Supplement to "Minerals of Korea"

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Introduction

In the second edition of *Minerals of Korea,** the writer intended to summarize all the data on the minerals which had been discovered in Korea up to 1940. When it was published in 1941, however, the writer found some omissions. Subsequently, as new localities of minerals together with minerals new to Korea were discovered, he tried to summarize knowledge of these additional data every five years, to compile finally a conclusive supplement to the former work.

At the end of World War II, as it had been about five years since the publication of the second edition of *Minerals of Korea,* the writer collected all the additional data obtained during the past five years on localities and minerals new to Korea, although he had lost some notes and some were carried back to Japan and have already been partly published in the journal "Kōbutsu to Chishitsu" (Minerals and Geology).

In this paper all additional data, published and unpublished, have been revised in part and summarized. Some papers still need revision, but are unfortunately inaccessible to the writer at present. The writer would be most happy if readers of this paper would bring any points to his attention.

1. Natural bismuth

Locality: Ilgwang Mine, Wŏl-li, Ilgwang-myŏn, Tongnae-gun Kyŏngsang-namdo

Natural bismuth[18] from the Ilgwang Mine, Tongnae-gun is usually associated with galena, tetrahedrite, zinc blende, bournonite or gudmundite and is 0.01–0.2mm in size. Under the microscope, it is granular, showing fine reticulated polysynthetic twins.

* Rep. Geological Survey of Korea, v. 15, 1941.

2. Natural silver

Locality: Kŏmdŏk Mine, Sindŏng-ni, Puktuil-myŏn, Tanch'ŏn-gun, Hamgyŏng-namdo

Natural silver[54] from the Kŏmdŏk Mine, Tanch'ŏn-gun is found replacing margins of zinc blende or as very small grains scattered in ores which consist chiefly of hemimorphite and smithsonite.

3. Molybdenite

Locality: Tanje Mine, Koegong-ni, Susan-myŏn, Chech'ŏn-gun, Ch'ung-ch'ŏngpukto
Sodŏk Mine, Myŏngdŏng-ni, Kyenae-myŏn, Changsu-gun, Chŏllapukto.
Onjŏng-ni, Oegŭmgang-myŏn, Kosŏng-gun, Kangwŏn-do
Chungjŏng Mine, Imnam-myŏn, T'ongch'ŏn-gun, Kangwŏn-do.
Pusŏng Mine, Fusŏng-ni, Changjin-gun, Hamgyŏng-namdo

Molybdenite from the Tanje Mine, Chech'ŏng-gun forms hexagonal tabular crystals, 10cm in diameter, showing short pyramidal crystals(?), with well developed basal planes.

The basal planes have striae vertical to prismatic planes and are dented in the center. The pyramidal planes show striation nearly parallel to the basal planes and are uneven and rough. There is a deformed zonal structure.

Molybdenite from the Sodŏk Mine, Changsu-gun occurs in pegmatite in two-mica granite. Crystals, hexagonal tabular, showing crystal planes c(0001) and l(10$\bar{1}$3), 4 cm in diameter of table. The basal plane, with striae perpendicular to the prismatic planes, is depressed toward the center.

Molybdenite[18] from Chjŏng-ni, Kosŏng-gun occurs in quartz veins in granite. Crystals, hexagonal tabular, tabular diameter 1 cm, thickness slightly over 1 mm, and with crystal planes: c (0001), m (10$\bar{1}$0) and l(10$\bar{1}$3), c-plane issmooth. Striae due to repeating of m- and l-planes are seen on l-plane, m-plane is small.

Molybdenite[31] from the Chungjŏng Mine, T'ongch'ŏn-gun occurs in pegmatitic quartz vein in injection-gneiss and biotite granite, and is associated with pyrite, chalcopyrite, beryl, fluorite, amazonstone and biotite. Crystals rare, usually occur as irregular scales, some 2–3 cm in diameter.

Molybdenite from the Pusŏng Mine, Changjin-gun occurs in quartz veins in biotite granite intruding gneiss. The crystals are hexagonal and tabular, the diameter being less than 1 cm and often showing characteristic plum-flower-like aggregations.

