Ascent of magmas associated with the Solchiaro eruption Procida Island (Italy) based on melt inclusions and glasses

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The Solchiaro eruption on the island of Procida is one of the few trachybasaltic eruptions in the Phlegrean Volcanic District (PVD), Italy.

The goal of this study is to provide information on the magma dynamic associated with the Solchiaro eruption based on hourglass inclusions (HI), glass embayments (GE) and melt inclusions. HI are portions of melt ± vapour connected to the outside of phenocrysts through a narrow neck, and GE are portions of melt ± vapour delimited by an indentation in a phenocryst. We have characterized the major, minor and trace elements and volatile compositions of several HI and GE glasses. The HI and GE are associated with olivines of samples from the Solchiaro eruption, representing different stratigraphic heights.

The results show a good negative correlations between the maximum contents of dissolved H_2O, CO_2 and S of HI and GE and the eruptive time (stratigraphic heights). Reversely, minimum contents of Cl and F of HI and GE show positive correlation with the eruptive time.

The H_2O and CO_2 contents of some of the early-erupted HI are the same as those of early-erupted MI [1, 2] suggesting that residence times of early-erupted olivine were short enough to preserve the original dissolved volatile contents of HI. Alternatively, some HI were quenched to a glass from a great depth (up to 8 km) under equilibrium conditions. We develop a quantitative model to understand the duration of decompression for the Solchiaro eruption based on shape and size of both the HI and the contained bubble(s) as was previously done for the Bishop Tuff [3].

[1] Esposito *et al..* (2011) *J. Petrol.* **52**, 2431-2460. [2] Mormone *et al..* (2011) *Chem. Geol.* **287**, 66-80 [3] Anderson (1991) *Am. Mineral.* **76**, 530-547.

Attachment of aspartic acid at the brucite [Mg(OH)₂]-water interface

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The interaction of organic molecules at the mineral/water interface could play a key role in the emergence of more complex organic species in origins of life scenarios. In one such scenario, hydrothermal vents, particularly serpentinite-hosted hydrothermal vents, may possibly act as a suitable environment for this process to occur. We conducted a batch adsorption study between a stable mineral product of serpentinization, brucite ($Mg(OH)_2$), and the amino acid aspartic acid at 25ºC. We studied the adsorption of 2-500 μM aspartate onto a pure synthetic brucite at a single pH value of ~10.4 and a solid to ligand concentration of 10 g•L^{-1} under conditions where the brucite was in thermodynamic equilibrium with the aqueous solution. The point of zero charge (pH_{ZPC}) of brucite is approximately 11.0 [1], thus resulting in weak electrostatic attraction between the weakly-positive brucite surface and the negative aspartate. We obtained an isotherm, in which the concentration of aspartate adsorbed onto brucite reached a maximum of about 0.1 μmol/m^2, after increasing linearly with the concentration of aspartate in solution ($[Asp]_{aq}$) from 2-100 μM and leveling off at 250-500 μM. We used an extended triple-layer surface complexation model (ETLM) to acquire a preliminary fit to the isotherm. The data and the ETLM suggest that the surface site density is restricted to a very low value. Model predictions also suggest that the extent of aspartate adsorption onto brucite will decrease with increasing background electrolyte concentration. In comparison with our previous batch adsorption study of aspartate onto rutile (TiO_2) [2], we conclude that aspartate adsorbs to a lesser extent onto brucite than rutile. This is the first study in which we have obtained an adsorption isotherm for a non-oxide, rock-forming mineral and an amino acid. We expect the adsorption data collected for this system at surface conditions to provide a necessary analog for future adsorption experiments at hydrothermal conditions with implications for the emergence of complex biomolecules on Early Earth environments.

[1] Pokrovsky & Schott (2004), *Geochim Cosmochim Act* **68**, 31-45. [2] Jonsson *et al.* (2010), *Geochim Cosmochim Act* **74**, 2356-2367.