Nature of metamorhosed high-aluminum rocks of southwest Transbaikalia, Russia

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The occurrences of metamorphosed high-aluminum rocks are discovered in southwest Transbaikal Area (Ichetuyskoe, Kyahtinskoe, Haranhoyskoe). They are located within sublatitudinal line in the basin of the Dzhidy and Chikoya rivers. The change of kyanite (Ichetuyskoe) through kyanite-sillimanite (Haranhoyskoe) to sillimanite (Kyahtinskoe) associations was found from west to east. The rocks were transformed in two mineral groups of the rocks at progressive metamorphism. The first group was formed at higher-pressure conditions (subfacies of kyanite-muscovite schists) and is represented by muscovite-kyanite and kyanite-andalusite schists. The second group includes sillimanite-bearing quartzites, sillimanite-feldspar-quartz schists and correspond to high-temperature subfacies of sillimanite-biotite gneiss

The composition of mineral paragenesises testifies to the stages of progressive and regressive metamorphism. The first stage is characterized by presence of sillimanite, kyanite, muscovite, quartz, rutile, feldspars, biotite, apatite and zircon. The andalusite, diaspore, quartz, pyrophyllite, muscovite, and a big group of phosphate and sulphate-phosphate minerals were formed during the regressive stage. Lasulite is the most typical phosphate minerals in regressive stage. It was formed at transformation of primary apatite, which was source of phosphorus. New generation of the apatite was formed on late regressive stage. The presence of high contents of Na and S (up to 4,68 wt. % Na2O and 14,37 wt. % SO3) is main feature of apatite. It also contains up to 1,91 wt. % SrO. The zircon was found in bodies of both kyanite and sillimanite rocks. Features of zircon are higher content of Sc (0,45 - 1,02 wt.% Sc_2O_3) and round shape.

Participation of oxygen of surface water (atmospheric?) is distinctly display in forming rocks of both types. The isotopic composition of oxygen was determined for Kyahtinskoe and Ichetuyskoe occurrences and corresponds to values for lasulite (-0,2 and -5,7 ‰ ^{18}O SMOW) and (- 7,2 and -12 ‰ ^{18}O SMOW) for titanohematite and hematite, accordingly.

The investigations allow affirm with certainty that crusts of weathering were by sources of metamorphosed high-aluminium rocks. Reconstruction of primary composition of rocks also allow assume that pelitic crust of weathering was formed on sedimentary (Kyahtinskoe) and alkaline (Ichetuyskoe) rocks.

Systematics and controls on REE zoning in metamorphic garnet

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In-situ analyses of garnet reveal processes of trace element behavior during metamorphism. Laser ablation ICP-MS analyses reveal the residence, zoning and distribution of trace elements in medium grade metamorphic garnets from the Nason Terrane (Cascades, Washington USA). Ongoing work into the behavior of the trace elements in these garnets sheds light on the controls of rare earth element (REE) zoning during garnet growth.

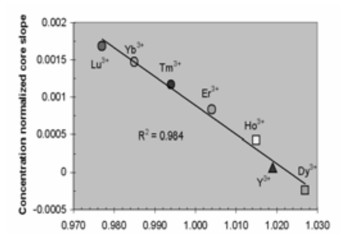

Figure 1

Diffusion limited transport controls the zoning of REE in the cores of these garnets. A striking linear relationship between the nature of REE zoning in the cores of these garnets and ionic radius exists (Figure 1). Annulus formation appears consistent with the transient phase model of Chernoff and Carlson (1999).

Detailed REE mapping of a single 10 mm garnet show a striking disparity between major and trace element zoning. Variation in the zoning patterns between the REEs is also striking (Figure 2). Differences in the Sm and Nd zoning patterns result in Sm/Nd ratios varying from 3.91 in the core to 2.84 at the rim. Zoning of the garnet Sm/Nd ratio coupled with inclusion contamination can result in reduction of precision of the Sm-Nd isochron and possibly lead to erroneous ages.

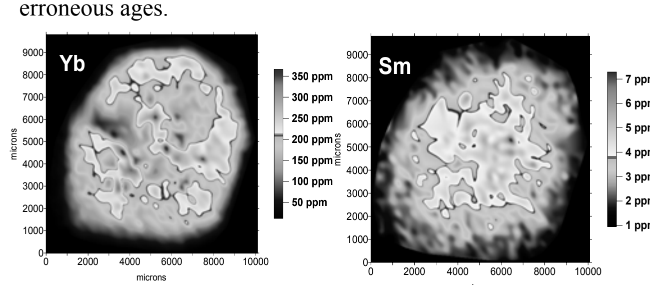

Figure 2

References

Chernoff, C. B. and W. D. Carlson (1999). Geology **27**(6): 555-558.

Stowell, H.H. and Tinkham, D.K. (2003) Geol. Soc. London, Spec. Pub, **220**, 119-145.