

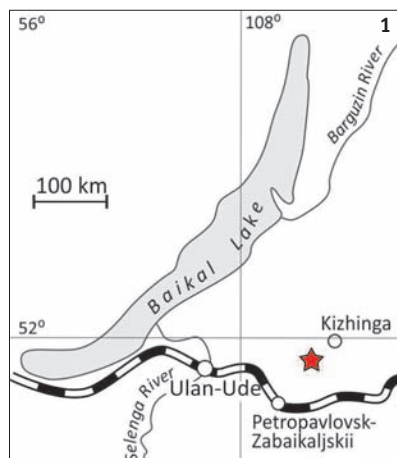
BERYLLIUM MINERALS OF ERMAKOVKA DEPOSIT (WESTERN TRANSBAIKAL REGION, RUSSIA)

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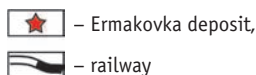
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In loving memory of

*Anatoly I. Ginzburg, Nadezhda P. Zabolotnaya, Mariya I. Novikova, Valentina T. Shatskaya, and Evgeny P. Shpanov,
our Teachers and Colleagues whose researches are the base for the study of the Ermakovka deposit*



1. Geographical location of the Ermakovka deposit.



The Ermakovskoe fluorite-beryllium economic deposit in the Western Transbaikalian Region (frequently named as Ermakovka) is a high-grade and large location not only for Russia but for the whole world. This deposit, the most interesting in geology and mineralogy, has no analogs worldwide and is very important in the study and preservation of mineral diversity. It is unique not only in geological singularities but museum and mineralogy aspects: aesthetic quality of ore specimens and diversity of mineral assemblages with numerous beryllium silicates: bertrandite, phenakite, eudidymite, meliphanite, leucophanite, milarite, bavenite, and helvite. Therefore, this deposit earns the status of global geological memorial (Geological memorials..., 1998). Moreover, it is located within the ecological buffer zone of Baikal Lake requiring special admission of the state ecological expertise for human activities.

Beryllium, the major economic ore constituent, is a *crucial* element. Owing to its unique properties, it is essential in nuclear, aerospace, and electronic



2. View of Ermakovka open pit.
Photo: D.I. Cherepanov.

* Some chemical analyses of the Ermakovka bavenite correspond to the mineral species bohseite according to modern mineralogical nomenclature. In this paper, the name bavenite is used for the bavenite-bohseite solid solution members as a superspecies name (*Editor's note*).

3. Dumps of Ermakovka deposit.
Photo: D.I. Cherepanov.



industry and electric, telecommunication and other high-tech branches (Klapovskaya, 2008). Geographical and economic location of the deposit is profitable. It is situated 180 km ESE of Ulan-Ude and 45 km of the Bada station of the Transbaikal railway in the central part of the Western Transbaikal region in the southwestern part of Republic of Buryatia with advanced infrastructure (*Fig. 1*). Owing to economic and high scientific value of the deposit, its further operation should be accompanied with the systematic selection of the collection of ores and host rocks sampled by qualified specialists similar to those during operation in 1975–1989.

Brief History of Investigation and Mining

The deposit was discovered by G.A. Ermakov using prospecting guides elaborated by A.I. Ginzburg and his staff in the course of the 1:200,000 geological surveys in 1964–1965. For example, all fluorite prospects were recommended to be examined for beryllium with portable beryllometer, which is based on the neutron flux resulted from γ -irradiated Be. When fluorite prospects of the future Ermakovka were measured, the Be grade was so high that geologists suspected instrument failure. However, instrument readings were verified.

The deposit was explored in 1965–1975 by the Ermakovka exploration crew of the Buryatia Geological Bureau supervised by V.I. Galchenko. Initial drilling of zone I showed that orebody sharply pinched out and doubts began to arise in prospectiveness of the location. However, N.P. Zabolotnaya, a supervisor of the VIMS beryllium group, enforced continuation of exploration as a result of which nine ore zones were delineated. After termination of exploration in 1975, the deposit was transferred to the Transbaikal Mining and Processing Works of Ministry of Medium and Special Machine Building of the USSR and was open-cut mined for beryllium to 1989. Currently, the open pit (*Fig. 2*) stopped at the 836 m level is partly flooded, but the dumps attractive in mineralogy were retained (*Fig. 3*).

The staff of VIMS strongly studied geology, mineralogical and chemical composition of ores, and ore and concentrate processing throughout exploration and operation (A.I. Ginzburg, N.P. Zabolotnaya, M.I. Novikova, and V.I. Galchenko in 1969; A.I. Ginzburg, N.P. Zabolotnaya, I.I. Kupriyanova, M.I. Novikova, V.T. Shatskaya, and E.P. Shpanov in 1975; A.I. Ginzburg, I.I. Kupriyanova, M.I. Novikova, V.T. Shatskaya, E.P. Shpanov, N.P. Zabolotnaya, N.N. Vasilkova, Z.A. Zhurkova,

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4. Sheaf-like split crystal of **milarite**.
5 x 3.5 cm.
Specimen: I.V. Pekov, #4722.
Photo: M.B. Leybov.

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7. Radiated columnar aggregates of **bavenite** enclosed in purple fluorite with reddish microcline. 6 x 4 cm.
Specimen: I.V. Pekov, #3973.
Photo: M.B. Leybov.

