Crystallization kinetics of alkali feldspar in trachytic melts of Phlegraean Fields (Napoli, Italy)

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The aim of this study is to quantify crystallization kinetics of trachytic melts and eruption dynamics of phlegraean volcanoes. In particular, studying the growth rate (G_L), through cooling experiments, of alkali feldspar and their crystal size distribution (CSD), is possible to constrain residence time of magma in magma-chamber and into the conduit during the eruption.

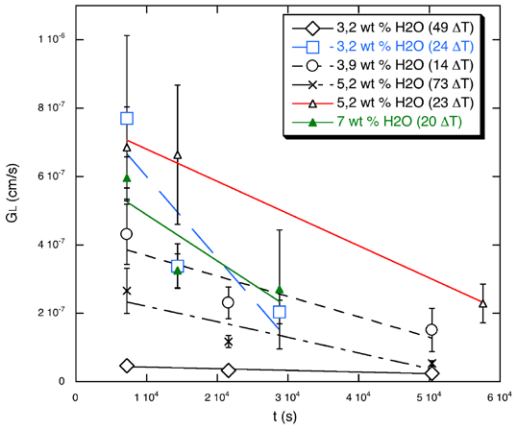

Figure 1: Relation between the growth rate (G_L) and the experimental time (t).

Discussion of Results

The order of magnitude of alkali feldspar growth rate obtained from cooling experiments varies between 10^{-7} and 10^{-8} cm/s (Fig. 1). This difference in order of magnitude depends on percentage of H_2O dissolved in the melt and degree of undercooling ($\Delta T = T_{liquidus} - T_{experimental}$) [1] (Swanson, 1977). Moreover, this difference implies significant variations of the ascent time. CSD studies on Monte Nuovo products carried out by Piochi *et al*. [2] to investigate magma dynamics in syn- eruptive conditions combined with G_L values obtained in this experimental work suggest ascent times between 2 days and several hours.

[1] Swanson (1977) *Am. Min.* **62**, 966-978; [2] Piochi *et al*. (2005) *Bull. Volcanol.* **67**, 663–678.

Molybdenum isotopes as oceanic paleoredox proxy of the Paleoproterozoic Shunga event

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Molybdenum (Mo) isotopes in ancient organic-rich black shales may directly reflect the contemporaneous seawater Mo isotope compositions and can thus be used as an oceanic paleoredox proxy. We measured Mo isotope composition and Fe speciation of black shales from the 2.0 Ga Zaonega Formation from the Eastern Fennoscandian Shield (ICDP FarDeep project, [1]). The studied section contains thick units of Paleoproterozoic C_{org}-rich sediments (up to 99% C) that represent a giant, petrified oil field, including petroleum source rocks and black shales. Samples were measured by MC-ICP-MS (Neptune), and data were corrected using double-spike iterations (using ^{97}Mo and ^{100}Mo). Mo isotope ratios are reported relative to our internal lab standard SPEX, where $\delta^{98/95}Mo_{SPEX} = \delta^{98/95}Mo_{NIST3137} - 0.37‰$.

Overall, the studied section shows relatively small Mo isotope variations, averaging $\delta^{98/95}Mo = 0.79 \pm 0.29$ ‰. Using Fe speciation ($Fe_{Py}/Fe_{HR} > 0.8$ and $Fe_{HR}/Fe_T > 0.38$), euxinic conditions were identified for several samples in the upper part of the section which also shows higher Mo concentrations. These samples show slightly higher $\delta^{98/95}Mo$ values of 0.88 ± 0.28 ‰, and are considered to represent contemporaneous seawater due to quantitative Mo removal to the sediment. Simple oceanic mass balance of the Mo isotope system shows that euxinic sinks dominated the Mo removal from the oceans and controlled the isotopic composition of seawater.

At this time, after the GOE, increasing oxygen levels in the atmosphere amplified the delivery of dissolved Mo to the oceans. However, the oceans were apparently dominated by anoxic, ferruginous/euxinic conditions with an oxic sink smaller than that suggested by [2] at 2.5 Ga.

[1] Melezhik *et al*. (2004) *Ore Geology Reviews* **24**, 135-154.
[2] Duan *et al*. (2011) *Geochimica et Cosmochimica Acta* **74**, 6655-6668.