4. Zinc blende

Locality: Yonghwa-dong, Ilwŏl-myŏn, Yŏngyang-gun, Kyŏngsang-pukto

Zinc blende[10] from Yonghwa-dong, Yŏngyang-gun is grayish white in color, has a metallic luster and brown streak. It consists mainly of an o-plane, together

with a small a-plane. On the a-plane are seen many striations parallel to the edge formed by the a-and o-planes. The crystals are more or less curved, 2–5 mm in diameter, and are associated with a little pyrite and thuringite.

5. Pentlandite

Locality: Kosansang-ni, Wangjing-myŏn, Yŏnch'ŏn-gun, Kyŏnggi-do
Tŏktong-ni, Sannae-myŏn, Namwŏn-gun, Chŏlla-pukto
Sindae-ri, Sudong-myŏn, Kosŏng-gun, Kangwŏn-do
Kongch'i-dong, Yongdang-ni, P'an'gyo-myŏn, Ich'ŏn-gun, Kangwŏn-do

Pentlandite[9] from Kosansang-ni, Yŏnch'ŏn-gun is found in an amphibole schist of the Rensen (Yŏch'ŏn) system. It is granular, about 0.1 mm in diameter, disseminated and associated with pyrrhotite and chalcopyrite.

Pentlandite[9] from Tŏktong-ni, Namwŏn-gun is embedded in biotite amphybolite in porphyritic granite-gneiss and associated with pyrrhotite and chalcopyrite.

Pentlandite[9] from Sindae-ri, Kosŏng-gun occurs in amphybolite in metagneiss and is associated with pyrrhotite and violarite.

Pentlandite[40] from Kongch'i-dong ("Okura" Mine), Ich'ŏn-gun occurs in chlorite-schist in granite-gneiss, filling up interstices of pyrrhotite and pyrite. In parts, it is altered to violarite.

6. Greenockite

Locality: Hwangjŏl-li, Segong-myŏn, P'yŏngsan-gun, Hwanghae-do

Greenockite[29] from Hwangjŏl-li, P'yŏngsan-gun is a secondary mineral of zinc blende, formed in the contact zone of limestone and granite, and occurs as incrustations of thin film or powder of zinc blende, the color being yellow.

7. Niccolite

Locality: Sunch'ŏn Mine, Unp'yŏng-ni, Sŏ-myŏn, Sunch'ŏn-gun, Chŏlla-namdo

Niccolite[39),43] from the Sunch'ŏn Mine, Sunch'ŏn-gun occurs in galena-pyrite-zinc blende veins in granite-gneiss and is associated with pentlandite or native silver. It is 1 mm or so in diameter and light crimson-brown.

8. Pyrrhotite

Locality: Sujung Mine, Chŏkkong-ni, Susan-myŏn, Chech'ŏn-gun, Ch'ungchŏng-pukto

Pyrrhotite[28] from the Sujung Mine, Chech'ŏn-gun occurs in hübnerite-bearing quartz veins, associated with chalcopyrite and pyrite. It shows hexagonal short prisms, 3.5 cm in length, and 4 cm in diameter. Crystal planes u(40$\bar{1}$1), c(0001); the prismatic planes seem to show transverse striations due to repetition of u-planes.

9. Violarite

Locality: Tŏkha-ri, Yangas-myŏn, Kanghwa-gun, Kyŏnggi-do
Nabu-dong, Nodong-ni, Wangjing-myŏn, Yonch'ŏn-gun, Kyŏnggi-do
Kongch'i-dong, Yongdang-ni, P'angyo-myŏn, Ich'ŏn-gun, Kangwŏn-do
Sindae-ri, Sudong-ryŏn, Kosŏng-gun, Kangwŏn-do

Violarite[9] from Tŏkha-ri, Kanghwa-gun occurs in gabbro in meta-gneiss and is associated with magnetite, ilmenite, pyrrhotite and chalcopyrite. Under the microscope, it is faintly reddish in color, imbedded in the central portion of pyrrhotite, showing cleavages intersecting at right angles with each other, more soft than pyrrhotite and turns to dark gray with foaming in HNO_3 solution.

