Corundum of the Russian Far East

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俄羅斯遠東區的唯一剛玉及鋯石沖積礦是位於Primorsky Kray 的 Nezametnoye 礦床，該區出產的剛玉來源有着各種爭議，而通過檢測該區出產的各種顏色剛玉之內含物，有助瞭解其剛玉的源頭。

The only placer deposit of gem corundum (sapphire) and zircon (jacinth) in the Russian Far East is located in the Primorsky Kray (the Nezametnoye deposit). The origin of these corundum still remains an issue for debate. Some researchers believe that the corundum crystallised from granosyenite melts[1, 2, 3], and others consider alkali-basalts to be the source[4, 5]. The authors' investigation of corundum and their inclusions was undertaken in order to clarify these problems of origin and source.

Over the last two years the main purpose of our fieldwork has been to investigate the prospecting areas located within the Samarka accretionary prism of the Sikhote-Alin accretionary-folded system (in the Russian Far East). These areas are the contacts of the Khungariyskaya series granitoids with the Dzhaur series argillaceous slate, sandstone, and aleurolite.

The high-alumina binary mica cordierite-containing melagranites[6] are related to intrusions of the Khungariyskaya plutonic series (131-105 Ma, isotope dates). These can appear to be corundum-bearing by analogy with the Nezametnoye granitoids with corundum-bearing sienites.

The area studied is located up stream in the basin of the Punchi River, in the south-western part of the Khabarovsky Krai. (Fig. 1). The district is composed of sedimentary and magmatic assemblages with the argillaceous slate of the Largasinskaya volcanogenic series; sandstone, aleurolite; siliceous and argillaceous slate of the Dzhaurskaya suite; alaskitic granite, alaskitic granite-porphyry and quartz porphyry; biotite granite; gabbro; basalts; gravel and sand.

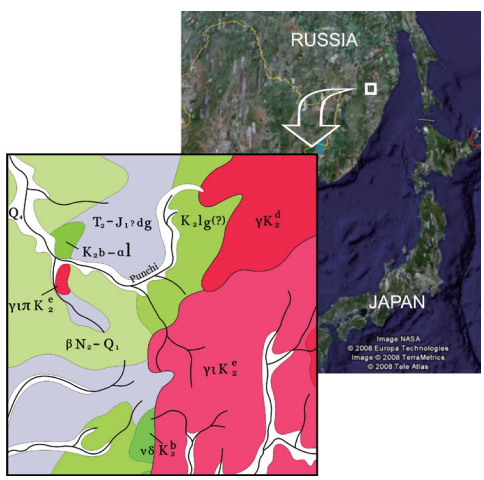

Fig. 1 Geological map of the Nezametnoye deposit

Partial processing of the field data revealed high-alumina facies of potentially corundum binary mica granites containing cordierite, sillimanite, andalusite, and garnet. Schlichs demonstrated many gravel corundum crystals (some of them reaching 7 mm in size) and fragments. While the small size of some of these crystals renders them non-commercial, they are still useful for scientific research.

Findings:

The placer contains corundum, zircon, spinel, garnet, octahedrite, and pyroxene (Fig. 2).

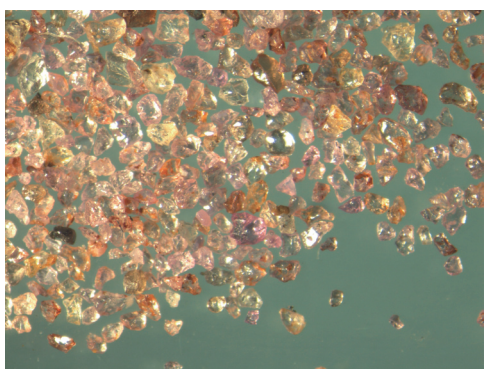

Fig. 2 Corundum and zircon of the Russian Far East

Corundum is represented by hexagonal prisms with basal pinacoids. It is inert in UV rays of 364 and 265 nm.

Different colours of corundum were observed using both the GIA and AIGS systems.

Leucosapphire (Fig. 3) has many inclusions.

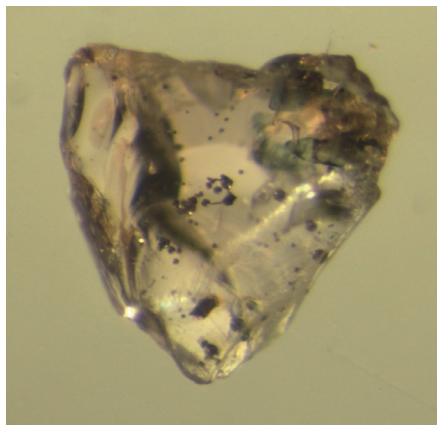

Fig. 3 Leucosapphire of the Russian Far East

Red corundum (Fig. 4). Colour stpR, slpR; tone from colourless to dark c(w)-dk; saturation from grayish to bright gr (br) – v.

