# Si isotope fractionations in igneous silicates

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Experimentally derived mineral-mineral oxygen isotope fractionations at igneous temperatures are well established and have enabled researchers to better understand the relationship between crustal weathering, recycling, and the isotopic composition of igneous mineral phases. Current knowledge about Si isotopes shows their potential to complement and enhance that understanding because weathering of the crust results in a residuum with lower $\delta^{30}Si$ (where $\delta^{30}Si$ is the deviation in ‰ of a sample's $^{30}Si/^{28}Si$ ratio to that of a standard) when compared to 'fresh' igneous material [1-2]. The Si isotopic composition in so-called sedimentary-type granitic rocks are, on average, enriched in the lighter Si isotopes when compared to igneous-types [3-4]. Further, in the absence of a sedimentary/evolved component, Si isotopic composition varies linearly with Si content in igneous rocks with equilibrium mineral assemblages, with the more differentiated samples yielding higher $\delta^{30}Si$ values [5], and in cumulate igneous rocks Si isotope compositions can be used to broadly predict the rock's normative mineralogy.

We explore how the Si isotope compositions of individual minerals relates to the whole rock (WR). Preliminary Si isotope fractionation data for silicate minerals (e.g., zircon, quartz, jadeite, and olivine) are reported through a combination of the three-isotope method and direct synthesis experiments. The three-isotope method requires that an isotope system has at least three stable isotopes (i.e., $^{28}Si$, $^{29}Si$, and $^{30}Si$) and two isotope ratios ($^{30}Si/^{28}Si$ and $^{29}Si/^{28}Si$), and involves doping one of the equilibrating phases in the denominator isotope ($^{28}Si$). The direct synthesis experiments simply involves co-crystallization of the two phases in question.

The Si isotope variations among individual phases determined in experiments and natural samples enable preliminary predictions of the whole rock or magma $\delta^{30}Si$ value based on mono-mineralic $\delta^{30}Si$ measurents, with potential importance for the detrital record.

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