Evidence of mantle modification in diamondiferous eclogite xenolith from Udachnaya kimberlite pipe (Yakutia)

V.S. SHATSKY[1] D.A. ZEDGENIZOV[1] AND A.L. RAGOZIN[1]

[1]Institute of Geology and Mineralogy, Novosibirsk, Russia; shatsky@uiggm.nsc.ru

This communication presents results of the investigation of a unique diamondiferous eclogite xenolith (length 18 cm, weight 6900 g) from the Udachnaya kimberlite pipe (Yakutia). The xenolith is composed of large, often euhedral pyroxene crystals (up to 30 mm in size) and round garnet grains (less than 5 mm) and minor rutile and sulfide minerals. The xenolite has the following specific features: the garnet content does not exceed 20%; phlogopite (5–7%) formed by alteration pyroxene and garnet and also occurs as euhedral grains in matrix. In terms of major element composition of clinopyroxene and garnet the eclogite studied has been classified as Group A eclogite [1].

From eclogite a total of 80 diamonds were studied. The majority of extracted diamonds occur as octahedra. Sometimes, the crystals have an intricate shape, owing to their growth in a limited space. Diamonds were polished to expose their inclusion. Inclusions of clinopyroxene, intergrowths of clinopyroxene and ortopyroxene, garnet, sulfide, coesite phlogopite, rutile and a phase of $CaCO_3$ were identified. An olivine inclusion has also been detected in one diamond crystal. It should be noted that neither olivine, nor coesite, nor ortopyroxene have been detected in matrix. The K_2O content in clinopyroxene inclusions vary from 0.7 to 0.83wt%. In contrast, the highest K_2O content in clinopyroxene from host eclogite is only about 0.45wt%. The presence of K-clinopyroxene, phlogopite, olivine, coesite and $CaCO_3$ inclusions in diamond, the arrangement of diamond crystals in the intergranular space and their internal morphology, and the development of glass and its replacement products around diamond crystals allow us to suggest that the diamonds crystallized during interaction of high-K carbonate-bearing fluid with ultramafic substrate. The high contents of several incompatible elements and light carbon isotopic composition of diamond ($\delta^{13}C$ – from -13.5 to -16.0‰) suggest that subducted rocks of the Earth´s crust may serve as the source of material.

This work is supported by RFBR (05-05-64246), Foundation of President of Russia (MK-1463.2005.5, MK-1539.2005.5).

References

[1] Taylor L.A., and Neal C.R. (1989) *J. Geol.* **97**, 551-567.