

MINERAL CARBONATION OPPORTUNITIES IN THE WESTERN UNITED STATES

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Mineral carbonation—the production of carbonates from carbon dioxide and alkaline earth compounds—is a candidate route for carbon capture and storage because alkali earth carbonates are stable over geologic time. Successful mineral carbonization requires a source of alkalinity near a source of carbon dioxide and a chemical pathway requiring only mild energy input. This poster explores the many sources of alkalinity and carbon dioxide in the western United States, and evaluates an ambient-pressure moderate-temperature route to produce carbonates from magnesium silicates. ⁽¹⁾ Candidate magnesium-containing compounds include olivine, $(\text{Mg,Fe})_2\text{SiO}_4$, and serpentine, $(\text{Mg,Fe})_3\text{SiO}_5(\text{OH})_4$. These minerals are common overburden in metal mining operations. Carbon capture proceeds by first extracting magnesium from the crushed silicates at 440 °C in the presence of ammonium sulfate and exposing an aqueous slurry of the resulting compounds to CO_2 (coal flue gas: 10-15% CO_2 at 1 atm) below 100 °C. The result is insoluble magnesium carbonate, silica, and an aqueous solution from which the ammonium sulfate may be recovered.

(1) R. Zevenhoven, M. Slotte, J. Åbaca, J. Highfield; *Energy*, 117 (2016) 604-611