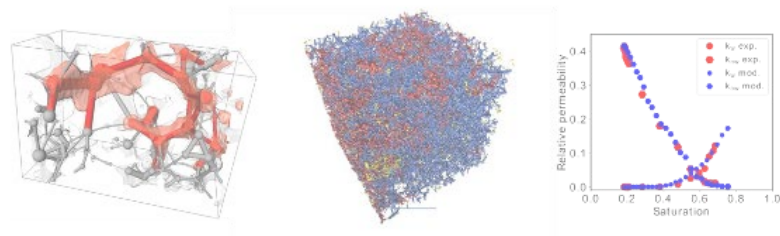
This complete solution delivers organic and inorganic geochemistry, routine and special core analysis and advanced techniques such as digital rock analysis.



Relative Permeability
Capillary pressure



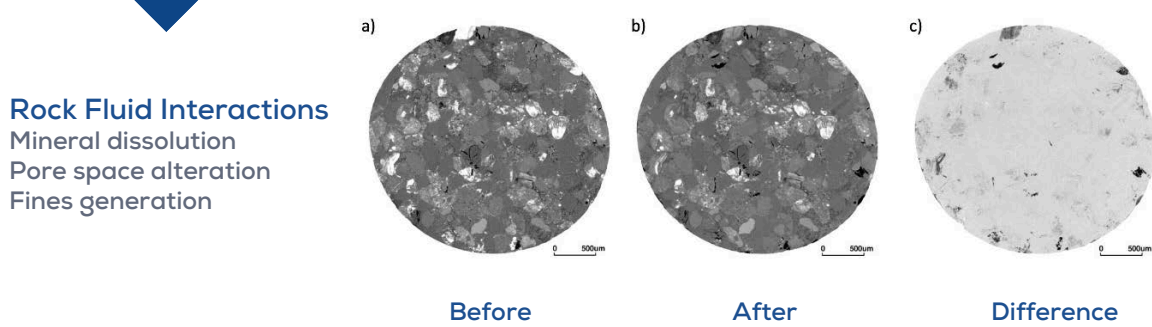
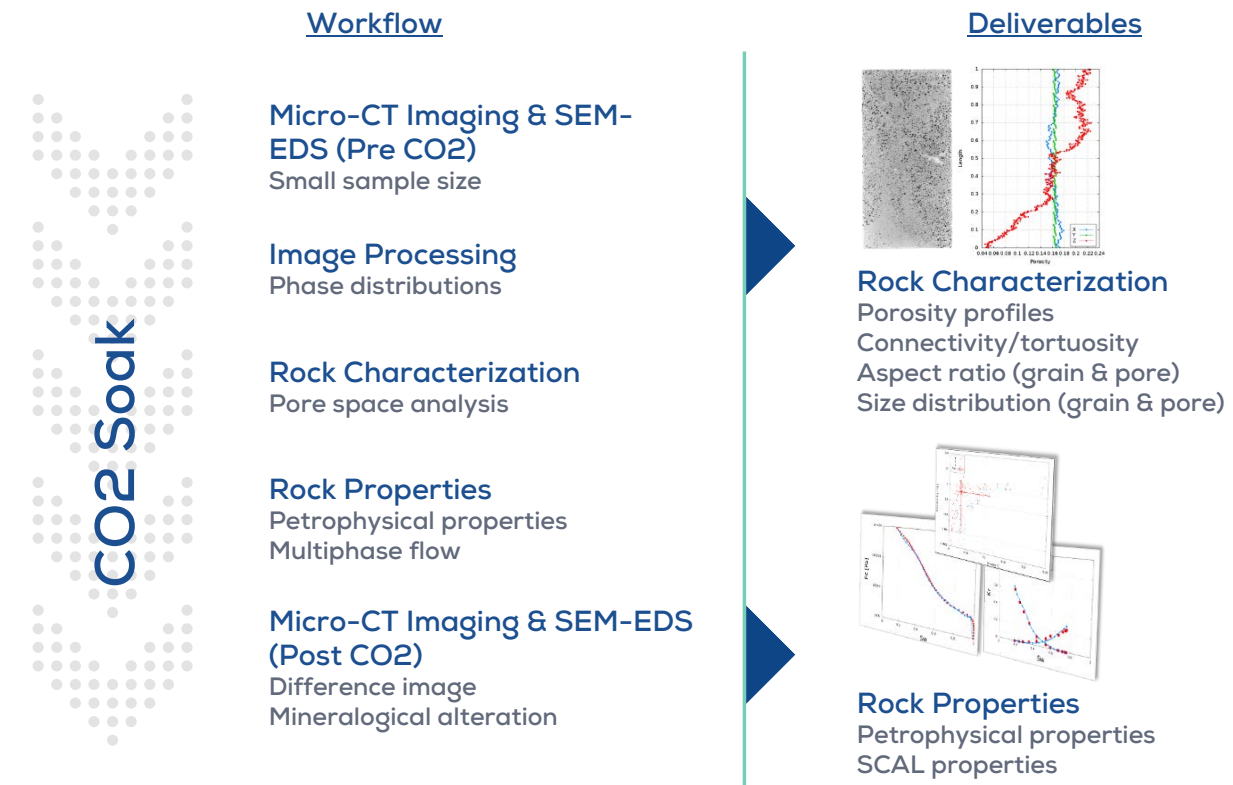
Mineralogy (XRD, SEM)
Aspect ratio (pore & grain)



