(Cr_2O_3/Al_2O_3 ratio) in complex compositions and this will vary due to coupled reaction (2) with pyroxene.

With the complexity of the reactions in mind, there is much to be said for the direct experimental testing of model pyrolite compositions. In the following sections the data obtained on the model pyrolite compositions of GREEN and RINGWOOD (1963) and RINGWOOD (1966a) are summarized and emphasis is placed on the attempts to establish reaction boundaries by unequivocal reversals.

3. Experimental data on the incoming of garnet in pyrolite

3.1. *Experimental methods*

The experimental compositions (table 1) were prepared from AR grade chemicals, carefully ground and reacted together under high temperature reducing conditions and then analyzed for FeO and Fe_2O_3 contents. The initial mixes were extremely finegrained (≤ 1 μ) and consisted of olivine, clinopyroxene, orthopyroxene, plagioclase and minor chromite and ilmenite. To facilitate identification of minor phases and of the presence or absence of small degrees of partial melting, compositions were prepared which are equivalent to the pyrolite compositions of table 1 after extraction of 50% olivine ($Mg_{91.5}Fe_{8.0}Ni_{0.4}Mn_{0.1}$) from pyrolites I and II and after extraction of 40% olivine ($Mg_{91.6}Fe_{8.1}$-$Ni_{0.2}Mn_{0.1}$) from pyrolite III. In all experiments conducted with these modified pyrolite compositions, excess olivine was present. Hence the above procedure did not affect in any way the equilibrium relationships which are discussed below.

Crystallization of the experimental compositions was carried out using a single-stage, piston-cylinder apparatus and a pressure correction of −10% was applied to the nominal pressure for all runs. Samples were run in both platinum capsules and in graphite capsules. The run conditions using platinum capsules were such that iron loss to the Pt capsule was less than 25% of the amount present. Analyses of samples after experimental runs are listed in table 1a, the average iron content is 5.7% FeO, 0.7% Fe_2O_3 yielding a normative composition with approx. 33% Ol and 30% enstatite. The worst examples (in table 1a) give normative olivine of approximately 31% and 33% enstatite.

Microprobe analyses across a polished sample (36 kb,

TABLE 1

Chemical compositions and CIPW norms of model pyrolite compositions used in experimental runs. Pyrolite I and pyrolite III refer to the model compositions calculated by GREEN and RINGWOOD (1963) and RINGWOOD (1966a) respectively. They differ principally in their MgO/SiO_2 ratios and thus in pyroxene $(Al, Cr)_2O_3$ and pyroxene/olivine ratios. Pyrolite II is a composition intermediate between the two in which the enstatite/olivine ratio of pyrolite I was increased without appreciable change in the R_2O_3 content

	Pyrolite I	Pyrolite II	Pyrolite III	Pyrolite III less 40% olivine
SiO_2	43.20	43.95	45.20	47.84
TiO_2	0.58	0.57	0.71	1.18
Al_2O_3	4.01	3.88	3.54	5.90
Cr_2O_3	0.42	0.41	0.43	0.72
Fe_2O_3	0.35	0.75	0.48	0.80
FeO	7.88	7.50	8.04	8.21
MnO	0.13	0.13	0.14	0.13
NiO	0.39	0.39	0.20	0.18
MgO	39.54	39.00	37.48	28.73
CaO	2.67	2.60	3.08	5.14
Na_2O	0.61	0.60	0.57	0.95
K_2O	0.22	0.22	0.13	0.22
100 Mg/($Mg+Fe^{2+}$) atomic ratio	89.9	90.3	89.2	86.5
CIPW Norm				
Or	1.1	1.1	0.8	1.3
Ab	5.2	5.2	5.0	8.3
An	7.5	7.3	6.6	11.0
Di	4.6	4.3	6.8	11.3
Hy	3.8	9.4	15.8	26.4
Ol	75.6	69.8	62.5	37.5
Ilm	1.1	1.1	1.3	2.2
Mt	0.5	1.2	0.7	1.1
Chr.	0.6	0.6	0.6	1.0

TABLE 1a

Effect on FeO, Fe_2O_3 contents of pyrolite III less 40% olivine of loss of iron to platinum capsules during experimental runs (E. Kiss, analyst)

P (kb)	*T* (°C)	Time (hrs)	% FeO	% Fe_2O_3	% total Fe as FeO
27	1500	0.33	5.62	0.38	5.96
29.3	1500	0.33	5.18	0.78	5.88
30.4	1500	0.33	5.11	1.03	6.04
29.3	1400	1.0	5.10	0.54	5.59
30.4	1400	1.0	5.56	0.75	6.24
24.8	1300	2.0	5.21	0.56	5.71
20.3	1200	2.0	6.89	1.01	7.80
22.5	1100	4.0	7.17	0.75	7.70