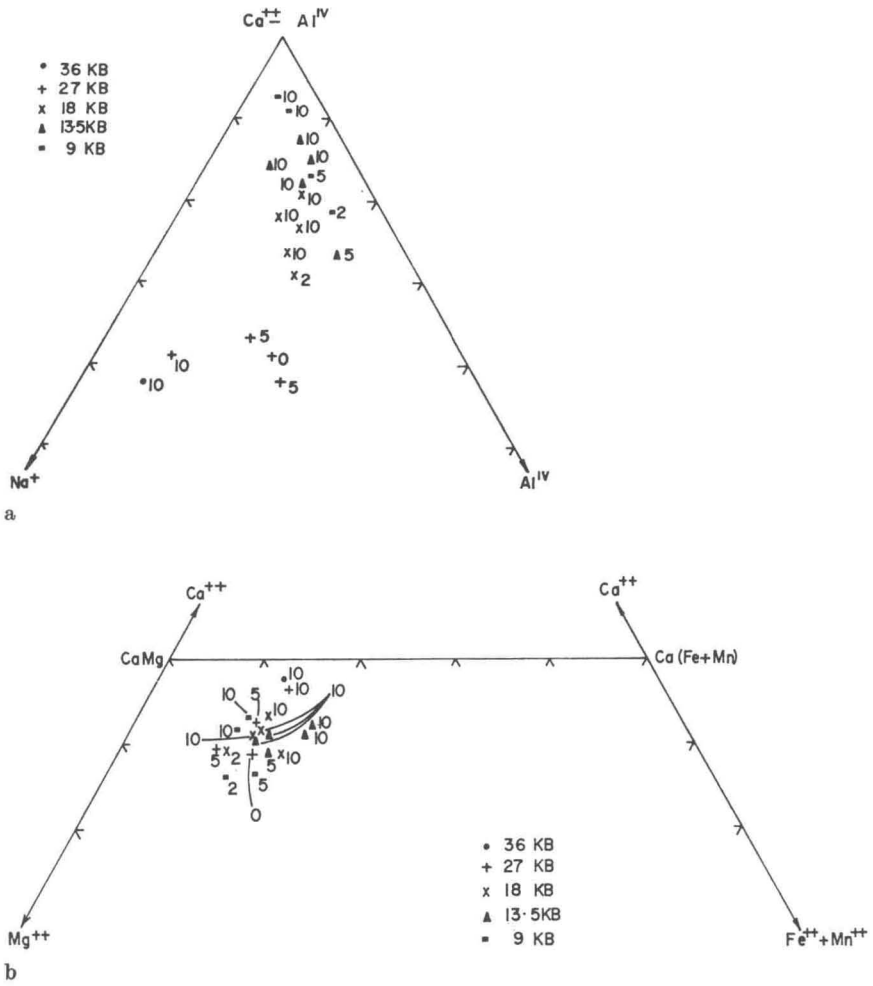

Fig. 8a and b. Pyroxene compositional diagrams (atomic %) showing compositions of pyroxenes analyzed from experimental runs. Numbers beside each point refer to the water content of the charge from which that pyroxene crystallized

pyroxene. The K/Na ratio of the amphibole is slightly less than the same ratio in the starting composition.

Discussion of Equilibrium Problems

In runs at temperatures $<900°$ C and at pressures of 9 and 13.5 kb difficulty is experienced in nucleating garnet even over times of 24 hours. Thus with 10% H_2O garnet is observed in a run at 940° C, 13.5 kb but does not crystallize at the same pressure at lower temperature (800–900° C). A large field of crystallization of amphibole occurs in this temperature range, but only minor amphibole is present with garnet at 940° C. This may indicate a reaction relation garnet +

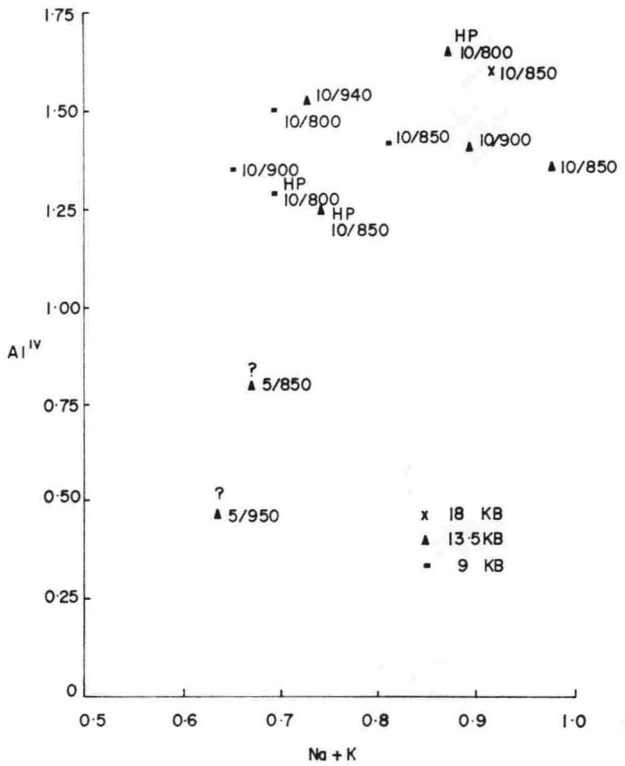

Fig. 9. Plot of atomic % of Al^{IV} against Na+K for amphibole crystallizing from experimental runs. Numbers beside each point refer to water content and temperature. *HP* a run seeded with garnet and clinopyroxene

liquid⇌amphibole with decreasing temperature, or a nucleation problem as suggested above. To investigate this further a mix was prepared, consisting of 70% glass and 30% high pressure assemblage (derived from garnet-clinopyroxene-glass runs at 36 kb, 1000–1100° C, 10% H_2O). 10% by weight of water was added to this and runs conducted at 9 kb, 800° C, 48 hours; 13.5 kb, 800° C, 71 hours; 13.5 kb, 850° C, 60 hours.

The products of these runs consisted of amphibole, clinopyroxene, garnet and glass. Garnet occurs in both euhedral and fragmental habits. X-ray powder patterns demonstrate it has increased in amount, relative to the proportion present in the starting mix. Analyses of the garnet show that it is zoned, indicating that complete equilibrium has not been attained. However, garnet crystallized at 13.5 kb, 800° C, has a higher average Ca, Fe content than garnet at 13.5 kb, 850° C, consistent with the trend in compositional changes with change in temperature (Fig. 7). This indicates an approach to equilibrium. Similarly, clinopyroxene crystals in the run at 13.5 kb, 800° C, have a lower Mg/Fe ratio and a higher Na content compared with crystals in the run at 13.5 kb, 850° C. This is also consistent with pyroxene trends in composition with changing tem-