



Zircon mineralogy of the earliest and the last Pt-bearing rocks of the Proterozoic Federov-Pansky layered intrusion and Archaean surrounding gneisses.

Nitkina E., Bayanova T., Vursy G.

Geological Institute, Kola Science Center, Russian Academy of Science, Russia
(nitkina@rambler.ru)

Proterozoic Pt-bearing layered Federovo Pansky intrusion is situated in the north-eastern part of the Baltic Shield, has the total area of 4000 km² and includes from west to east Federov, Lastjavr, West-Pansky and East Pansky blocks [Mitrofanov et al., 1997]. Federovo Pansky massif is located along the contact between the Archaean Kola block gneisses and Keivy Terrain with alkaline granites (2.76 Ga) in the north and earlier Proterozoic Imandra-Varzuga zone volcanic rock in south. The massif consist of marginal zone, taxitic gabbronorite zone, norite zone, main gabbronorite zone, lower layered zone, gabbro zone, upper layered zone and upper gabbronorite zone according to Dokuchaeva [1994] and Schissel [2002].

Using the geochronological zircon U-Pb data from three different rock of Federov block of Pt-bearing layered Federovo Pansky intrusion were shown there are at least two magmatic stage - orthopyroxenite and gabbro of the earliest phase (2526-2516 Ma) and Pt-bearing norite of the last phase (2485±9 Ma). This investigation focuses on study morphology, internal structure and chemical composition of zircon from that different Proterozoic rock of Federov block and Archaean surrounding gneisses.

A 42 kg sample of orthopyroxenites was taken, and 12 mg zircon concentrate was extracted. The zircon crystals with 150-200 μm in size show facets of the prism {110} and dipyramid {111}. The colour of zircon grains varies from dark brown to pale and pink. The ZrO₂/HfO₂ ratio has a high meaning from 30 to 65. Zircons contain 350-600 ppm of uranium. The ratio of Pb²⁰⁶/Pb²⁰⁸ varies from 1.2 to 2. The U-Pb age, which was obtained from the four zircon populations, is 2526±6 Ma, which is interpreted as time of orthopyroxenite emplacement.

Zircon concentrate with weight of 110 mg was picked out of a 57 kg sample of the gabbro. Crystals with size from 200 to 400 μm show facets of prisms {100}, {110} and dipyramid {111}. The $\text{ZrO}_2/\text{HfO}_2$ ratio varies from 43 to 62. Zircons have a high uranium concentration equal 1350 ppm. The meaning of ratio $\text{Pb}^{206}/\text{Pb}^{208}$ is 3.6-3.8. The coordinates of three points describe a discordia, which intersects the concordia at the point of 2516 ± 7 Ma and can most likely indicate time of gabbro crystallization.

Zircon concentrate 14 mg were extracted from norite 67 kg. Zircons grains are characterized by prismatic and di-pyramidal habitus and have 250-450 μm in size. Crystals show facets of prisms {100}, {110} and dipyramid {111}. The $\text{ZrO}_2/\text{HfO}_2$ ratio is 57-84. The uranium concentration varies from 800 ppm to 1200 ppm. The ratio has meaning 2.1-2.6. Zircon populations yielded the U-Pb age of 2485 ± 9 Ma, which shows time of the norite crystallization.

A 50 kg gneisses sample contains 400 mg of zircon concentrate. Zircon crystals with 100-300 μm in size have no facets and are characterized by metamorphic zoning. The $\text{ZrO}_2/\text{HfO}_2$ ratio is 40-50. Zircons contain 200-600 ppm of uranium. The ratio of $\text{Pb}^{206}/\text{Pb}^{208}$ has high mean from 6 to 12. The U-Pb age, which was obtained from the four zircon populations, is 2822 ± 20 Ma, which is interpreted as time of metamorphic events.

The mineralogical research of the zircon in Proterozoic rocks of the Pt-bearing Federovo-Pansky intrusive shows that all crystals from the orthopyroxenite, gabbro and norite are characterized by magmatic features: there are the facets of prism and dy-pyramids on the crystals, high means of $\text{ZrO}_2/\text{HfO}_2$ ratio and low of $\text{Pb}^{206}/\text{Pb}^{208}$. Appearing the crystals with dy-pyramids habitus in the rock of the last phase reflects the increase of the crust contamination processes. The zircon grains from Archaean gneisses have no facets, low mean of $\text{ZrO}_2/\text{HfO}_2$ and high mean of $\text{Pb}^{206}/\text{Pb}^{208}$ ratios.

Authors are grateful to Felix P. Mitrofanov for geological consultations.

The work is supported by RFBR 00-05-72032, 04-05-64179, 04-05-64059; Scientific School 2305.2003.5; Russian Science Support Foundation.

Dokuchaeva V.S. Petrology and condition of ore deposition in Federov Pansky intrusion // Geology and genesis of ore deposits. M.: Nauka, 1994, pp. 87-100

Mitrofanov F.P., Bayanova T.B., Balabonin N.L., Sorohtin N.O., Pozilenko V.I. The Kola deep Precambrian collision: new data on geology, geochronology, geodynamic and metallogeny. // Vestnik of S.-Pt. University. Ser. 7. 1997. Vol. 3, \acute{z} 21, pp. 5-18.

Schissel D., Tsvetkov A. A., Mitrofanov F. P., Korchagin A. U. Basal Platinum-

Group Element Mineralization in the Fedorov Pansky Layered Mafic Intrusion, Kola Peninsula, Russia. // *Economic geology*. Vol. 97. 2002. P. 1657-1677