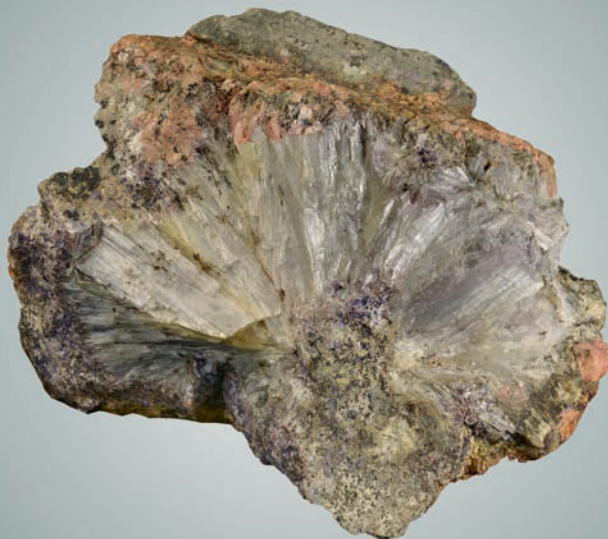
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8. Spherulite of **phenakite** on fluorite with microcline and pyrite. 5 x 3 cm.
Specimen: I.V. Pekov, #3672.
Photo: M.B. Leybov.

5. **Bavenite**. 8 x 7 cm. Fersman Mineralogical Museum. #83391, I.I. Kupriyanova, 1985. Photo: M.B. Leybov.

6. **Milarite**. 6.5 x 6 x 5.5 cm. Fersman Mineralogical Museum, #86321, G.S. Ripp, 1989. Photo: M.B. Leybov.

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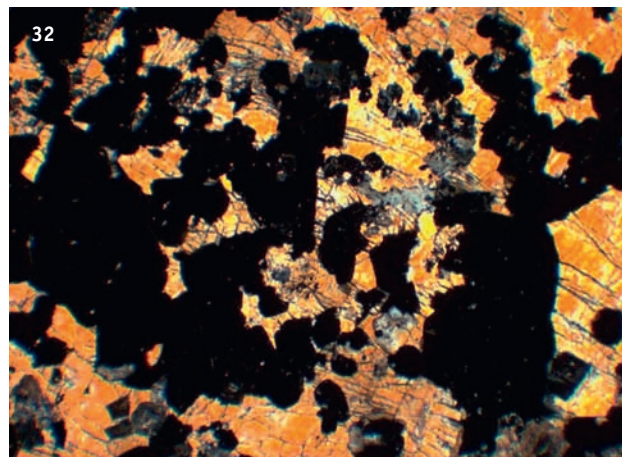


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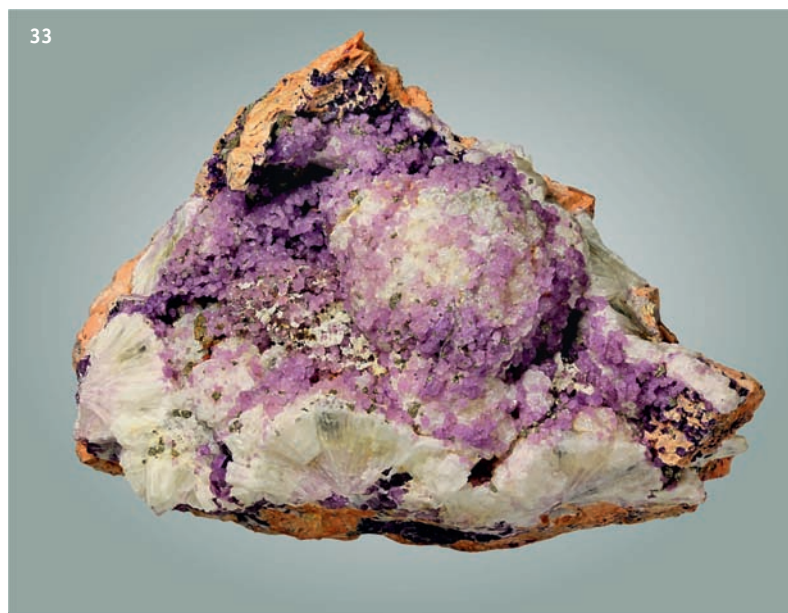
31. Photomicrograph of radiated **phenakite** clusters associated with fluorite in albitite stringer cutting porphyry syenite. Crossed polars. Specimen from collection of M.I. Novikova, thin section 3391. Photo: N.N. Krivoshchekov.

32. Photomicrograph of skeletal **phenakite** crystals enclosed in fluorite from cellular ore. Magnification 17x, crossed polars. Specimen from collection of M.I. Novikova, thin section 2646. Photo: N.N. Krivoshchekov.

33. Spherulite crust and isolated large spherulites of white **phenakite** (2.5 cm in diameter) on the wall of fracture cutting pink microcline. Phenakite is powdered by late lilac fluorite and negligible pyrite. 8 x 6.5 x 4 cm. Found in 2014. Visual identification. Specimen and photo: V.V. Levitsky.

34. Slightly split crystal of **phenakite** (1.5 cm). Found by O.E. Kudryavtseva, 2009. Specimen and photo: M.M. Moiseev.

35. Lilac spherulites of **phenakite** (up to 1.2 cm) colored by fluorite inclusion in growth zones. Specimen and photo: B.Z. Kantor.



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36. Light spherulites of **phenakite** (up to 2 cm in diameter) on the wall of carbonate-fluorite-phenakite veinlet (calcite leached by acid). Image width 6.5 cm. Found in early 1990th. Specimen and photo: V.V. Levitsky.

37. Spherulites and isolated crystals of **phenakite** intergrown with fluorite on microcline of 12 cm in height. (a) Fragment, (b) general view of specimen. Ore zone II, open pit of Ermakovka deposit. Specimen and photo: D.I. Cherepanov.

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37b