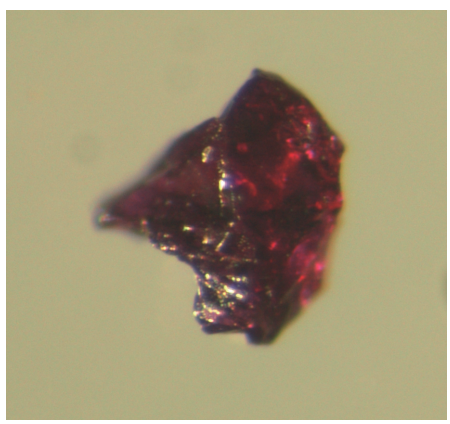

Fig. 4 Red corundum of the Russian Far East

Fancy ***silky*** corundum is tabular in appearance and 5x7 mm sizes. Cross-sections demonstrate growth zonality - alternation of differently coloured bands with sharp borders repeating crystal facets (Fig. 5).

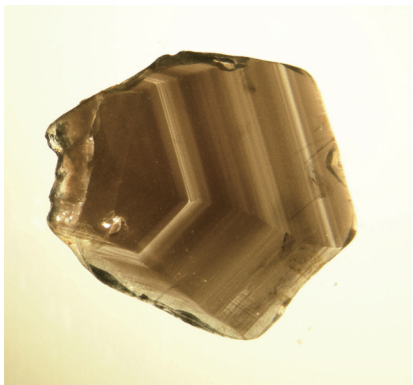

Fig. 5 Fancy silky corundum of the Russian Far East

Milky blue corundum. Colour B; tone c(w)-l, saturation gr (br) – mst.

Pink corundum (Fig. 6). Colour R; tone c(w)-m, saturation gr (br).

Milky pinkish blue corundum (Fig. 6).

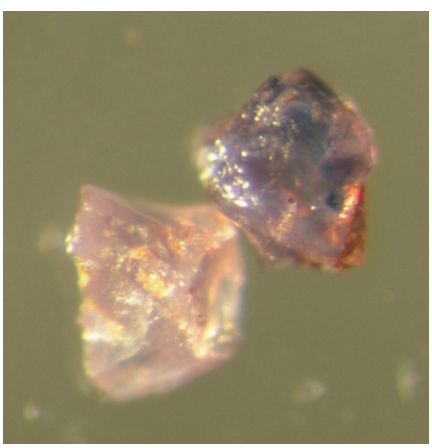

Fig. 6 Milky blue corundum of the Russian Far East

Some samples of the corundum were analyzed with the JXA-8100 (JEOL electron probe microanalyzer) at the Far East Geological Institute of the Far Eastern Branch of Russian Academy of Sciences. 19 polystyrene cartridges were prepared to investigate the mineral composition of the corundum and its inclusions.

As predicated, the studies showed that the composition of corundum of different colours shows definite elements of admixture. Transparent corundum mainly contains no admixtures; their composition being 100% Al_2O_3. However, some of them do include 0.32-0.55% of TiO_2.

Findings:

Pink corundum contains 0.3-1.04% of Cr_2O_3, some samples simultaneously include an admixture of Cr_2O_3 (0.4-0.7%) and TiO_2 (0.4-0.6%).

Red corundum contains 4.01-5.94% of Cr_2O_3; a high chrome content making them purple in tone.

Brown corundum contains mainly TiO_2 (0.37-1.96%), although both Cr_2O_3 (0.7-2.3%) and TiO_2 (0.5-0.8%) were seen.

Milky blue corundum contains TiO_2 (0.7-1.49%) only.

Milky pinkish blue corundum contains both Cr_2O_3 (0.6-1.58%) and TiO_2 (0.7-1.81%).

The inclusions discovered are as follows: spinel composed of MgO 8.71%, Al_2O_3 59.92%, MnO 0.43%, FeO 28.46% (Fig. 7, 8), ilmenite, rutile, and garnet.

Minerals were also determined that by their composition are close to feldspar and clay mineral.

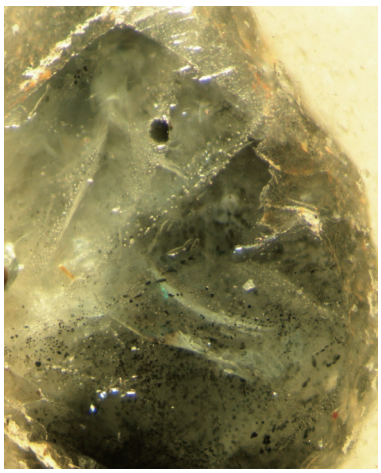

Fig. 7 Spinel in corundum of the Russian Far East

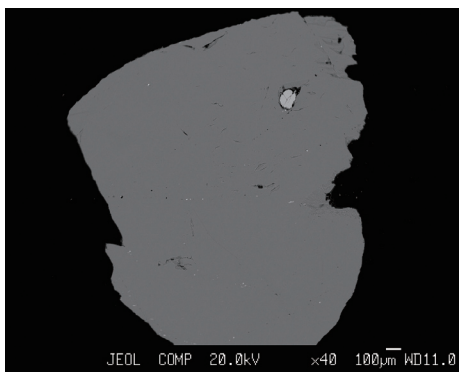

Fig. 8 Spinel in corundum analyzed with the JXA-8100

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