

Part or all of enstatite may be dissolved in omphacite to make a complex clinopyroxene solid solution. In the present experiment the mole ratio of potassic richterite and garnet is nearly 1:1; potassic richterite is still present after the run, however, probably because of incomplete reaction or the effect of solid solution. Because of the fine-grained nature of the products, electron-probe analysis was not successful in determining in detail the compositions of pyroxene phases. The present experiment suggests that in the presence of garnet, potassic richterite reacts to form phlogopite and clinopyroxene or clinopyroxene + orthopyroxene. In the presence of spinel, potassic richterite may also react to form phlogopite, clinopyroxene, and forsterite. Potassic richterite and Ca-Tschermak's pyroxene component are also isochemical with phlogopite + omphacite. The phlogopite + diopside assemblage is stable in a wide pressure range, as shown elsewhere in this report, and the phlogopite + clinopyroxene (omphacite) assemblage would also be stable in a wide pressure range. It is suggested, therefore, that potassic richterite is not stable in the presence of garnet, spinel, or aluminous pyroxenes. The alumina content of diopside from the Wesselton nodule is only 0.71 wt %. To conclude, potassic richterite would not be expected to occur in eclogites and garnet- or spinel-bearing peridotites under equilibrium conditions. To the best of our knowledge it has not been found in rocks of this type occurring in kimberlite. Potassic richterite may, however, occur in alumina-poor pyroxenites and peridotites or in the rocks in which K is in excess over Al and is still present after forming phlogopite and/or other potassium minerals (e.g., K-feldspar and leucite). The occurrence of potassic richterite in the Wesselton nodule is explained by the presence of excess K over Al.

POTASSIUM CONTENTS OF SYNTHETIC
PYROXENES AT HIGH TEMPERATURES
AND PRESSURES

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Electron-probe analyses of presumed upper-mantle materials, in particular kimberlite nodules, have revealed that olivines, garnets, and orthopyroxenes in general contain <30 ppm potassium and hence do not play an important role in the distribution of potassium in the upper mantle. The K content of clinopyroxenes is considerably larger and is crucial when considering the production of basaltic liquids with K contents varying from 0.05 to 1.5%.

Garnet peridotites, such as those found in kimberlites, are often assumed to be the dominant rock type present in the upper mantle. Chrome diopsides from these nodules generally contain on the order of 100 ppm K or less. The highest concentrations measured to date by electron-probe analysis have been observed in two subcalcic diopsides (Boyd, *Year Book 66*, pp. 331-334); concentrations of 280 and 340 ppm K in these two pyroxenes have been measured in this study. Even allowing for 15% modal abundance for diopsides in garnet peridotite, the K content of the resultant assemblage does not satisfactorily account for the high K contents of alkali basalts, provided at least 1% direct partial melting is involved in the production of the basalt.

Potassium contents of eclogitic omphacites from African kimberlites are more difficult to interpret. Electron-probe analyses given elsewhere in this report demonstrate that the K distribution of omphacites is apparently bimodal, with some containing 20-150 ppm K and others 800-1400 ppm K. The comments expressed above with respect to the diopsides obviously apply to the low K omphacites. The K content of the second group is larger than expected, however,

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