Violarite[11] from Nabu-dong, Yonch'ŏn-gun occurs in hornblende peridotite in mica schist of the Rensen (Yonch'ŏn) system and is associated with pyrrhotite and chalcopyrite.

Violarite[11] from Yongdang-ni, Ich'ŏn-gun occurs in a green rock in granite-gneiss and associated with pyrrhotite and copper-pyrite.

Violarite[11] from Sindae-ni, Kosŏng-gun occurs in hornblendite dyke in gneiss and associated with pyrrhotite, chalcopyrite and pentlandite.

10. Co-bearing pyrite

Locality: Okp'o-myŏn, Talsŏng-gun, Kyŏngsang-pukto

Pyrite[39] from Okp'o-myŏn, Talsŏng-gun is massive or shows crystal forms with a(100), o(111) and e(211), and is associated with limonite and micaceous iron ore (hematite). The chemical composition is as follows:

Table 1

	S	Fe	Co	As	Ni
1	51.30	44.90	0.55	very small	none
2	51.94	45.50	0.56	,,	,,

11. Chloanthite

Locality: Sunch'ŏn Mine, Ungyo-ri, Sŏ-myŏn, Sunch'ŏn-gun, Chŏlla-namdo

Chloanthite[39] from the Sunch'ŏn Mine, Sunch'ŏn-gun is found in association with smaltite, niccolite, galena, and zinc blende, is grayish in color and includes cobalt.

12. Chloanthite-smaltite

Locality: Sunch'ŏn Mine, Ungyo-ri, Sŏ-myŏn, Sunch'ŏn-gun, Chŏlla-namdo

Chloanthite-smaltite[39),43] from the Sunch'ŏn Mine, Sunch'ŏn-gun is found with chloanthite, galena, pyrite, zinc blende, and is hardly discernable from gersdorffite. It shows a fine zonal structure due to the arrangement of Ni-rich and Co-rich portions.

13. Cobaltite

Locality: Semjŏng Mine, Kalchŏl-li, Pung-myŏn, Taedŏk-kun, Ch'ungch'ŏng-namdo
Haman Mine, Yŏhang-myŏn, Haman-gun, Kyŏngsang-namdo
Talchŏlli Mine, Hada-myŏn, Tanch'ŏn-gun, Hamgyŏng-namdo

Cobaltite[39] from the Samjŏng Mine, Taedŏk-kun is found in quartz veins in the Yokusen (Okchŏn) system is reddish silver white, 3–9 mm, sometimes 1 cm in diameter, and shows crystal planes, a(100), o(111) and e(211), the e-plane being especially well developed.

Cobaltite[39] from the Haman Mine, Haman-gun is irregularly massive or occurs in hexahedron crystals, commonly 0.03–0.06 mm or rarely 0.7–1 mm in diameter. Under the microscope, it is silver white with a reddish tinge, with a strong metallic luster, and is found in paragenesis with Cu ore.

Cobaltite[39] from Talchŏl-li, Tanch'ŏn-gun is embedded in cobalt deposits in mica-schist of the Matenrei (Mach'ŏl-lyŏng) system and is in paragenic relation with Co-bearing pyrite and arsenopyrite. Commonly it shows no crystal forms but in some cases shows cubic crystals. The mineral is accompanied by a little chalcopyrite, pyrite, pyrrhotite and molybdenite.

14. Gersdorffite

Locality: Sunch'ŏn Mine, Unp'yŏng-ni, Sŏ-myŏn, Sunch'ŏn-gun, Chŏlla-namdo

Gersdorffite[43] from the Sunch'ŏn Mine, Sunch'ŏn-gun is grayish white and occurs in galena-pyrite-zinc blende veins, associated with niccolite.

15. Arsenopyrite

Locality: Sach'ŏl-li, Pung-myŏn; Hanim-ni, Chungnam-myŏn; Haman-myŏn and Yohan-myŏn, Haman-gun, Kyŏngsang-namdo
Yŏmisan Mine, Chodong-ni, Sindong-myŏn, Chŏngsŏn-gun, Kwangwŏn-do

Arsenopyrite[8] from Haman-gun occurs in auriferous quartz veins in slate of the Keishō (Kyŏngsang) formation and is associated with chalcopyrite, arsenopyrite, pyrrhotite and quartz. It shows short prismatic crystals, 7 mm or so in length, the crystal planes being as follows: c(001), m(110), u(104), q(011).

