

On the two types of melts generating andesites of Gorely and Shiveluch volcanoes (Kamchatka)

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The genesis of andesitic rocks remains one of the most discussed problems in magmatic petrology (Dirksen et al., 2006; Reubi and Blundy, 2009). Melt inclusions in minerals from andesitic rocks may have different major and trace element composition (Humphreys and Edmonds, 2009; Tolstykh and Naumov, 2000). Plagioclase-hosted magmatic inclusions of two Kamchatka volcanoes demonstrate broad variations of melt composition, while compositions of the host rocks are similar.

Andesites of Gorely volcano are presented by dense lavas from the Young Gorely's edifice. They are represented by porphyric rocks with plagioclase being the main rock-forming mineral. Shiveluch andesites are presented by extrusion lavas and pumice lapilli. This pyroclastic material is represented by porous rock composed of frothed glass, Pl-Px-Amf paragenesis and basitic xenoliths.

The partially crystallized inclusions from Gorely volcano were homogenized before analyses. The naturally quenched glass melt inclusions from Shiveluch volcano were measured by electron microprobe without heating.

Majority of melts from Gorely volcano have andesitic composition ($\text{SiO}_2 < 59$ mass%) and are characterized by rather high contents of TiO_2 (1.5 - 2.5 mass%), MgO (2 - 2.5 mass%) and K_2O (about 3 mass%). Enrichment of SiO_2 is typical for all Shiveluch melts; they may be defined as water-rich dacites (SiO_2 68-71 mass%, $\text{TiO}_2 < 0.3$ mass%, $\text{MgO} < 0.9$ mass% and K_2O about 2.8 mass%).

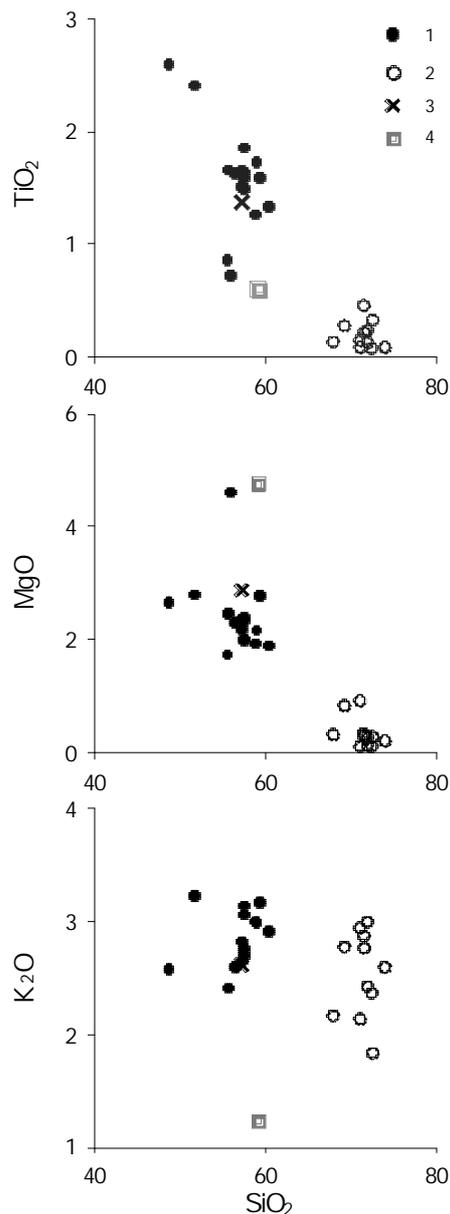


Fig. 1. Compositions of rocks (quadrates and crosses) and melt inclusions (circles) of Gorely (1, 3) and Shiveluch (2, 4).

However these differences can't be explained only by different degrees of fractionation. All melts of Gorely volcanic centre are enriched by trace elements (LILE, HFSE, HREE), while Shiveluch melts are REE-depleted.

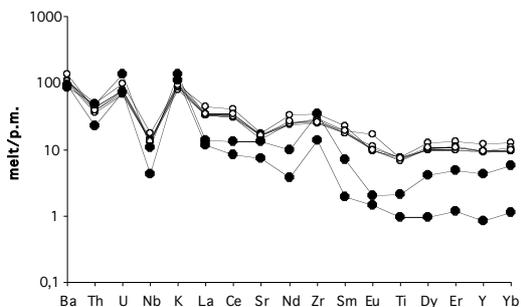


Fig. 2. Spider-diagram for melts of Gorely (empty circles) and Shiveluch (black circles) volcanoes.

The difference between the distribution patterns of trace elements could be explained by the association of these volcanoes with different magmatic sources. Therefore andesitic lavas of Gorely volcano are considered as the result of crystallization of the andesitic melt, while andesitic pumices of Shiveluch volcano are the result of mixing of water-rich dacitic and rhyolitic magmas and xenophases (olivine-spinel xenoliths).

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