Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17858

Cu, Zn, and Fe isotopes behaviour in an experimental martian-like serpentinization system.

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On Earth, hydrothermal geological systems witnessing serpentinization (Eq. 1) are a potential cradle for life due to the local generation of H_2 and sometime CH_4 (Eq. 2) in such systems [**1**]. On Mars, evidences show serpentinization occurred in the past in the near-surface [**2**]. At the present-day, serpentinization is not possible anymore on the near-surface due to the P/T conditions not allowing liquid water. However, conditions to sustain liquid water can be met in the deeper subsurface (~3 to ~20 km) [**3**].

(Eq. 1) Fe^{2+}-mineral (olivine, pyroxene) + H_2O = Serpentines + Fe^{3+}-minerals + ... + H_2

(Eq. 2) $CO_2 + 4H_2 \rightarrow CH_4 + H_2O$

In this frame, we developed an experimental hydrothermal system to reproduce martian subsurface-like conditions, focusing on serpentinization, H_2 generation, and CH_4 production. In addition to traditional geochemical and spectral analyses, Cu, Zn, and Fe isotopic systems are used to better characterize and understand the mobility of elements in our experiments.

In natural systems, fluid-rock interactions and the fluid source of a hydrothermal system can be tracked by Cu, Zn, and Fe isotopes fractionation [**4**-**5**]. In addition, Cu and Fe isotopes are sensitive to variations in oxidation state and thus can be used to track the redox conditions in a geological system. As such, our samples, obtained in controlled experiments where iron was oxidized from anhydrous to hydrous silicates, could represent a good case-study to provide a better understanding of isotope fractionation in hydrothermal systems.

Major and trace elements concentrations, dissolved ions concentrations through time, and isotope analyses will be presented to understand the mobility of elements during our hydrothermal experiments.

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