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Titanium isotope fractionation of shoshonitic melts and cumulates

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Isotope fractionation associated with igneous processes is documented for many non-traditional stable isotope systems, making them promising tools to advance our understanding of modern arc crust formation. Titanium isotopes are especially promising, as the $d^{49}Ti$ of volcanic and plutonic rocks correlate with indices of magmatic differentiation like SiO_2 concentration, and different magmatic fractionation series exhibit distinct slopes in $d^{49}Ti$ vs. SiO_2 [1, 2].

We present new Ti isotopic data on a shoshonitic differentiation suite (basalt to granite and cumulate rocks) from the Middle Triassic magmatic province in the Southern Alps of northern Italy [3]. Mafic cumulates are overall isotopically lighter than their evolved counterparts. Cumulates enriched in Fe-Ti oxides represent $d^{49}Ti$ values lighter than the depleted MORB mantle and thus counterbalance the isotopically heavy composition of felsic rocks. Based on the distinct Ti isotopic composition of cumulate rocks with and without Fe-Ti oxides, we identify that Fe-Ti oxide crystallization and segregation is the major driver of Ti isotope fractionation in mafic and intermediate magmatic systems [4]. The results will further help to develop the Ti isotopic system as a petrogenetic and potentially geotectonic tracer.

[1] Deng et al. (2020). *PNAS*, *116*(4), 1132-1135.

[2] Aarons, et al. (2020). *Science advances*, *6*(50), eabc9959.

[3] Storck et al. (2020), *EPSL*, *535*, 116100.

[4] Hoare et al. (2022) *GCA*