Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.21361

Experimental insight into chemical enrichment in liquid water post exposure to magmatic gas.

MORTEZA SAFARI AND HANNA NEKVASIL

Stony Brook University

Presenting Author: morteza.safari@stonybrook.edu

Exsolved gas from uprising melt can carry a significant load of metals. Reaction of this hot and reactive gas with shallow groundwater around volcanic fields can cause acidification and metal saturation in liquid water, which may lead to mineral deposition [1], [2]. Investigating high T gas phase transport of metals is impossible in nature and our knowledge is mostly limited to the hydrothermal hot springs and fumaroles where gas has substantially fractionated and modified [3]. However, the evidence for vapor phase complexation and transport of metals are preserved in fluid inclusions [4]. Our experimental degassing setup [5] allows to investigate gas phase metal transport in shallow hydrothermal systems (Fig. 1). In these experiments, the gas source is a glass, doped with volatiles and trace elements, synthesized by piston cylinder apparatus at elevated P and T and rapidly quenched. Melting of this glass in an evacuated and sealed silica glass tube produces a low-pressure magmatic gas. As this gas ascends, cools and condenses into solid minerals: the remaining gas is allowed to react with deionized water. Analysis of this water indicates a correlation between the halogen concentration with relatively volatile elements such as P, Cs, Rb, Na, K, Se, Zn, Pb and Fe. This is a complementary finding to previous experimental work on metal transportation by chlorine complexes in vapor phase [6]–[11].

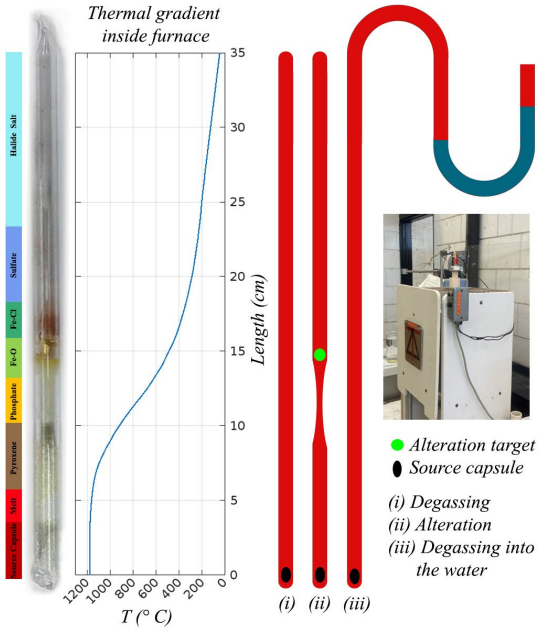

Figure 1 Experimental setups allowing to investigate the magmatic gas condensates, gas-solid and gas-water interactions.

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