In size, the m-plane is the largest and the u-plane is next, while the q-plane is very small. On the u-plane are striations due to repetition of u and q-planes or of c-and u-planes. It contains cobalt.

Arsenopyrite[8] from Hanim-ni, Haman-gun occurs in cavities of auriferous quartz veins in granite. Its crystals consist of c(001) and m(110), the c-plane being provided with striations due to repetition of c and u-planes. It contains 1% or so of cobalt.

Arsenopyrite[39] from the Yŏmisan Mine, Ch'ŏngsŏn-gun is associated with iron-zinc blende, is silver-white, massive or shows granular crystals of 10 mm or so in diameter. The crystals consist of m(110) and u(104) planes, and are striated on the u-plane, often showing penetration-twins. It contains 0.2–1.0% of cobalt.

16. Gudmundite

Locality: Ilgwang Mine, Wŏl-li, Ilgwang-myŏn, Tongnae-gun, Kyŏngsang-namdo

Gudmundite[18] from the Ilgwang Mine, Tongnae-gun is found in pyrrhotite, with native bismuth, galena and chalcopyrite. It shows a pseudo-eutectic structure and contains small grains of pyrrhotite.

17. Klaprotholite

Locality: Holgol Mine, Suan-gun, Hwanghae-do

Klaprotholite[42] from the Holgol Mine, Suan-gun occurs in paragenesis with bornite, chalcopyrite and native bismuth, and is microgranular.

18. Cosalite-teallite

Locality: "Yamaguchi", "Furukawa" and Yŏnsu Mines, Chŏnch'ang-myŏn, Ch'angsŏng-gun, P'yŏngan-pukto

Cosalite-teallite[45] from Chŏnch'ang-myŏn, Ch'angsŏng-gun occurs in tungsten-bearing quartz veins.

19. Bournonite

Locality: Kŏmdŏk Mine, Sindŏng-ni, Puktuil-myŏn, Tanch'ŏn-gun, Hamgyŏng-namdo

Ilgwang Mine, Wŏl-li, Ilgwang-myŏn, Tongnae-gun, Kyŏngsang-namdo

Bournonite[42] from the Kŏmdŏk Mine, Tanch'ŏn-gun is found as inclusions of galena and is 1–5 μ across. Under the reflecting microscope, its color is similar to that of galena, but it is slightly harder.

Bournonite[18] from the Ilgwang Mine, Tongnae-gun is accompanied by galena, native bismuth, tetrahedrite and zinc blende, and is 0.01–0.1 mm across. Under the reflecting microscope, it is granular and shows polysynthetic twins and in some cases, two sets of twins intersecting at an angle of 98° with each other.

20. Wittichenite

Locality: Holgol Mine, Suan-gun, Hwanghae-do

Wittichenite[42] from the Holgol Mine, Suan-gun is found in small quantity, and is associated with bornite, chalcopyrite and native bismuth.

21. Boulangerite

Locality: Kŏmdŏk Mine, Sindong-ni, Puktuil-myŏn, Tanch'ŏn-gun, Hamgyŏng-namdo

Ilgwang Mine, Wŏl-li, Ilgwang-myŏn, Tongnae-gun, Kyŏngsang-namdo

Boulangerite[42] from the Kŏmdŏk Mine, Tanch'ŏn-gun is found as needle-shaped long prismatic crystals in galena. In reflecting light it resembles galena but shows a bluish green color and strong pleochroism; in the direction parallel to the elongation of needle-shaped or fibrous crystals, it is light in color, while in the other direction, at right angles to the former, it is slightly dark and dark bluish

green. In crossed-nicols, it is markedly anisotropic, showing straight extinction and grayish yellow—grayish blue at 45° position.

Boulangerite[16] from the Ilgwang Mine, Tongnae-gun is associated with galena, native bismuth and bournonite, is 0.1–0.2 mm across, and is needle-shaped or long prismatic.

