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Characterization of magmatic xenoliths from the 840 year B.P. Pico das Camarinhas cone (São Miguel, Azores)

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Sete Cidades is one of the main volcanoes of São Miguel island (Azorean archipelago). The complex morphology of Sete Cidades volcano is characterised by a summit central caldera and by cinder cones, pumice cones, Maars (sl), and domes on its flanks. Scoria cones are monogenic volcanic structures formed by the accumulation of basaltic pyroclastic scoria (sl) and in Sete Cidades volcano they are present only in areas outside the caldera, along the NE and W main flanks [1] consistent with main tectonic regional structures like the NW-SE trending Terceira Rift.
The most recent flank eruption is dated at 840±60 years B.P. [2] and produced a scoria cone (Pico das Camarinhas), located in the western part of the volcano, and the lava flows of Ponta da Ferraria. This eruption has a high concentration of plutonic nodules with dimensions up to about 50 cm, found either in the pyroclasts or in the lava flows. Mattioli et al. [3] suggested that these nodules are cumulates, crystallised within the crust at very shallow depth from magmas co-genetic with the post-caldera mafic lavas erupted on the flanks of Sete Cidades.
To better understand the magmatic evolution of this peculiar flank eruption we have determined the volume of the Pico das Camarinhas cone and characterized the mineralogy and geochemistry of four xenoliths and two high density bombs. The presence of clinopyroxene can be used to infer the crystallisation pressure of the xenoliths as proposed by Nazzareni et al. [4].
The volumes of the cones outcropping in this area were calculated with the Surface Volume tool in ArcGIS (© ESRI). Among the scoria cones of the area, Pico das Camarinas has an intermediate volume (0.007 km3) (max value 0.018 Km3 - min value 0.00011 km3)
The studied xenoliths are kaersutite gabbros and diorites with a holocrystalline fine to medium grained texture. Preliminary results on the mineralogy of the xenoliths showed that they are composed by feldspar (An77-9Ab23-48Or0-43), kaersutitic amphibole, clinopyroxene (Wo53-48En38-35Fs9-17) and biotite. Apatite and Fe-Ti oxides are present as accessory minerals. Their compositions are in good agreement with those found by Mattioli et al. [3].
The high density bombs are vesciculated with a porphyritic texture. Phenocrysts are clinopyroxene and plagioclase plus pyroxene and Fe-Ti-oxides microphenocrysts in the groundmass for one sample and phenocrysts of plagioclase, clinopyroxene and kaersutitic amphibole in the other sample.
Only limited variation in the chemistry of mineral assemblages can be observed in the studied samples. Pyroxene crystal chemistry is in progress to define the crystallisation pressure of both the xenoliths and the bombs.
The results of this study could provide important information on the evolution of basaltic magmas able to trigger flank eruptions on the Sete Cidades volcano.

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[3] Mattioli M. et al 1997 Mineral Petrol 60(1–2), 1–26
[4] Nazzareni S, et al 2001 Bull Volcanol 63(1), 73-82