Deep Crustal Xenoliths from Hrólfsvík, Reykjanes Peninsula

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The present research aims to outline the origin and history of the Hrólfsvík xenoliths with implications for deep crustal mineralogy. The study is based on definition of mineral assemblages and mineral compositions as well as upcoming oxygen isotopes analyses of feldspar separates. Preliminary results of the work in progress are presented here.

The xenolith-bearing Hrólfsvík lava is located in a bay East of Grindavík town, on the Reykjanes Peninsula's southern shore. The xenoliths range between 3 and 25 cm in size and have all kind of shapes, but their edges are always rounded. The xenoliths are either coarse or fine grained and both types exist side by side. In some places the xenoliths are seen closely packed in linear bands, confined to flows in the sea-eroded lava shield.

The Hrólfsvík xenoliths can be classified as gabbroic to troctolytic rocks, consisting generally of 60-90% feldspar, 10-30% olivine, minor clinopyroxene and accessory oxide. Complicated textures have been observed and the minerals presumably represent a assemblage of primary minerals and a secondary intergranular mineralization. The primary population consists mainly of 1-4 mm subhedral feldspars, 1-7 mm anhedral olivines and few 0,5-2 mm clinopyroxenes in an inequigranular adcumulate texture. Some of the xenoliths contain pockets of groundmass, which in some cases are cryptocrystalline. These pockets are believed to be a consequence of initial partial melting at the grain boundaries, where especially clinopyroxene shows a resorbed appearance, indicating that this phase was the first to reach solidus. The secondary mineral assemblages consist mainly of small euhedral olivines and of plagioclase lists. The primary feldspars frequently contain glass inclusions, in general situated around the core of the crystals, parallel to the elongated grain boundaries.

Microprobe analyses of the xenoliths show that they can be considered of deep crustal origin, because they contain chromian dioside and few chromites. Primary olivines have a forsterite content of 88-86, while the smaller secondary ones are more evolved (Fo_{82-78}). The primary plagioclases can be classified as bytownites (An_{91-88}), whereas composition of the lamellae is more varied, for example, some are more evolved and can be classified as labradorites (An_{70-58}). The minerals usually show no zonation, indicating a mantle origin. Only the outermost rim of the minerals is more evolved as an outcome of partial melting, which is especially the case for plagioclase in the periphery of the groundmass pockets.
Whole rock composition of xenoliths also suggests that they can only be plutonic equivalents of the most primitive lavas of the Reykjanes (picrites), because of their constantly low K_2O composition.