1500 °C, 20 mins, pyrolite III less 40% olivine) showed average Fe as FeO content of 6.1% (i.e. sample 100 Mg/(Mg+Fe) = 89.5) at the edge against platinum and Fe as FeO content of 7.0% (i.e. sample 100 Mg/(Mg+Fe) = 88) in the centre of the sample. Microprobe analyses of olivines and orthopyroxenes from runs in Pt capsules yield values of 100 Mg/(Mg+Fe) = 90–91.5, whereas from subsolidus runs in graphite capsules the olivine and orthopyroxene had 100 Mg/(Mg+Fe) = 87–88. Runs across the pyroxene pyrolite/garnet pyrolite boundary at 1350 °C and a reversal on the boundary at 1400 °C were carried out in graphite capsules. The use of graphite capsules in longer runs allowed access of water producing depression of the solidus and the presence of amphibole in runs at 1100 °C, 22.5 kb and 20.5 kb. These effects were eliminated by repeating these runs in sealed Pt capsules. To summarize, the use of sealed Pt capsules appears necessary for reliable determination of the solidus and prevention of growth of amphibole at low temperatures. The use of platinum causes slight iron loss changing the overall sample 100 Mg/(Mg+Fe) ratio by 2–3% but this does not perceptibly affect the position of the phase boundary marking the appearance of garnet as subsolidus runs in graphite and platinum are mutually consistent. The iron loss also causes a small increase in normative Hy/Ol ratio and thus in pyroxene/R_2O_3 ratio. It may be noted that the effect of Fe increase due to experiments in Fe capsules by ITO and KENNEDY (1967) appears to be similar in magnitude (modal olivine $\approx Fo_{95}$ but experimental olivines in subsolidus assemblages range from Fo_{88}–Fe_{91}) but has the opposite effect in decreasing normative Hy/Ol and pyroxene/R_2O_3 ratios.

Samples were examined optically and by X-ray powder diffraction. Orthopyroxene forms quite large tabular porphyroblasts; garnet is commonly subhedral but contains many inclusions at lower temperatures and olivine and clinopyroxene form small anhedral grains. Spinel occurs as small, equant, green, isotropic grains and differs from ilmenite (ilmenite+geikielite solid solution) in that the latter is commonly elongate, brown, translucent and with high birefringence. The orthopyroxene crystals are readily analyzed by electron microprobe techniques and some data have been obtained on olivine, clinopyroxene and garnet compositions. The presence of small amounts of amphibole required detection by X-ray powder diffraction photographs.

In the experiments on the stability of amphibole, the methods used should outline the *maximum* stability of amphibole at 1000 °C and were designed to specifically test the model that pyrolite contains 0.1–0.2% H_2O at shallow mantle depths. The use of a very small water content also avoids the problems of large degrees of melting and depression of the solidus, and of the possibility of solubility of components in a vapour phase. The starting material for these runs was prepared by adding 0.3% H_2O to the "pyrolite III less 40% olivine" mix. This mix was run at 10.8 kb, 900 °C for 4½ hrs yielding a fine-grained assemblage of olivine, pyroxenes and amphibole (≈15%). This was then rerun at 1000 °C and at pressures of 18 kb to 29 kb and examined carefully by optical and X-ray methods for the disappearance of amphibole and the appearance of garnet.

3.2. *Experimental results*

The results of the determination of the synthesis fields for garnet pyrolite and pyroxene pyrolite are presented in fig. 1. The data points denote the phase assemblages present in pyrolite III composition. Plagioclase pyrolite is stable under dry conditions on the low pressure side of AB. Between AB and ELF, both garnet and plagioclase are absent and the mineral assemblage is dominated by aluminous pyroxenes. Within this field, spinel is present as a minor phase at temperatures below the line marked K but only olivine, aluminous pyroxenes and accessory ilmenite are present at higher temperatures. Garnet first appears in trace amounts along the line ELF and, at a given temperature, steadily increases in abundance as pressure increases.

The data points for pyrolites I and II are not shown in fig. 1 but in these compositions the first appearance of garnet is along EJ and spinel remains up to solidus temperatures on the low pressure side of EJ. Garnet and spinel co-exist together over a very small pressure interval on the high pressure side of EJ. The triangular P, T field FLJ is one in which the olivine+aluminous pyroxenes assemblage occurs in pyrolite III but olivine+aluminous pyroxenes+garnet occurs in pyrolites I and II.

The boundary for the appearance of garnet was apparently defined by different reactions at low and high temperatures and it was desirable to obtain reversals