5.5.P02

U-Pb, Pb-Pb tantalite and tourmaline dating of rare metal pegmatites from the Kolmozero-Voron'ya greenstone belt (NE Baltic Shield)

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The Kolmozero-Voron'ya greenstone belt is located in the central suture zone, which separates Murmansk block from the Central-Kola and Keivy blocks. The belt is represented by volcano-sedimentary rocks of Archaean age (2900-2500 Ma). Rare metal pegmatites (Li, Cs with accessory - Nb, Ta, and Be) are concentrated within the belt. Pegmatite fields are placed among amphibolites and gabbroid intrusions in the Northwestern and Southeastern parts of the belt. According to the Rb-Sr data an age of pegmatites was considered to be 2.7 Ma. Until recently there was no generally accepted point of view on origin of pegmatites. Now we have isotopic data for a range of rock complexes that could be pretenders to the role of maternal granites for the rare metal pegmatites. These are: granodiorites of the Porosozero massif, zircon age of which is 2733+/-6 Ma and tourmaline granites of the Southeastern part of the belt - zircon age of 2558+/-6 Ma. Pb-Pb isochronal age of tourmaline from tourmaline granites of the Northwestern part of the belt is - 2520+/-70 Ma.

Zircons from pegmatites are represented mostly by crystals with disturbed structure as a result of fluid influence that put certain restrictions on their use as a geochronometer of crystallization processes. Earlier U-Pb measurements of intensively altered zircon gave an age of 1.9-1.8 Ga and proved this conclusion. For this reason we measured U-Pb age of tantalite – the main concentrator of Ta. For U-Pb dating a sample of pegmatite from excavation of Vasin-Mylk deposit in the Northwestern part of the belt was selected. Three fractions of tantalite yield an age of 2518+/-9 Ma, which probably reflects the time of rare metal pegmatite crystallization, coeval with the age of tourmaline granites.

The obtained results indicate a Late Archaean time for the rare metal pegmatite formation. Pegmatites are probably connected with muscovite-tourmaline granites, which were intruded into the volcano-sedimentary rocks at the final stage of the Kolmozero-Voron'ya greenstone belt development.

5.5.P03

Cathodoluminescence and U-Pb SHRIMP study on granulitic zircons from Siberia

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Along the southern margin of the Siberian craton several crystalline blocks occur, bearing a large variety of metamorphic and magmatic rocks. Of special interest for this study were the granulitic rocks of the Kitoi river, the Sharizhalgai area, Cape Kaltigey and Cape Khadarta.

The investigated granulites vary in their geochemical composition from acidic to basic (77 wt% SiO_2 to 46 wt% SiO_2). Whereas the acidic and intermediate granulites are biotite and garnet bearing, the very basic ones are dominated by two pyroxenes.

The age of the granulites scatter between 1.85 and 3.4 Ga, reflecting a multiple magmatic and metamorphic history [1].

The cathodoluminescence (CL) images of the granulitic zircons show a large structural diversity. Besides weak luminescent and bright luminescent magmatic cores of mid Archean age inherited from the precursors, several outer zones are visible. These zones are related to multiple granulite metamorphism.

Most interesting are the 2.6 Ga old overgrowth zones, which are connected to the first granulite phase which occured in late Archean. The CL of zircon areas related to this age are either dark luminescent with magmatic zoning or very bright luminescent with diffuse structures. This phenomen is rather astonishing because both zones must be a result of the same granulite metamorphism.

Similar CL features were found also for the 1.88 Ga and 1.85 Ga metamorphic events. Again bright and dark luminescent areas of the same age related to the same granulitisation are present in these Siberian granulites.

As this study reveals, granulite metamorphism causes rather complicated cathodoluminescence features in the zircons. The differences in brightness and structural characteristics cover nearly the whole range of known CL phenomena.

References

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