Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.4729

Dissolution of sulfide-rich cumulates in Nisyros volcano

ARIADNI AFRODITI GEORGATOU AND MASSIMO CHIARADIA

University of Geneva

Presenting Author: Ariadni.georgatou@unige.ch

Recent studies have reported the presence of magmatic sulfides in a variety of rocks corresponding to diverse geodynamic settings and magma compositions[1,2], suggesting that sulfide saturation is a common process in magmas. Although sulfides are the main repositories of chalcophile elements, sulfide saturation does not necessarily have a negative effect on the potential of a magmatic system to produce a porphyry deposit[3]. It has been suggested that assimilation of sulfide-rich cumulates by magma at shallow crustal levels could result in partial sulfide dissolution and a consequent re-fertilization of the magmatic system and associated exsolving fluids[4]. In order to investigate the possible occurrence of such a process of cumulate/metal-recycling, we study the magmatic sulfides occurring in the lavas, enclaves and cumulates of Nisyros volcanic centre (Aegean subduction front). The factors that render this study area unique are: (1) the wide compositional range of volcanic products (SiO_2=52-76 wt.%, Cu=2-79 ppm), (2) the variable compositions and textures of the enclaves, including quenched evolved enclaves and hornblende-rich cumulates, and (3) the fact that previous studies have shown petrological and geochemical evidence for mixing and assimilation of mafic cumulates by more evolved magmas[5]. Preliminary results indicate that sulfide abundance (s.a. in area%) and composition (Cu_{median} in ppm) vary according to magma differentiation, starting with deep-forming sulfide-rich hbl-rich mafic cumulates (SiO_2=53-55 wt.%, s.a.=4-5*10^{-5}, Cu=260), passing to shallower cpx-rich gabbroic micro-cumulates (s.a.=2-3*10^{-5}, Cu=570) and to more evolved hybrid enclaves (SiO_2=56-70 wt.%, s.a.<1*10^{-5}, Cu=602), and finally to sulfide-poor rhyodacitic host lavas (SiO_2=66-76 wt.%, <0.5*10^{-5}, Cu=3.2 wt.%). Sulfides often show oxide replacement and sulfide-dissolution textures. These observations, coupled with the fact that with eruption time the enclave size is decreasing[6] while the Cu in the lavas is increasing (from 14 to 38 ppm), suggest dissolution of sulfide-rich cumulates which results in Cu-enrichment of the magmas.

[1]*Rottier et al., 2020: Journal of Volcanology and Geothermal Research 401,10697*

[2]*Georgatou and Chiaradia, 2020: Solid Earth 11,1–2*

[3]*Du and Audetat, 2020: Geology 48,519–524*

[4]*Bai et al., 2020: Geochimica et Cosmochimica Acta, 280,66-84*

[5]*Klaver et al., 2018: Earth and Planetary Science Letters 497,169-180*

[6]*Braschi et al., 2012: Bulletin of Volcanology 74,1083-1100*