

## Si isotope fractionation during the dissolution of quartz, opal-CT, diatomite, and amorphous SiO<sub>2</sub>

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The Si isotope compositions of natural minerals and fluids are being increasingly applied to gain insight into a variety of processes including weathering, the global Si cycle and hydrothermal alteration. Fractionation of stable Si isotopes during dissolution has been reported during basaltic weathering and biogenic silica dissolution [1],[2].

In an attempt to quantify this fractionation processes opal-CT, quartz, diatomite and amorphous SiO<sub>2</sub> were dissolved at 70 °C and pH 3 and 9 in closed system batch reactors (I = 0.1) for up to several months. The isotopic composition of the Si released from quartz is identical within uncertainty to that of the dissolving mineral. In contrast, the Si initially released from opal-CT, diatomite and amorphous SiO<sub>2</sub> dissolution at pH 3 is isotopically light but that initially released at pH 9 is isotopically heavy compared with the solid. With time, the Si isotopic composition of the fluid phase of the pH 3 and 9 experiments converges attaining a stationary state with δ<sup>30</sup>Si values between 0 to 0.3‰ heavier than the initial solid, as the the dissolved Si concentration approaches equilibrium. The observation that a single steady-state aqueous fluid-solid Si fractionation value is attained by distinct pathways depending on fluid pH is consistent with the two way transfer of material during dissolution as equilibrium is approached [3]. Moreover, the distinct Si fractionation behaviour observed for biogenic versus abiogenic SiO<sub>2</sub> may provide a useful tool for distinguishing processes in natural environments.

[1] Ziegler, K. *et al Geochimica et Cosmochimica Acta*, 2005. **69** (19): 4597-4610. [2] Demarest, M.S. *et al Geochimica et Cosmochimica Acta*, 2009. **73** (19): 5572-5583. [3] Pearce, C.R. *et al Geochimica et Cosmochimica Acta*. **92** (0): 170-183.