Digital Rock Analysis

Digital rock analysis delivers fast advanced rock property data through the combination of digital imaging, image processing and numerical solvers to provide crucial insights to potential CO₂ reservoir targets. Key rock property information such as porosity, permeability (absolute & relative), formation resistivity, capillary pressure, mineralogy and pore geometry can be collected and assessed in a short timeframe.

To assess the potential reactivity of CO₂ reservoirs and their subsequent seal(s), an exclusive rock soaking technique has been developed that accounts for formation pressures and temperature conditions. Through the utilization of digital rock analysis, it is possible to evaluate rock properties before and after a CO₂ soak. Previous experiments have identified variations in mineralogy, porosity, permeability and the creation and migration of 'fines'. Our workflow and deliverables are presented below.



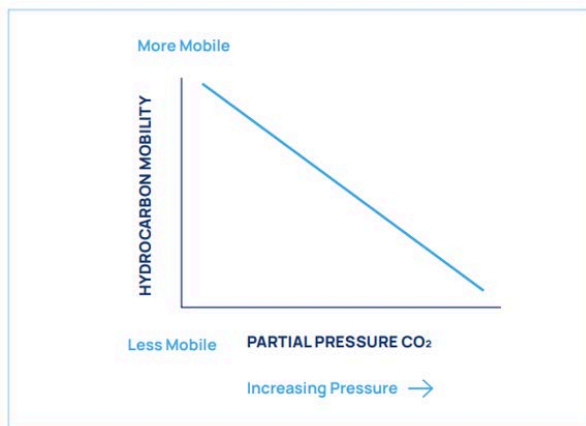
Monitoring: Reservoir Surveillance with Geochemistry

CO2 Plume Monitoring - Movement

CO2 sequestration can effectively act as Enhanced Oil Recovery (EOR), liberating less mobile hydrocarbons from the formation and driving them to monitoring wells for sampling and analysis.

The Benefits

- Mobility of shorter chained, less mobile hydrocarbons will be increased with pressure from CO2 injection.
- Regular sampling and analysis of hydrocarbons (plus water and gas) from monitoring wells can provide an indication of CO2 plume movement across a storage area.

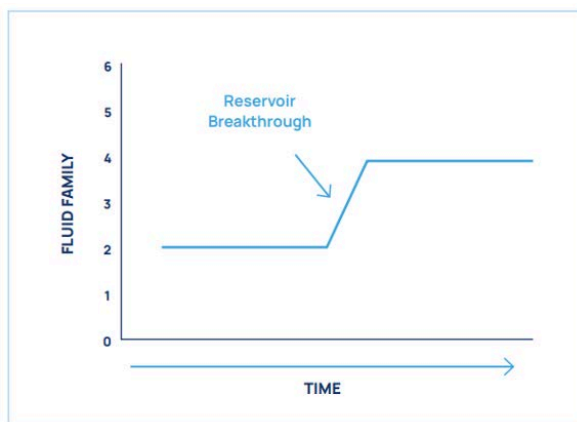


CO2 Plume Monitoring - Formation/Seal Breakthrough

Baseline fluid families as defined by oil, gas and water analyses allow for the vertical fluid character (fingerprint) of each formation above, within and below the CO2 injection reservoir.

