

Silicate globules in kyanite from grospyrites of Zagadochnaya kimberlite Pipe (Yakutia): composition, origin

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Spherical silicate globules with unusual composition along with clinopyroxene and garnet microlites have been found in kyanite from grospyrites of the Zagadochnaya kimberlite pipe. The size of the globules is from 30 to 60 microns (Fig.1).

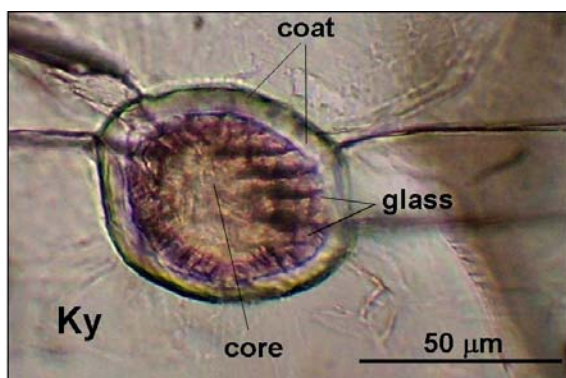


Fig.1. Micrograph of silicate globule in kyanite from grospyrites of the Zagadochnaya kimberlite pipe.

Cracks radiating outward from the globules into the matrix (kyanite) testify that the content of globules is strongly compressed. Typically, globules have a zonal structure: their coat and core (nucleus) are clearly visible under an optic microscope (Fig. 1).

The composition of the globule's coat corresponds to orthoclase (Tabl. 1). Some were found to contain globules high Na and Ca in silicate coat along with potassium. The nucleus of globule is represented by a fine-grained aggregate of silicate and, probably, carbonate phase.

The coat of the globule is essentially enriched in Ba, La, Ce, Nb and other incoherent elements as compared to xenolith minerals (Fig. 2,3). Water content is about 0,6 wt.% (SIMS date).

Table 1. Representative analyses of silicate globules and minerals from grospyrites of the Zagadochnaya kimberlite pipe

| mineral | coat | glass? | Gar | Cpx | Ky |
|--------------------------------|------|--------|------|------|------|
| SiO ₂ | 66.4 | 66.0 | 40.1 | 54.5 | 36.8 |
| Al ₂ O ₃ | 16.9 | 17.0 | 22.2 | 13.2 | 62.7 |
| FeO | 0.4 | 0.5 | 8.8 | 2.1 | 0.2 |
| MgO | 0.4 | 2.3 | 5.2 | 8.6 | 0.0 |
| CaO | 0.1 | 0.2 | 23.3 | 15.4 | 0.0 |
| Na ₂ O | 0.2 | 0.7 | 0.0 | 5.9 | 0.0 |
| K ₂ O | 14.7 | 10.9 | 0.0 | 0.0 | 0.0 |
| Sum | 99.1 | 97.6 | 99.6 | 99.7 | 99.7 |

Coat - coat of silicate globule; Glass - glass (?) in coat. Gar – garnet; Cpx - clinopyroxene crystalline inclusion in kyanite; Ky - kyanite (host mineral).

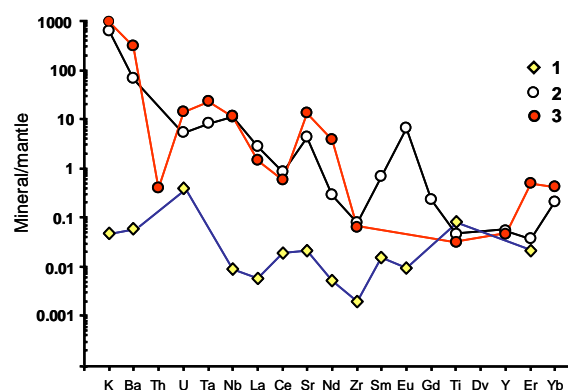


Fig. 2. Primitive mantle-normalized REE and REE patterns of the kyanite and silicate globule in kyanite from grospyrites of the Zagadochnaya kimberlite pipe (SIMS data). 1 – kyanite (host mineral); 2 – coat of silicate globule; 3 – glass (?) in coat.

Compared to the host mineral (kyanite), nucleus is also enriched in Co, Ni, Zn and Cu, which are in trace

amounts in kyanite. Most likely, the source for the increased content of trace and rare-earth elements in globules was fluid and/or the silicate-carbonate melt conserved by kyanite (probably, together with garnet and clinopyroxene microlites) before it was trapped in kimberlite melt.

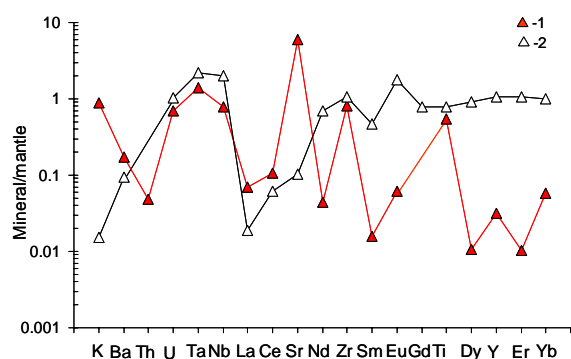


Fig. 3. Primitive mantle-normalized RE and REE patterns of the clinopyroxene crystalline inclusion in kyanite and garnet from grospydites of the Zagadochnaya kimberlite pipe (SIMS data). 1 – clinopyroxene crystalline inclusion in kyanite; 2 – garnet.

Apparently these globules were formed during the interaction of the conserved fluid and/or silicate-carbonate melt with host mineral and, probably, clinopyroxene and garnet crystalline inclusions as pressure decreased when kimberlite melt transported xenoliths to the Earth's surface.

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