Geophysical Research Abstracts
Vol. 16, EGU2014-1046-1, 2014
EGU General Assembly 2014

Mesoproterozoic orangeites of Karelia (Kostomuksha-Lentiira): evidence for composition of mantle lithosphere

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The 1.23-1.20 Ga old diamondiferous lamproites and orangeites (kimberlites of II group) of the Kostomuksha-Taloveys and the Lentiira-Kuhmo dyke fields intrude the Archaean crust of the Karelian craton, NE of the East European Platform.
Mineral (a trend of compositional evolution of mica, presence of carbonate minerals in basis, composition of olivine) and geochemical (major elements, ratio of trace elements, primitive mantle normalized trace elements patterns) characteristics of these rocks suggest an orangeitic rather than lamproitic or lamprophyric nature.
The composition of Phl-Ol orangeites suggests intensive processes of fractional crystallization for their melts. Cpx-Phl-Ol orangeites indicate higher intensity of lithospheric mantle assimilation then other orangeitic types. Phl-Carb orangeites of the Taloveys area and Cpx-Phl-Ol one of the Lentiira area are closest to primary melts.
The Ol-Phl-Cpx orangeites of the Lentiira area contain three generations of unaltered olivine that vary in composition and origin: a) xenocryst derived from depleted mantle peridotite; b) orangeitic olivine phenocryst and c) and olivine like early stage crystallization of megacryst assemblage or a product of metasomatic interaction between mantle peridotite and protokimberlitic melt.
Orangeites of Kostomuksha-Lentiira have low- and medium-radiogenic value of (87Sr/86Sr)1200 that range from 0.7038 to 0.7067. Phl-Carb orangeites of Taloveys have less radiogenic isotopic composition of Nd (eNd -11 ... -12) then Cpx-Phl-Ol and Phl-Ol orangeites of Kostomuksha (eNd -6.9 ... -9.4).
The study of Sm-Nd and Rb-Sr isotopic systems suggests that an ancient metasomatic mantle source took part in origin of orangeites. We propose a two-steps model of origin of their source (Kargin et al., 2014):
1) The metasomatic component of mantle source (like as MARID-type veins) formed during Lapland-Kola and/or Svecofennian orogeny events (2.1-1.8 Ga ago).
2) The intrusion of orangeites is comparable by time and geological setting with back-arc extensions (such as magmatism of CSDG) during the first stage of Sveconorwegian orogeny, initial stage of assembly of the supercontinent Rodinia (1.31-1.14 Ga). These back-arc extensions inspired of asthenosphere-derived melts to metasomatic lithospheric mantle and a generation of orangeitic melts.

Kargin A.V., Nosova A.A., Larionova Yu.O. et al. Mesoproterozoic orangeites (kimberlites II) of Western Karelia: mineralogical, geochemical and Nd-Sr isotopic-geochemical characteristics // Petrology. 2014. V.2. in press.