OLIVINE GARNETIZATION - THE KEY TO ULTRABASIC-BASIC EVOLUTION OF UPPER-MANTLE MAGMATISM: EVIDENCE FROM MELTING RELATIONS OF OLIVINE-CLINOPYROXENE-JADEITE SYSTEM AT 6 GPA

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Abstract

Probability of the upper-mantle ultrabasic-basic magmatic evolution is marked by petrochemical trends with smooth clinopyroxenes and garnets conversions from olivine-normative peridotite to silica-normative eclogite compositions (MacGregor, Carter, 1970). Experimental melting relations of the ultrabasic olivine-orthopyroxene-clinopyroxene-garnet system demonstrate invariant peritectic reaction of orthopyroxene with melt and transition to univariant curve olivine+clinopyroxene+garnet+ melt (Litvin et al., 2016). Experimental melting relations in the join forsterite - jadeite over 4.5 GPa have revealed formation of pyropic garnet (Gasparik, Litvin, 1997). This is promising for deliverance of the Ol+Cpx+Grt+L univariant association from olivine components and transfer from ultrabasic to basic compositions. Experimental study of melting relations of the multicomponent olivine – clinopyroxene – jadeite system using the polythermal sections Ol – Cpx (= Di35Jd75) and Ol80Jd20 – Di65Jd35 at 6 GPa has discovered invariant peritectic reaction of olivine with jadeite components and transition to univariant curve (clinopyroxene ↔ omphacite) + garnet + melt. The peritectic reaction represent the key to ultrabasic-basic evolution of the upper-mantle magmatism and applicable also to evolution of diamond-parental melts-solutions. Finally, the generalized diagram of melting relations for the multicomponent system olivine – diopside – jadeite – garnet is constructed which demonstrates the physicochemical mechanisms providing a control over regularities of fractional ultrabasic-to-basic upper-mantle magmatism and formation of indivisible olivine-saturated peridotite-pyroxenite and silica-saturated rock series. Gasparik T., Litvin Yu.A. (1997). European Journal of Mineralogy, 9, 311- 326. Litvin Yu.A. (2017). Genesis of Diamonds and Associated Phases. Springer, 137 p. Litvin Yu.A., Spivak A.V., Kuzyura A.V. (2016). Fundamentals of the mantle-carbonatite concept of diamond genesis. Geochemistry International, 54, 839-857. MacGregor I.D., Carter J.L. (1970). The chemistry of clinopyroxenes and garnets of eclogite and eridotite xenoliths from Roberts Victor Mine, South Africa. Physics of Earth and Planetary Interiors, 3, 391-397.

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