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Karsten Michael, Jennifer J. Adams, Beate E. Buschkuehle, and Stefan Bachu, Alberta Geological Survey, Edmonton, AB

Analogues for CO₂ Geological Sequestration in the Alberta Basin

Geological sequestration of carbon dioxide is an option for significantly reducing CO₂ emissions into the atmosphere. This option is immediately available and technologically feasible as a result of the experience gained in CO₂-flood enhanced oil recovery, mainly in Texas, and in lesser-known acid-gas injection operations in Rocky Mountain foreland basins. Acid gas, a mixture of H₂S and CO₂, is being increasingly produced in the Alberta basin, Canada, where stringent emission-control regulations require sour gas desulphurization prior to pipeline collection and distribution. Because sulphur recovery has proven uneconomic, and flaring has become environmentally unacceptable, operators are turning to disposal of acid gas by injection into deep saline aquifers and depleted hydrocarbon reservoirs. A preliminary assessment of acid gas injection operations in the Alberta basin shows a wide range of reservoir characteristics and operating conditions. The acid gas is injected mainly in a supercritical phase, or to a lesser extent as a gas or liquid, or mixed with wastewater from hydrocarbon production. To date, in the order of 1.2 megatons of CO₂ and 0.7 megatons of H₂S have been injected successfully into depleted hydrocarbon reservoirs or regional aquifers. The record of commercial-scale acid gas injection operations in Alberta since 1989 constitutes a perfect analogue for CO₂ geological sequestration into on-shore continental sedimentary basins, particularly in North America, indicating that the large-scale CO₂ storage in sedimentary basins is both feasible and safe.