

## Fractionation of silicon isotopes during dissolution of SiO<sub>2</sub>

Silicon is the second most abundant element in the Earth's crust. The investigation of the stable silicon isotopes is a promising approach to gain insight into weathering processes, diatom productivity, the global silicon cycle and quantification of silica scaling in hydrothermal systems, among others. Fractionation of the stable silicon isotopes during dissolution of silicates has been reported for example by (Ziegler, Chadwick et al. 2005; Demarest, Brzezinski et al. 2009) during basalt weathering and biogenic silica dissolution, respectively. We conducted laboratory experiments investigating the role of pH in fractionation of silicon isotopes during the dissolution of relatively pure silicate phases. Therefore opal-CT, quartz, diatomite and SiO<sub>2</sub>(a) have been dissolved at 75 °C and pH 3 and 9 in closed system batch reactors for several month.

$\delta^{30}\text{Si}$  values are reported relative to the NBS-28 standard. Preliminary results for dissolution at pH 9 suggest an enrichment factor  $\epsilon_{\text{DSi}} - \text{Si}(\text{solid})$  of appr. +0.08 ‰ for diatomite, +0.12 ‰ for amorphous silica (SiO<sub>2(a)</sub>), +0.3 ‰ for opal-CT and +0.04 ‰ for quartz. Strong initial fractionation in the diatomite and opal-CT might be related to Fe and Al impurities and related absorption of Si.

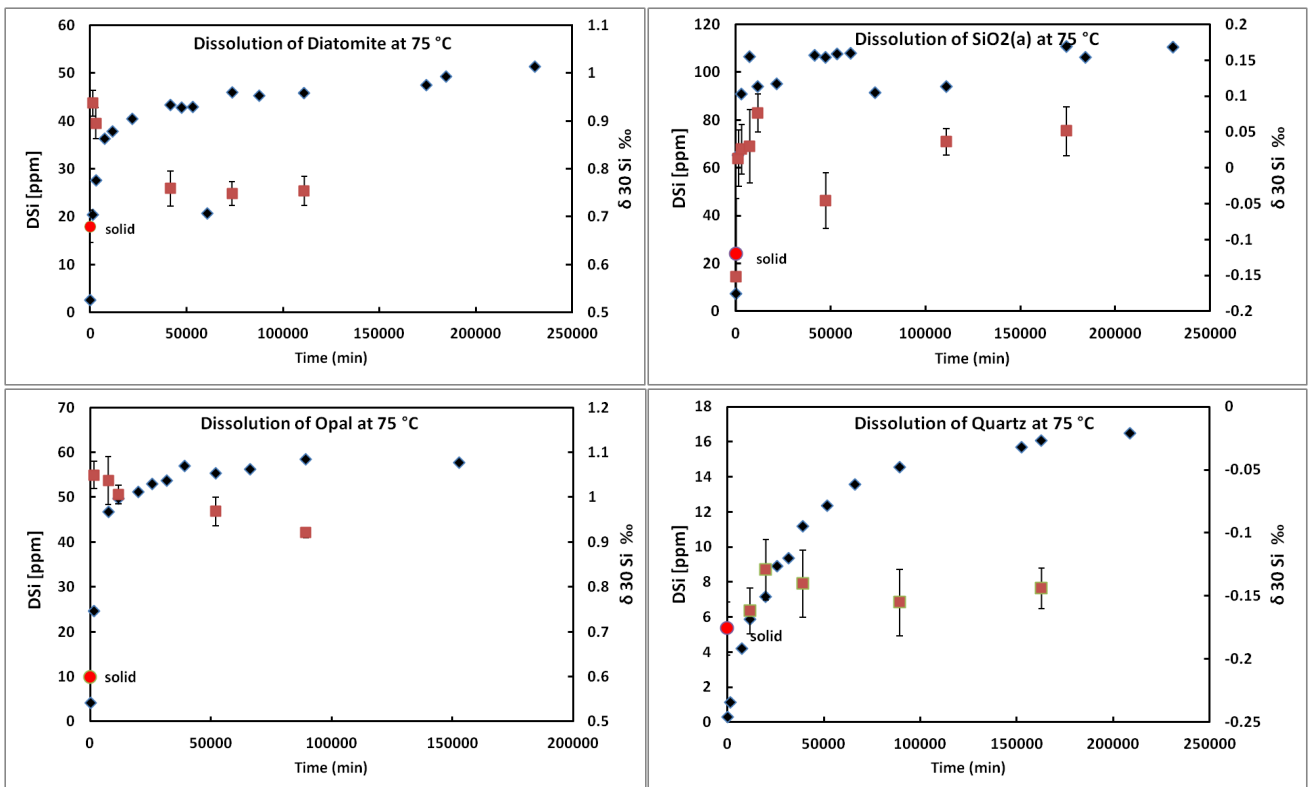


Fig. 1: Dissolution of diatomite, SiO<sub>2</sub>(a), opal-CT and quartz at 75 °C and pH 9. Dissolved Silicon (DSi) in ppm (◆).  $\delta^{30}\text{Si}$  (■ in ‰) reported relative to the NBS-28 standard. (●) represents the isotopic composition of the solid before experiment. Error bars indicate  $\pm 1$  standard deviation.

Demarest, M. S., M. A. Brzezinski, et al. (2009). "Fractionation of silicon isotopes during biogenic silica dissolution." *Geochimica et Cosmochimica Acta* 73(19): 5572-5583.

Ziegler, K., O. A. Chadwick, et al. (2005). "Natural variations of  $\delta^{30}\text{Si}$  ratios during progressive basalt weathering, Hawaiian Islands." *Geochimica et Cosmochimica Acta* 69(19): 4597-4610.