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Phase relations and volatiles content of the Minopoli2 Campi Flegrei caldera shoshonitic magma

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New constraints on pre-eruption conditions of the Minopoli2 shoshonitic magma are provided by experimental studies. The products of this eruption represent the least evolved magma composition erupted in the first epoch of Campi Flegrei caldera activity (10.3-9.5 ka). Recent geochemical investigations (Mangiacapra et al.,2008)* on dissolved volatiles in the Minopoli2 phenocryst-hosted melt inclusions (MIs), revealed a H2O- and CO2-rich shoshonitic magma, stored at two depths (8-9 and 2-3 km) where it experienced both open-system degassing, driven by crystallization, and flushing with a CO2-rich gas phase coming from deeper levels. Phase equilibrium experiments dry and with 3.5wt% H2O have been guided by the dissolved H2O and CO2 in MIs. The phase equilibria of the shoshonite with 3.5 wt% H2O shows that the observed phenocryst assemblage (olivine, Ca-pyroxene, plagioclase and biotite) becomes stable at 1020$\pm$15 °C over the pressure range of 40 to 150 MPa and to higher pressures. The experimental data indicate that the shoshonite crystallised the phenocryst assemblage (15 vol%) at a depth of circa 9 Km and 1025 °C; only small degrees of additional crystallization occurred as the magma ascended to a depth of circa 3 km with degassing of some MIs. Sulphur speciation in glassy MIs was determined as $\geq$ 79% sulphate which is equivalent to a log fO2$\geq$ NNO + 1.5. The low end of the fO2 range is interpreted to represent the pre-eruption magma at depth. The solubility of CO2 and H2O as a function of pressure in the Minopoli2 shoshonite have been experimentally calibrated. These results contribute to the understanding of magma chamber processes and conduit dynamics, relevant parameters for hazard assessment.

* Mangiacapra A., R. Moretti, M. Rutherford, L. Civetta, G. Orsi and P. Papale (2008) The deep magmatic system of the Camp Flegrei caldera (Italy). Geophys. Res. Lett., 35, doi: 10.1029/2008GL035550