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# Fingerprinting captured $CO_2$ using natural tracers: Determining $CO_2$ fate and proving ownership

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In the long term, captured $CO_2$ will most likely be stored in large saline formations and it is highly likely that $CO_2$ from multiple operators will be injected into a single saline formation. Understanding $CO_2$ behavior within the reservoir is vital for making operational decisions and often uses geochemical techniques. Furthermore, in the event of a $CO_2$ leak, being able to identify the owner of the $CO_2$ is of vital importance in terms of liability and remediation.

Addition of geochemical tracers to the $CO_2$ stream is an effective way of tagging the $CO_2$ from different power stations, but may become prohibitively expensive at large scale storage sites. Here we present results from a project assessing whether the natural isotopic composition (C, O and noble gas isotopes) of captured $CO_2$ is sufficient to distinguish $CO_2$ captured using different technologies and from different fuel sources, from likely baseline conditions.

Results include analytical measurements of $CO_2$ captured from a number of different $CO_2$ capture plants and a comprehensive literature review of the known and hypothetical isotopic compositions of captured $CO_2$ and baseline conditions. Key findings from the literature review suggest that the carbon isotope composition will be most strongly controlled by that of the feedstock, but significant fractionation is possible during the capture process; oxygen isotopes are likely to be controlled by the isotopic composition of any water used in either the industrial process or the capture technology; and noble gases concentrations will likely be controlled by the capture technique employed. Preliminary analytical results are in agreement with these predictions.

Comparison with summaries of likely storage reservoir baseline and shallow or surface leakage reservoir baseline data suggests that C-isotopes are likely to be valuable tracers of $CO_2$ in the storage reservoir, while noble gases may be particularly valuable as tracers of potential leakage.