The Benefits

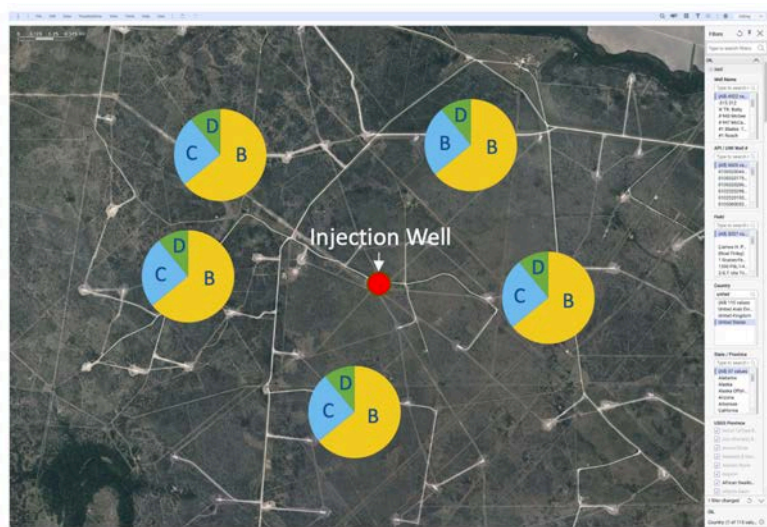
- Regular sampling and analysis of fluid samples from monitoring wells can provide critical information on potential reservoir breakthrough events if sudden fluid family shifts are observed in monitoring wells.



PlumeView™ - A dashboard to monitor your CO2 plume

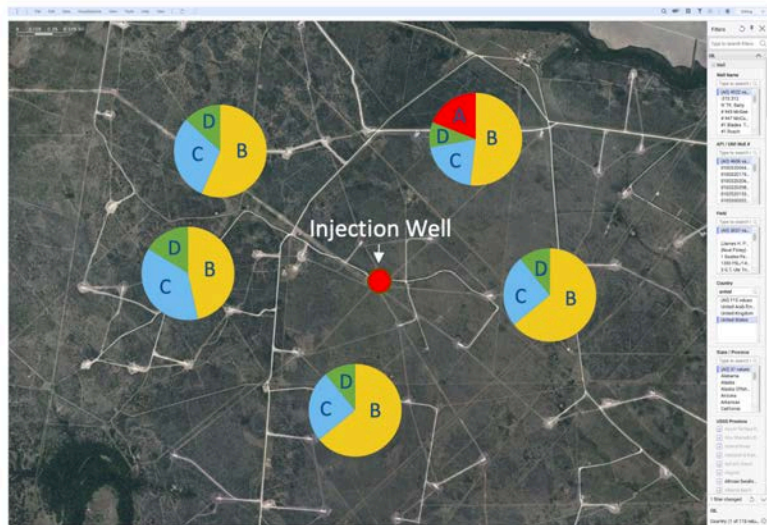
PlumeView™ provides a workflow and a data visualization dashboard to monitor the lateral and vertical migration of your CO2 plume. Through the generation of 'Day 0' geochemistry families (baseline) created from oil, gas and/or water analysis, it is possible to identify baseline deviations across monitoring wells via routine sampling and analysis. A variation in baseline within a monitoring well could indicate either CO2 plume movement in that direction or a seal breakthrough that delivers geochemistry families outside of the target reservoirs.

Day 0
Geochemical family distribution at each monitoring well location before CO2 injection.



Day 100
Geochemical family distribution at each monitoring well location on day 100 of CO2 injection.

Note that the values of each geochemical family has changed, along with the addition of a new family (A). This information allows for the interpretation of a) movement direction of CO2, b) preferred reservoir target flow, and c) potential seal or fault breakthrough.





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