MINERAL EQUILIBRIA AS INDICATORS OF THE MANTLE-DERIVED ULTRA-HIGH K-LIQUIDUS

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Existing experimental and petrological data suggest an increase with pressure (P) of partition coefficient of K2O between brine of carbonate (b) and a silicate melt (mSi) because of decrease in Ê2Î in the mSi. P is getting narrow the immiscibility gap in the system mSi – mb and displaces the gap toward a low alkalis mSi at aK2O= const in the system. As a result, the K2O-bearing clinopyroxene (Cpx1) is to be crystallized from mSi as a liquidus mineral being in equilibrium with mb. An analog of such high-potassium liquids was observed by Nevon et al. (1988) in a fluid-melt inclusions in diamonds from Zair. Cpx1 as a possible indicator of such deep-seated liquids is described from diamonds of Yakutian kimberlites (Sobolev et al., 1996) and from ultra high-pressure intercalating Grt-Cpx and diamond-bearing Grt-Cpx-Carbonate rocks of the Kokchetav Complex (KC). At P 70 kbar and T = 1200oC in equilibrium with such Cpx1 carbonate melt must contain 20-27 wt. % (Harlow, 1995).

Cores and centers of microinclusions of Cpx1 in Grt of the Grt-Cpx rock from the KC show a flat zoning in K2O at 1.05 wt. %, while its content in rims is ~ 0.25 wt.%. A major constituent of the rock is the matrix K2O-free Cpx2 (up to 90 mm in size). Its cores contain lamellae-like microinclusions of Kfs and show a flat zoning in bulk K2O ~ 0.25 wt.% (Cpx2+ Kfs), while K2O content in rims of the Cpx2 reaches 0 wt.%. The chemical zoning of minerals from these rocks suggests crystallization of Cpx1 and Kfs from the msi liquid on the way its uprising from a depth of 200 km. A possible phase diagram of the system is considered. A peritectic reaction KAlSi2O6+ [SiO2]m/fl = KAlSi3O8 taking place at a relatively shallow level of the Mantle is discussed, in particular.