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Megacrysts as indicators of the magmatic systems beneath Mont Briançon and Marais de Limagne, Devès, France

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A number of studies have demonstrated that megacrysts can have a variety of origins. In some cases, these phases are in chemical equilibrium with the host lavas, providing a glimpse at conditions just prior to eruption. In other cases, the megacrysts have crystallised at high pressures from magmas genetically related to the host lavas. Here the megacrysts can give us insights into the chemical evolution of the magmatic system. Of course, megacrysts can also be unrelated to the current volcanic system, having been entrained in the magma as a xenocryst or even originally as a xenolith that has become disaggregated.

A suite of clinopyroxene (cpx) megacrysts have been studied from a) the scoria at the Mont Briançon, and b) the lapilli tuffs on the flank of the maar at Marais de Limagne, which are located $\sim$8 km from each other. The rocks from both localities are basanites (Liotard et al. 1998). Three populations of cpx were found at Mont Briançon: 1) aggregates of cpx have a mg# (Mg/Mg+Fe) $\sim$0.80, are relatively low in Na and Fe^{3+} ($Fe^{3+}/\sum Fe < 0.3$ from Mössbauer spectroscopy), 2) individual crystals containing inclusions of euhedral apatite, with mg# = 0.63-0.65 and high Fe^{3+}, 3) individual crystals with apatite $\pm$ titanite inclusions, mg# = $\sim$0.52 and high Na and Fe^{3+}. $Fe^{3+}/\sum Fe > 0.4$ in types 2 and 3. Combining their FeO/MgO with partitioning data from Purtika et al. (1996) reveals that all 3 cpx types must have crystallised from magmas much more Fe-rich than the host magma (Liotard et al. 1988). Estimates of crystallisation pressure (Nimis & Ulmer 1998) range from $\sim$4 kb for type 1 cpx to $\sim$3 kb for types 2 and 3, indicating crustal conditions. Fe^{3+}-mg# systematics suggests that types 2 and 3 could belong to a differentiation series. A possible interpretation

of these data is that a flux of Mg-rich magma from the mantle entered an existing magmatic system that had strongly differentiated and it entrained cpx as megacrysts at several stages of ascent, before erupting at the surface.

At Marais de Limagne, in addition to cpx megacrysts with variable mg#, aggregates of cpx and amphibole are also present. One population of cpx has mg# $\sim$0.78, $Fe^{3+}/\sum Fe$ $\sim$0.35 and is low in Ca and Al-rich. From their FeO/MgO, it is clear that these cpx must also have crystallised from a magma richer in Fe than the host lava (Liotard et al. 1988). Estimated crystallisation pressures of $\sim$12 kb place their origin near the Moho ($\sim$30 km, Zeyen et al. 1997). The megacrysts at Mont Briançon and Marais de Limagne indicate differences in magma migration and interactions in the crust, which could also be reflected in the different eruption styles at these two localities.

Liotard JM, Briot D, Boivin P (1988) Contrib Mineral Petrol, 98, 81-90

Nimis P & Ulmer P (1998) Contrib Mineral Petrol, 133, 122-135

Putirka K, Johnson M, Kinzler R, Longhi J, Walker D (1996) Contrib Mineral Petrol, 123, 92-108