The contribution of bubble-hosted mineral phases to the volatile content of melt inclusions estimated by 3D Raman imaging

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Volatile abundances in magmas control the style, dynamics and intensity of volcanic eruptions. Reliable assessment of pre-eruptive conditions and degassing budget depends on correct estimation of the original volatile contents of magmas. Phenocryst-hosted melt inclusions (MI) record the volatile contents of the magma at the time of MI entrapment. During magma ascent and eruption, bubbles often form inside MI due to pressure drop and cooling. Recent studies have shown that up to 40-90% of the CO_2 initially contained in MI is sequestered inside bubbles [1]. In addition to a fluid phase, bubbles often contain solid phases crystallized on the bubble wall.

Raman spectroscopy measurements indicate that the volume of these solid phases (mainly carbonates and sulphates) relative to the fluid phase may be important. We present a method to identify the different phases filling inclusion-hosted bubbles and to quantify the volume of the solid phases using 3D Raman imaging. The method is applied to the study of olivine-hosted MI of basanitic and basaltic compositions erupted from different volcanoes. The accuracy and the limits of the method are examined by performing both MI homogenization experiments and 3D Raman imaging of bubbles in silicate glasses synthesized in the laboratory. The contribution of bubble-filling mineral phases to the MI volatile content is quantified and discussed.

[1] Wallace *et al.* (2015) *Am Mineral* **100**, 787-794.