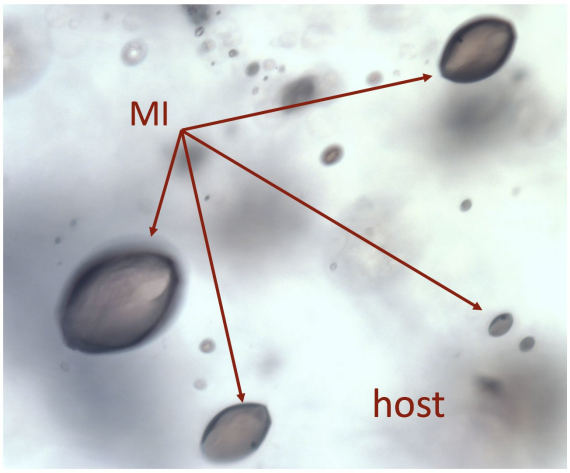
Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11843

A protocol to interpret volatile contents of melt inclusions in volcanic rocks

ROSARIO ESPOSITO

Università Milano Bicocca

Presenting Author: rosario.esposito@unimib.it



Melt inclusions (MI) are droplet of melts trapped during crystal growth (Fig. 1) and considered by many researchers as objects retaining magmatic information otherwise lost after eruptions [e.g., 1]. One of the main goals of studying MI is to constrain the pre-eruptive physical and chemical processes that have occurred in a magma reservoir at the micro-scale. In particular, the MI are studied to understand (1) the volatile origin, (2) the volatile evolution during magma differentiations, and (3) the volatile outgassing budget. In addition, the pre-eruptive volatile contents are used by researchers to understand magma dynamics. Pre-eruptive volatiles are also used to understand the composition of magmatic volatile phases in equilibrium with the magma, with implications for the formation of ore deposits. Also, studying pre-eruptive volatiles has important implications for the volatile global budget of the Earth and other extraterrestrial bodies as the Moon. One of the common features of the volatile dataset recorded by MI from a single sample is the high variability of their contents. The meaning of this variability is puzzling and requires a protocol to select the most reliable MI.

In this study, I present a protocol to select the most reliable MI associated to large database of MI from the literature. After applying this protocol, most reliable MI of single volcanic systems still show that the volatile contents span in a wide range. This systematics suggests that volatile-saturated magmas are common below volcanoes. Interpretations of pre-eruptive volatile contents of reliable MI from volcanoes as the Aleutians, Marianas and Campi Flegrei are in agreement with the transcrustal magmatic system model proposed by [2]. However, the lack of relative age constrains on the MI formation in single samples hampers the interpretation of MI data.

[1] A protocol and review of methods to select, analyze and interpret melt inclusions to determine pre-eruptive volatile contents of magmas, Esposito, R. (2020), in Fluid and Melt Inclusions: Applications to Geologic Processes, *Min. Ass. of Canada*, 163-194.

[2]: Vertically extensive and unstable magmatic systems: a unified view of igneous processes, Cashman, K.V., Sparks, R.S.J. & Blundy, J.D. (2017), *Science*, **355**