

Mineral control on Ca isotopic fractionation in mantle reservoirs

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Calcium (Ca) isotopes are ideal tracers of the evolution of the interiors of rocky planets and can help us explore the role of fractional crystallization and crystal segregation in the establishment of mantle reservoirs (e.g. terrestrial, lunar). Not only does Ca, a refractory lithophile element, allow us to circumvent any issues related to impact-induced volatilization (which fractionates more volatile isotopes (e.g. Zn [1]), Ca is also a major element and highly abundant in some samples, even those that are particularly depleted in trace elements commonly used to investigate planet interiors.

Notably, Ca, along with many other elements (e.g. Mg, Fe; [2] [3]) has recently been shown to exhibit mass-dependent isotopic fractionation among co-existing minerals within terrestrial mantle xenoliths. Chen et al. (2014) [4] showed that $\delta^{44}\text{Ca}$ values for bulk mantle xenolith samples vary from 0.81 to 1.25 ± 0.10 ‰ (2sd) and that olivine and orthopyroxene in xenoliths are isotopically much heavier than co-existing clinopyroxene [4].

Given these recent observations, we aim to investigate the mineral control on mass-dependent fractionation of Ca isotopes among mantle reservoirs in order to trace reservoir development and evolution. For this, we are investigating the Archean Guelb el Azib ultramafic-mafic-anorthosite (UMA) layered complex in the West African craton of Mauritania. This complex is composed of ultramafic cumulates, chromitites, gabbros, leucogabbros and highly calcic anorthosites metamorphosed under amphibolite and granulite grades. The previous petrological observations [5] will be coupled with a geochemical approach based on Ca isotopic analyses of mineral separate and whole-rock samples from the complex. Such analyses will provide a more detailed picture of how crystallization affected the isotopic evolution of this particular layered complex, which in turn will lend us a deeper understanding of general planetary interior evolution.

[1] Paniello, R.C. et al. (2012). *Nature Geoscience* **490**: 376-379. [2] Liu, S.A. et al. (2011). *EPSL* **308**: 131-140. [3] Macris et al. (2015). *GCA* **154**: 168-185. [4] Chen et al. (2014). Goldschmidt 2014 Meeting, #3940: [5] Berger et al. (2013). *Precambrian Research* **224**: 612-628.