TABLE 9

	Olivine	Ortho-pyroxene *	Clino-pyroxene *	Quench clino-pyroxene	Quench amphibole	Glass 1 **	Glass 2 **
SiO_2	40.7	53.5	53.2	45.6	47.4	70.0	68.8
TiO_2	–	0.2	0.5	3.3	2.2	0.2	0.1
Al_2O_3	0.1	2.5	2.3	9.0	15.5	19.3	21.0
FeO	12.1	8.1	4.1	8.8	10.8	0.9	0.6
MnO	–	0.1	–	–	–	–	–
MgO	46.9	33.9	17.6	17.2	11.2	1.2	0.5
CaO	0.1	1.0	20.8	14.2	8.4	5.7	7.2
Na_2O	–	–	0.4	0.8	2.0	$\geqslant$ 1.5	$\geqslant$ 1.0
K_2O	–	–	–	–	0.4	1.2	0.8
Cr_2O_3	–	0.9	1.1	0.2	0.1	–	–
$\frac{100\ Mg}{Mg + Fe}$	87.5	88.0	88.5	77.5	65	72	60
"H_2O"					(2%)	(16%)	(15%)

Run conditions: 20 kb, 1050°C, 4 hr, $Ag_{75}Pd_{25}$ capsule.
Run description: Large ($\geqslant$10 μ) euhedral orthopyroxene, olivine and clinopyroxene as outgrowths on orthopyroxene and also as separate crystals. Primary crystals enclosed in glass with quench mica and quench amphibole. Estimated ~20% melting.
100 Mg/(Mg + ΣFe) of sample after run: 85.6.

* Note the similar 100 Mg/(Mg + Fe), Al_2O_3, TiO_2 contents of the two pyroxenes in contrast to the orthopyroxene and quench clinopyroxene of table 8.

** Glass analyses using stationary beam, Na_2O values estimated from 10 kb data evaluating the effect of Na volatilization by the electron beam.

TABLE 10

	Olivine	Orthopyroxene	Clinopyroxene	Ilmenite
SiO_2	41.4	53.9	50.8	–
TiO_2	–	0.2	0.7	59.4
Al_2O_3	0.1	4.5	6.0	0.7 *
FeO	12.7	8.0	4.1	25.0
MnO	–	–	–	–
MgO	45.2	31.6	16.3	12.1
CaO	0.2	0.9	20.6	–
Na_2O	–	–	0.6	–
K_2O	–	–	0.1	–
Cr_2O_3	–	0.9	0.8	2.4
NiO	0.4	–	–	–
$\frac{100\ Mg}{Mg + Fe}$	86.4	87.6	87.8	46.3

Run conditions: 20 kb, 1000°C, 4 hr, $Ag_{75}Pd_{25}$ capsule.
Run description: Common olivine and orthopyroxene laths and minor clinopyroxene in quench amphibole + mica + glass. Accessory ilmenite and spinel included in some orthopyroxene and olivine. Differs from the 1100°C run in the absence of *broad* clinopyroxene borders on the orthopyroxene laths.

* Al_2O_3 may be too high from matrix interference.

TABLE 11

	Olivine	Orthopyroxene	Clinopyroxene
SiO_2	40.2	53.2	51.0
TiO_2	–	0.3	0.6
Al_2O_3	–	5.5	5.0
FeO	12.6	8.5	4.4
MnO	–	–	–
MgO	46.7	30.3	16.8
CaO	–	1.0	20.8
Na_2O	–	0.1	0.6
K_2O	–	–	0.1
Cr_2O_3	–	0.7	0.8
NiO	0.4	–	–
$\frac{100\ Mg}{Mg + Fe}$	86.9	86.5	87.3

Run conditions: 20 kb, 970°C, 6 hr, $Ag_{75}Pd_{25}$ capsule.
Run description: Common orthopyroxene, olivine and clinopyroxene (commonly as simply-twinned crystals) together with mica (possibly primary) and spinel (and ilmenite) and minor interstitial glass.

TABLE 12

	Olivine	Ortho-pyroxene	Clino-pyroxene	Amphibole
SiO_2	40.5	53.2	51.3	44.3
TiO_2	–	0.4	0.3	1.1
Al_2O_3	–	5.4	4.6	13.6
FeO	13.9	8.8	3.8	5.5
MnO	–	–	–	–
MgO	45.1	30.5	17.0	19.1
CaO	0.1	0.8	21.2	10.4
Na_2O	–	–	0.7	2.4
K_2O	–	–	–	0.5
Cr_2O_3	–	0.7	1.0	1.1
NiO	0.4	–	–	–
$\frac{100\ Mg}{Mg + Fe}$	85.2	86.1	88.9	86.1

Run conditions: 20 kb, 950°C, 6 hr, $Ag_{75}Pd_{25}$ capsule.
Run description: Common olivine, orthopyroxene, amphibole (small colourless laths), minor clinopyroxene and accessory ilmenite and spinel. No evidence for melting, orthopyroxene does not have borders of (quench) clinopyroxene.

than at 1100°C, and the low Na_2O, K_2O and TiO_2 contents of the primary clinopyroxene shows that the liquid will be enriched in these elements while retaining $SiO_2 < 50\%$ (because of the increasing importance of pyroxenes as residual phases).

5.2.3. 20 kb, 1000°C, 970°C and 950°C

In these runs, although quench phases and glass were present at 1000°C and 970°C, only primary phases have been analyzed. With decreasing temperature the Mg-values of olivine and orthopyroxene * decrease, with the compositions at 950°C being similar to those at 970°C and 900°C (both subsolidus) at 10 kb. The presence of Mg, Cr-rich ilmenite at 1000°C is noteworthy. This phase is probably present, though not analyzable, in lower temperature runs and would account for the lower TiO_2 content of amphibole at 20 kb 950°C than that at 10 kb 970°C and 10 kb 1000°C. In comparing the subsolidus, primary amphibole at 950°C with quench amphibole at 1050°C and 1100°C the main difference is in Mg-value in CaO, TiO_2 and SiO_2 contents. The K_2O/Na_2O ratio of the amphibole at 950°C is lower than that of the starting mix and this effect is more marked when the Na_2O content (0.7%) of the clinopyroxene is also considered . This comparison suggests the presence of a minor K-rich phase, possibly phlogopite or a trace of K-rich melt phase. If a melt phase is present and thus 950°C is slightly above the solidus, then the amount of melt must be too small to affect Mg-values.

The analysis of coexisting pyroxene pairs in these runs shows a similar temperature dependence of the width of the pyroxene miscibility gap at both 10 kb and 20 kb. There is some suggestion that orthopyroxene shows slightly lower CaO content at a given temperature at 20 kb than at 10 kb. The data at 950°C 20 kb support the view that orthopyroxene-clinopyroxene pairs in lherzolites, in which orthopyroxene has < 0.8% CaO and clinopyroxene has > 20% CaO, have equilibrated at $T < 1000°C$.

6. Application of the experimental melting studies to models of the upper mantle

6.1. The lithosphere and low velocity zone

The experimental data presented in this paper provide constraints on both geophysical and petrogenetic

* Because of its readiness to form inclusion-free porphyroblasts or phenocrysts, orthopyroxene is the most easily analysed mineral in the assemblage and thus the best for noting changes in Mg-value, Al_2O_3 content etc..