cumulates. Dykes with straight boundaries are filled by plastically deformed gabbros. The rotation of Cpx lineation has recorded the displacement of peridotite blocks during magma injection.

A more superficial magmatic event is indicated by fresh basaltic dykes of M.O.R.B. composition.

G14

GABBRO DIKES IN COMPOSITE XENOLITHS FROM HUALALAI

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Two composite xenoliths found in the 1801 Kaupulehu alkali olivine basalt flow of Hualalai volcano, Hawaii provide evidence for crystal-liquid separation processes in basaltic magmas ascending through narrow dikes at relatively shallow depths.

Specimen 1 shows a single, sharp, planar contact between dunite and gabbro. The gabbro has an allotriomorphic-granular texture and consists of about 50% each of aluminous calcic clinopyroxene (6.0 wt.% Al_2O_3) and plagioclase (An_{61}) with a few percent of angular grains of olivine (Fo_{78}). All of these minerals, as well as the olivine (Fo_{87}) of the dunite, contain bubbles of CO_2.

Specimen 2 consists of a straight, parallel-sided olivine-bearing gabbro dike (1.5 cm wide) cutting clinopyroxenite wallrock. No compositional gradients are apparent in either lithology. CO_2 bubbles are present in all phases. The dike has an irregular distribution of clinopyroxene (7.5 wt.% Al_2O_3) and plagioclase (An_{65}), and contains polycrystalline aggregates of olivine (Fo_{79}), interpreted as clasts of subjacent dunite wallrock which were carried in and reacted with the dike magma before crystallization of clinopyroxene and plagioclase.

The simple mineralogy of the dike rocks is consistent with formation by crystal accumulation (from flowing magma). Pressures cannot be specified well, but are possibly 5 to 10 kb. The absence of typical Cr-diopside, spinel lherzolite xenoliths at Hualalai (in contrast to their reltive abundance on Oahu) may imply a relatively shallow origin for the entire Hualalai suite. It is possible that the widely-studied dunites, although now possessing porphyroclastic textures, were originally formed also by crystal accumulation (from either tholeiitic or alkali basalt magmas) and are not samples of residual mantle beneath Hawaii.

G15

QUENCHED PYROXENITE XENOLITHS FROM THE MZONGWANA KIMBERLITE DIKE, TRANSKEI, SOUTHERN AFRICA

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Part of a large suite of garnet pyroxenite xenoliths in the Mzongwana kimberlite dike have quench textures. Others have polygonal granoblastic or transitional textures. Bronzite, rutile, and ilmenite form acicular crystals in sprays in the quenched rocks; diopside has crystallized as chains of fine granules. In rocks with transitional textures, bronzite crystals form thin, radiating blades up to 0.5-1 cm. In granoblastic pyroxenites the bronzite and diopside have crystallized as strain-free polygons 0.2-0.5 mm in diameter and garnet grains are sieved with fine inclusions.

About a third of the Mzongwana pyroxenites contain segregations of garnets that appear to have developed during nucleation and crystallization. Amphibole (potassic kaersutite) has crystallized along the borders of garnet segregations in two pyroxenites, where it is associated with Ti-rich phlogopite and with pool-like zones of serpentine and calcite. The amphibole is anhedral in contact with garnet but has well developed crystal faces in contact with the serpentine and calcite pools.

The presence of primary garnet and amphibole suggests that these pyroxenites formed at a depth of about 100 km, substantially shallower than the depth of 150 km at which the kimberlite eruption is believed to have originated. Quench textures would be quickly eliminated by recrystallization at such depth and hence must have formed in some process that was essentially coincident with eruption. It is suggested that the Mzongwana kimberlite entrapped pyroxenite magma during eruption and that the liquid pyroxenite became quenched in contact with erupting kimberlite.

G16

THE ORIGIN OF GLASS IN ULTRAMAFIC XENOLITHS

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Glass is a ubiquitous minor phase in high pressure xenoliths in alkalic basalts. We selected 3 samples for detailed microprobe investigation. A dunite from Hualalai contains glasses of both andesitic (anal. A) and anorthositic (anal. D) composition. The former typically coexists with chromite, sulfide and CO_2-rich fluid as inclusions (up to 50 µm) in olivine. The 4% sum deficiency is interpreted as H_2O. The anorthositic glass occurs as sinuous veinlets (up to 30 µm wide) within or cross-cutting olivine and chromite. A Canary Is. spinel lherzolite also contains andesitic glass in veinlets (anals. B,C); minor quench Ca-poor pyroxene is present. These glasses are also apparently hydrous, and have higher Ca, Mg and total Fe but lower K, Ti and P than the andesitic glass from Hualalai. In a spinel lherzolite from Mt. Leura, Victoria vesicular glass (anal. E) occurs with phlogopite in a vein.

We believe that the andesitic glasses found in these and other spinel lherzolites are produced largely by decompression during ascent as incongruent "flash" melts of low melting minerals. The anorthositic glass in the dunite may represent original intercumulus plagioclase. The andesitic glass in this sample may have originated as trapped melt+vapor±chromite±sulfide inclusions similar to those observed in submarine basalts; the present glass composition may result from subsequent crystallization of olivine and possible admixture with solute originally dissolved in the high pressure fluid phase.

Representative glass compositions

	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SUM
A.	63.1	0.96	20.4	2.3	0.0	0.8	4.2	1.3	2.5	0.23	95.79
B.	61.4	0.02	18.8	3.3	0.0	2.7	8.0	1.0	0.39	0.0	95.61
C.	57.7	0.02	18.2	4.1	0.0	4.1	11.3	2.4	0.45	0.0	98.27
D.	51.6	0.16	29.5	1.0	0.0	0.40	13.6	3.7	0.23	0.0	100.19
E.	59.1	3.5	18.4	3.0	0.0	2.1	4.5	2.2	5.6	0.45	98.85