

# Gemstone Resources of the Russian Far East

## The Mineragenic Approach and Prospects of the Development of Gemmology

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作者對俄羅斯遠東區域的寶石資源，以礦物學途徑作基本描述，並以此展望該區域的寶石產業及寶石學的發展。

One of the main tasks of gemmology is to reveal the provenance of precious stones, showing both their definite paragenesis as individual mineragenic and tectonic structures interacting with country rocks, and their peculiarities of petrology and geochemistry. Over the last decades, in different regions of the Russian Federation, the foundations have been laid for a scientific approach to prospecting for gemstone deposits. Theoretical principles of predictive-mineralogical research have been developed along scientific lines and a new line of investigative gemmological minerageny founded.

Until recently the main gemstone treasure troves in Russia were Yakutia and the Ural Mountains, and quite reasonably so. Other regions of Russia, including the Far East region, were not paid much attention. However, changes in the government's budgetary policy over the last decade, especially with regard to regional mining policies, and also the development of a new direction in Russian geological

science – a gemmological minerageny - have given rise to some positive changes. Many of the Far Eastern gemstone deposits and occurrences were discovered during exploration undertaken in the search for and extraction of ore minerals. The appraisal of the prospects of the hitherto poorly inspected gem material of the region is vital since the significance of gemstone deposits in the mining industry is increasingly being recognised. A valuable contribution to the solution of the problem is being made by scientists of the gemmological laboratory of the Far East Geological Institute. They have studied the interrelation of the formation of both ore and gemstones in varying geodynamic conditions in Sikhote Alin. Also a scientific basis for the placement, formation, and forecasting of gemstone deposits and occurrences has been developed. Evaluation of the gemmological characteristics of the gemstone deposits is being carried out and prediction criteria for the location of separate gem types set out. Gemstones occur over a wide geographical area in Primorsky Krai. In the gold-bearing placer of Kedrovka River (Krasnoarmeisky region, Nezametniy placer) gem quality sapphires (Figs 1, 2, 3) and zircons - hyacinth and jargon - (Fig. 4) of high quality were found in 1987. In the

north of the region a deposit of gem opal (Figs 5, 6) has been discovered [Ref. 3]. At the Sinerechenskoye deposit druses of non-transparent, brownish, collection andradite are being extracted (Fig. 7).



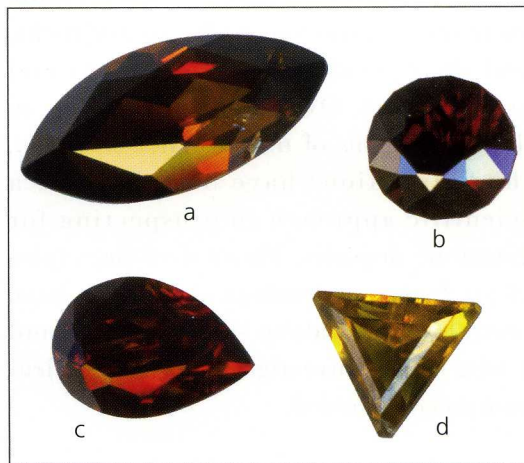
**Fig. 1** Dipyramidal sapphire crystal, 5.03 ct Nezametnoe deposit, Primorye  
*Photo: Y. Vas'kovskyi*



**Fig. 2** Faceted sapphire, 1.20 ct Nezametnoe deposit, Primorye  
*Photo: V. Sazonov*



**Fig. 3** Faceted sapphire, 2.53 ct Nezametnoe deposit, Primorye  
*Photo: V. Sazonov*

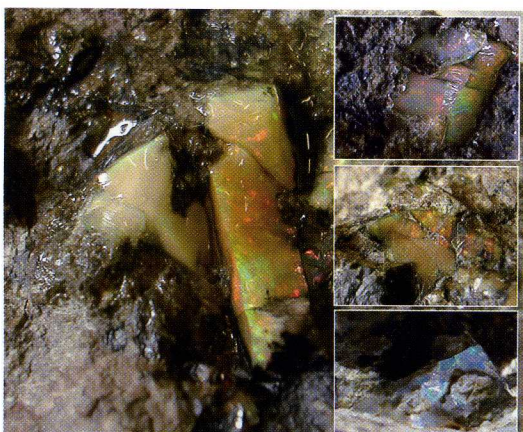


**Fig. 4** Faceted zircons: a, b, c – hyacinth, from 0.54 ct up to 0.89 ct, d – jargon, 0.30 ct Nezametnoe deposit, Primorye  
*Photo: S. Mikhaylova*





