High water in meimechites of the Siberian Traps LIP

ALEXEI V. IVANOV[1], SAMUEL B. MUKASA[2], VADIM S. KAMENETSKY[3], MICHAEL ACKERSON[4], ELENA I. DEMONTEROVA[1], BORIS G. POKROVSKY[5], NIKOLAY V. VLADYKIN[6]

[1] Institute of the Earth's Crust, Siberian Branch of the Russian Academy of Sciences, aivanov@crust.irk.ru
[2] College of Science and Engineering, University of Minnesota, mukasa@umn.edu
[3] School of Physical Sciences, University of Tasmania, dima.kamenetsky@utas.edu.au
[4] Geophysical Laboratory, Carnegie Institution for Science, mackerson@carnegiescience.edu
[5] Geological Institute, Russian Academy of Sciences, pokrov@ginras.ru
[6] Institute of Geochemistry, Siberian Branch of the Russian Academy of Sciences, vlad@igc.irk.ru

In order to assess the role of water and temperature in generation of meimechites (high-Mg, high-Ti ultramafic rocks) we conducted a number of experiments with homogenization of Cr-spinel- and olivine-hosted melt inclusions (MIs). The former and the latter MIs were homogenized at 1400 ^{o}C at ambient pressure and 1500 ^{o}C at 5-6 kbar, respectively. Cr-spinel-hosted MIs were used to determine the MgO concnetration of primary melts, which turned out to be ~17 wt.%, less than estimated on olivine-hosted MIs in previous studies. Olivine-hosted MIs were used to determine volatile element concentrations by SIMS. When corrected to the primary MgO, the volatiles are in the wide range of concentrations with the highest values up to 3.88 wt.% H_2O, 1477 ppm CO_2, 2490 ppm S, 4214 ppm F and 2.08 wt.% Cl. These are the highest concentrations ever reported for meimechites (except for S), thanks to serindipitous discovery of undegassed samples and homogenization at pressure that prevents H_2O loss. Studied meimechites are characterized by trace element patterns typical of asthenospheric-mantle-derived melts with residual garnet and by time (250 Ma) corrected $^{87}Sr/^{86}Sr$ and εNd in the ranges of 0.70289-0.70336 and +4.5-5.7, respectively, which exclude crustal contamination or derivation from ancient lithospheric mantle. This supports the notion that meimechites form by volatile fluxing of the asthenospheric mantle rather than by decompression melting of a rising abnormally high-temperature mantle plume. This study was funded by the RSF grant 16-17-10068 to AVI and EID and NSF grant OPP-1025513 to SBM. VSK acknowledges ARC discovery grants DP1092823 and DP130100257.