Viscosity of kimberlite and basaltic magmas during origin, ascent and volcanic eruption

E. S. PERSIKOV[1]*, P. G. BUKHTIYAROV[1], A. G. SOKOL[2] AND Y. N. PALYANOV[2]

[1]Institute of Experimental Mineralogy RAS, 142432 Chernogolovka, Moscow District, Russia (*correspondence: persikov@iem.ac.ru)

[2]Institute of Geology & Mineralogy SB RAS, 630090 Novosibirsk, Russia

Viscosity of kimberlite and basaltic magmas is a key physical property which significantly governs the dynamics of their origin in the Earth's mantle, ascent and volcanic eruptions (kimberlite and basaltic volcanism). Unfortunately, the viscosity of kimberlite magmas at the T, P – parameters of the Earth's mantle and crust as well the viscosity of basaltic magmas at the mantle T, P – conditions are unknown. Here we use both a new experimental data on viscosity of model kimberlite and basaltic melts at pressures up to 7.5 GPa and in the temperature range (1300 – 1850) ºC, and our structural chemical model for calculate and predict the viscosity of magmatic melts [1] to determine the fundamental features of viscosity of kimberlite and basaltic magmas during their origin, ascent and eruption. The results obtained indicate: 1) diamond carrier kimberlite magmas will ascend from mantle to the crust with the appreciable acceleration because their viscosity decreases by more than 3 times during ascent in spite of considerable decreasing the magmas temperature (~ 150 ºC), magmas partly degassing and crystallization; 2) on the contrary, the viscosity of basaltic magmas will increase by greater than 2.0 orders of magnitude during their origin, evolution and the ascent from the mantle to the Earth crust; 3) water which may dissolved in kimberlite and basaltic magmas (~ 8 wt. %) are not principally affect on the dynamics of their viscosity during ascent; 4) the mechanism of this new and unexpected phenomenon is conditioned by the much stronger influence of the pressure and volume content of crystals and bubbles on viscosity of kimberlite and basaltic magmas compared to water content effect when compound action of many parameters is taken into account.

The Russian Foundation for Basic Research, project 15-05-01318 and the Russian Science Foundation, project 14-27-00054 are acknowledged for the financial support.

[1] Persikov, E.S. & Bukhtiyarov, P.G. (2009) *Russian Geology & Geophysics*, **50**, No 12, 1079–1090.