Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19056

In-situ Ti isotope determination in silicates and oxides through LA-MC-ICP-MS

ENRICO CANNAÒ[1], MASSIMO TIEPOLO[1], GIANLUCA SESSA[1], NICOLAS D. GREBER[2], JULIAN-CHRISTOPHER STORCK[3] AND FEDERICO FARINA[1]

[1]Università degli Studi di Milano
[2]University of Bern
[3]Universität Bern

Presenting Author: enrico.cannao@unimi.it

Titanium (Ti) isotope systematic is a reliable tracer of the Earth's processes, with main applications ranging from early solar system evolution to magma differentiation and continental crust formation. Titanium is generally considered immobile in aqueous fluids, although experimental investigations on rutile and natural rocks reveal high solubility of Ti in halogen-bearing environments [1]. Therefore, Ti isotopes might be a promising new system to investigate low- to medium-temperature processes and chemical disequilibrium, especially when combined with other common isotopic tracers like ^{18}O, ^{11}B and ^{7}Li. Titanium has five stable isotopes that show small variations in their ratios related to mass-dependent (expressed as ^{49}Ti) and mass-independent (expressed as ^{x}Ti) isotope fractionation. Consequently, precise Ti isotope signatures have been obtained on whole-rocks and mineral separates in solution-mode after chemical purification applying double-spike technique. So far, *in-situ* Ti isotope determination by LA-MC-ICP-MS has been limited to Ca-Al-rich inclusions in meteorites [2] and little is known about *in-situ* Ti isotope determination in major Ti-bearing silicates and oxides.

We present a pilot project aimed at developing an analytical protocol to determine the *in-situ* ^{49}Ti of different minerals of magmatic and metamorphic origin and with variable TiO_2 contents via LA-MC-ICP-MS: amphibole, titanite, clinopyroxene, Ti-clinohumite, rutile, garnet and mica. Challenging limitation of the analytical approach is represented by the Si-oxide and Ca ion interferences, for which the matrix-matching sample-standard bracketing in medium- to high-resolution mode is required. Our preliminary *in-situ* results report an internal precision commonly better than 0.2‰ (2SE) and external reproducibility (2SD) commonly better than 0.2‰, depending on mineral homogeneity. The proposed LA-MC-ICP-MS procedure allows to achieve adequately precise and accurate ^{49}Ti data for different oxides and silicates, opening new avenues for micro-analytical research activities in the fields of geo- and cosmo-chemistry.

[1] Rapp, Klemme, Butler & Harley (2010), *Geology* 38, 323–326.

[2] Williams, Janney, Hines & Wadhwa (2016), *Chemical Geology* 436, 1-10.