**Fig. 5** Fragment of opal veinlet. Raduzhnoe deposit, Primorye  
*Photo: V. Tishkina*



**Fig. 6** Opal in rock. Raduzhnoe deposit, Primorye  
*Photo: V. Tishkina*



**Fig. 7** Recrystallisation druse of andradite (25.10.6 cm) Sinerechenskoye deposit, Primorye  
*Photo: Y. Vas'kovskyi*

The deposits of the Dal'negorsk region have already been known to us for more than a hundred years. Lead, zinc, silver, bismuth, boron and other materials are mined there. But these deposits are also well-known for their gemstones (Fig. 10) and collection minerals [Ref. 4], which number several dozens of varieties, some of which, among them danburite, have no analogues anywhere in the world. (Figs 8, 9), [Ref. 5].



**Fig. 8** Faceted danburite, 3.25 ct Dal'negorsk, Bor deposit, Primorye  
*Photo: Y. Vas'kovskyi*



**Fig. 9** Faceted danburite, 4.20 ct Dal'negorsk, Bor deposit, Primorye  
*Photo: Y. Vas'kovskyi*





**Fig. 10** Faceted amethyst-like quartz, 2.42 ct, Dal'negorsk, Bor deposit, Primorye  
*Photo: V. Sazonov*

Deposits of morion, rich in crystals of high quality, and separate crystals of almandine in metamorphic rocks are known in the west of Primorye. Investigations, have confirmed that crystals of morion, smoky quartz (Figs 11, 12), and beryl (in smaller quantities) are widespread within the Verkhne-Shibanovskoye tin-tungsten deposit. Morion and smoky quartz form crystals with well-marked crystallographic shapes. The smoky quartz of the Verkhne-Shibanovskoye deposit is a rich yellowish-brown in colour with natural dark tincture, has adequate transparency, and according to gemmological criteria can be used as both gem-quality and collection material [Ref. 6].



**Fig. 11** Faceted smoky quartz, 6.58 ct Verkhne-Shibanovskoye deposit, Primorye  
*Photo: Y. V Sazonov*



**Fig. 12** Faceted smoky quartz, 3.5 ct Verkhne-Shibanovskoye deposit, Primorye  
*Photo: V Sazonov*

One of the examples of an association, similar in composition to the gemstones of Verkhne-Shibanovskoye, is the Zabytoye deposit. Topaz (Fig. 13), beryl, and smoky quartz (Fig. 14) of gem-quality are formed in greisens here.



**Fig. 13** Faceted Cut topaz, 2.52 ct Zabytoe deposit, Primorye  
*Photo: V Sazonov*





**Fig. 14** Faceted smoky quartz, 3 ct and 3.52 ct, Zabytoe deposit, Primorye  
*Photo: V Sazonov*

Some corundum has been discovered in the Yevreyskaya Autonomous District (the Sutara Gold mine). In 2009 marundite samples were found in pegmatites within the Sutara area at the Petrovsko-Afanasyevsky site, and then corundum crystals and their fragments were discovered [Ref. 7] in the basins of the Petrovsky and Mikhaylo-Afanasyevsky rivers. Marundite contains, mainly, corundum, margarite, and phlogopite (Fig. 15). Corundum from the placer are violetish-blue, grayish-blue and purple in colour and specimens up to 5 cm in size have been found (Fig. 16).



**Fig. 15** Corundum rock – marundite. Sutara deposit (Yevreyskaya Autonomous District)  
*Photo: S. Buravleva*



**Fig. 16** Corundums. Sutara deposit (Yevreyskaya Autonomous District)  
*Photo: S. Buravleva*

In the south-west part of Khabarovsk Krai in the upstream section of the Mukhen river basin, in the junction of Sikhote-Alin' and the Sredne-Amourskaya depression, the occurrences of corundum, in the form of placers, found during exploration for ore minerals (gold, tin, tungsten and others) are widespread. The crystals of corundum are presented by hexagonal prisms with basal pinacoids and numerous small rounded crystals and their fragments. Individual stones may be up to 7 mm in diameter. Corundums, found at the "Berezovyi" area come in different colours and tints: pink, red, milky-blue [Ref. 8].

The gemstone resources concentrated in the Russian Far East, have the potential to form a rich new source of raw materials and mining centres. The Far East region, especially Primorsky Krai, is of particular interest to those who are actively engaged in developing the jewellery (gemstone) industry in Russia. The full potential and prospects of the Far East have not been revealed yet.

The successful development of the jewellery (gemstone) industry in the country leading to Russia taking its place alongside the world's leading proponents of the jeweller's art is a real possibility if several conditions are adhered to. They are: the development of a fundamental science in cooperation with industrial geology, the appropriate legislation, and global marketing.

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