

The Role of Chemical Tracers in the Monitoring and Verification of Carbon Storage

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There are numerous isotopic tracers that have the potential to track the movement of CO₂ as it is geologically stored underground. Their primary role is in verifying the presence of stored/injected CO₂. These tracers range from CO₂ to 3He to PFC's (perfluorocarbons) to SF₆. With such a variety of possible tracers, it is important to identify which tracer(s) are (a) economically viable, (b) can be measured appropriately, (c) fit with the specifics of the geological site, and (d) meet the concerns of the public. Tracers can be used either in a continuous mix with the whole body of injected gas for attribution or in discrete pulses to monitor changes in the reservoir characteristics of the body of rock hosting the sequestered gas.

While some CO₂ sources may be isotopically exotic and apparently easy to trace, over time this signature is lost during mineral reactions, initially dissolution of carbonate minerals, followed by exchange reactions, thus masking the original carbon isotopic composition of the CO₂ injected.

A series of tracers are being identified for use in the Otway Basin Pilot Project being undertaken by the Cooperative Research Centre for Greenhouse Gas Technologies (CO₂CRC) using an existing CO₂ accumulation at Buttress-1 for injection into Naylor-1. As the area has numerous CO₂ and natural gas accumulations it is important to differentiate background CO₂ emissions versus those that (while unlikely) may occur during the pilot capture and storage demonstration. Likely tracers to be included are SF₆ and CD₄, along with possible PFC's.