Epidote dissolution and its role within carbon storage

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In the past 20 years, basaltic aquifers have been studied as a key geologic carbon storage host due to their high reactivity and widespread distribution. However, many basaltic reservoirs contain substantial alteration minerals and their potential as cation sources for carbon mineralization processes still need to be assessed. A common alteration phase in high temperatures (≥ 200 °C) basalts is epidote. To help determine the possible contribution of this mineral to CO₂ sequestration through the release of its constituting cations, the dissolution rates of epidote from the Green Monster Mine (Alaska) were experimentally measured. Far-from equilibrium experiments were conducted over the pH range 2-11 using both batch reactors at 25 °C, and mixed-flow reactors at 100 and 200 °C. Furthermore, mixed-flow reactor experiments at pH ~9 on epidote in presence of CO₂ were carried out at 200 °C to study its carbonation potential and to quantify the yields of this reaction compared to basaltic glass. The determination of the extent of this process was monitored by inorganic carbon analyses on both solid and fluid fraction using non-dispersive infra-red (NDIR) CO₂ gas analyses. Preliminary results suggest that epidote and potentially other alteration Ca-silicate phases can provide Ca²⁺ as efficiently as fresh basalts at 25 and 100 °C to promote the precipitation of calcium carbonate. Further experimental and modelling work is ongoing to confirm these findings at different thermal conditions and as a function of injected fluid chemistry.