

FEATURED PROJECT

Storage Geochemistry



Tracing fate of injected CO₂

It's of paramount importance to be able to track injected CO₂ in a storage formation and detect and remediate any potential leaks into overlying rock formations, shallow aquifers or the atmosphere.

But with current tools, it's often difficult to trace the movement and the reactions of CO₂ after it has been injected underground. This project aims to fill that knowledge gap by conducting comprehensive geochemical baseline and monitoring studies that will clarify suitable monitoring strategies elucidating the fate of injected CO₂.

Researchers use hydrogeological and geochemical techniques to trace the movement and the fate of injected CO₂ in storage reservoirs, including assessments of solubility, ionic and mineral trapping potentials for injected CO₂ in order to identify and quantify transport and trapping mechanisms, and potential leakage pathways.

Developing comprehensive monitoring strategies, including a combination of geophysical and geochemical approaches, is essential for secure carbon storage. It's also likely that monitoring the fate of CO₂ in the injection reservoir may become an essential component for public and regulatory acceptance of CO₂ storage projects in mature oilfields and saline aquifers.

Research Grant

\$630,300 over 3 years; Awarded 2010

Research Team

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Benefits to Canada and beyond

Geophysical, geochemical, and modeling approaches are used at CCS projects world-wide and the combination of these approaches has the potential to realize the most accurate verification of CO₂ storage in the subsurface. Using both down-hole and well head sampling, this project will yield superior monitoring protocols that enable a more accurate and precise tracing of injected CO₂.

Researchers will develop recommendations on how to apply these monitoring approaches to large scale CO₂ injection programs as well as evaluate how accurately injected CO₂ can be accounted for within the storage reservoir and outside, should leakage of CO₂ occur.

The results of this project will be a lynchpin for securing public acceptance of CCS in Canada and elsewhere.

Industrial Applications

The developed techniques are of significant interest to industry for tracing the movement and the fate of CO₂ injected for enhanced oil recovery (e.g. Weyburn-Midale CO₂ monitoring and storage project) or for storing CO₂ in saline aquifers (e.g. Shell QUEST project, PTRC-Aquistore). They are also vital for assessing claims of CO₂ leaks.

Industrial Project Partners

Shell Canada Limited
 Cenovus Energy
 Penn West Exploration
 Petroleum Technology Resource Centre - Aquistore

Project Description

Goal

Researchers will develop accurate and highly efficient approaches to monitor the fate of injected CO₂ in the subsurface, therefore facilitating secure CO₂ storage.

Activities

Short-term objectives include:

- Assess interaction of potential storage sites with regional aquifers, pressure communication, and predict future flow.
- Conduct baseline geochemical assessment for potential sites and assess origin and distribution of fluids and gases, including H₂S, in potential injection horizons in the Western Canadian Sedimentary Basin.
- Integrate noble gas tracers with the hydrogeological and geochemical techniques to constrain regional transport mechanisms, fluid-rock-reactions and trapping mechanisms for carbon storage.
- Conduct lab experiments to test model predictions of CO₂ – brine – rock reactions using geochemical and isotopic tracers.

Medium-term objectives:

- Initiate a geochemical monitoring program at selected field pilot sites to assess CO₂ movement and reaction in the target reservoir and develop monitoring strategies for potential leakage of CO₂.
- Use initial monitoring data from pilot projects to compare predicted CO₂ – brine – rock reactions based on laboratory experiments and models with field measurements.

Milestones

- Development of novel monitoring approaches that integrate multiple geochemical tracers to constrain fluid-rock-reactions and trapping mechanisms for injected CO₂.
- Development of advanced monitoring approaches for injected CO₂ at both enhanced oil recovery (EOR) and saline aquifer sites.



Research associate Michael Nightingale obtains fluid samples at an observation well at a CO₂ injection enhanced oil recovery (EOR) pilot site in Alberta.

For additional information

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About Carbon Management Canada

Carbon Management Canada (CMC) is a national and international network of researchers dedicated to research, development and performance validation of technologies related to the reduction of industrial greenhouse gas emissions. Working with over 160 senior investigators at universities across Canada and abroad, CMC has committed over \$22 M to a portfolio of 44 research projects. CMC draws from world-wide pool of experts to find and develop real-world carbon solutions.

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