22. Meneghinite

Locality: Tŏngnae Mine, Wŏl-li, Ilgwang-myŏn, Tongnae-gun, Kyŏngsang-namdo

Meneghinite[18] from the Ilgwang Mine, Tongnae-gun occurs as microscopic grains on the margin of arsenopyrite or as fine veins in the latter and is associated with chalcopyrite and pyrrhotite.

23. Stannite

Locality: "Furukawa", "Yamaguchi" and Yŏnsu Mines, Chŏnch'ang-myŏn, Ch'angsŏng-gun, P'yŏngan-pukto

Stannite[45] from Ch'onch'ang-myŏn, Ch'angsŏng-gun is found in tungsten-bearing quartz veins, brownish gray or yellowish gray, massive and brittle. It forms aggregates of granular crystals 1.0mm across, including zinc blende, chalcopyrite and cassiterite. The aggregations are, moreover, pierced by pyrite- or zinc blende-bearing quartz veins and fine veins of bismuthinite and native bismuth or of cosalite-teallite veins.

24. Opal

Locality: Hwap'yo Mine, Hwaam-ni, Tong-myŏn, Ch'ŏngsŏn-gun, Kangwŏn-do

Opal[8] from the Hwap'yo Mine, Chŏngsŏn-gun occurs as concretions in limestone. It is ellipsoidal, 10 cm in long diameter and 7 cm in short diameter, showing a grayish green color; on the surface small crystals of marcasite are seen; H.=6, G.=2.25, N=1.491.

25. Diatomite

Locality: Yulli-san, Sanmyŏng-ho and the river basin of the Taegyo-ch'ŏn, Ch'ŏlwŏn-ŭp, and Sakkok, Ojŏng-ni, Inmong-myŏn, Ch'ŏlwŏn-gun, Kangwŏn-do

Diatomite[35] from Ch'olwŏn-gun is sediment of fresh water lake origin, on plateau-basalt. It is of excellent quality and rich in supply.

26. Molybdite

Locality: Yŏngwŏl-baengnyŏn Mine, Pophŭng-ni, Suju-myŏn, Yŏngwŏl-gun, Kangwŏn-do

Molybdite[46] from the Yŏngwŏl-baengnyŏn Mine, Yŏngwŏl-gun is yellowish in color and silky in luster. The chemical composition (analyzed by T. Sudō) is as follows:

Table 2

MoO_3	Fe_2O_3	H_2O (−)	H_2O (+)	Insoluble	Total
52.5	18.9	14.3	3.0	11.1	99.0

Chemical formula: $3MoO_3 \cdot Fe_2O_3 \cdot 8H_2O$

27. Corundum

Locality: Sangok-tong, Chŏgum-ni, Sangnyŏng-myŏn, Yŏnch'ŏn-gun, Kyŏnggi-do
Chinsa-ri, Sinhŭmg-myŏn, Kangsŏ-gun, P'yŏngan-namdo
Haunsŭng-ni, Suha-myŏn, Tanch'ŏn-gun, Hamgyŏng-namdo

Corundum[41] from Sangok-tong, Yŏnch'ŏn-gun is associated with andalusite or muscovite. It occurs in blocks of 10 cm or less in diameter. The mineral is blue, translucent or opaque and irregularly spherical, the diameter being 2–5 mm. G.=3.9–4.1.

Corundum from Chinsa-ri, Kangsŏ-gun occurs in a cyanite-sillimanite-muscovite rock. Uniaxial negative; Z=1.762, X=1.753, Z−X=0.009. It shows partings, normal to X.

Corundum from Haunsŭng-ni, Tanch'ŏn-gun is found in the river bed of the Namdae-ch'ŏn, light red or purplish red in color. Some are 0.5–1.5 cm and at times 2.8 cm in long diameter.

28. Titaniferous hematite

Locality: Tomok-tong, Tŏksan-myŏn, Kilchu-gun, Hamgyŏng-pukto

Titaniferous hematite[10] from Tomok-tong, Kilchu-gun is grayish black and granular. The diameter of the grains is 2–5 mm, with little variation. It shows sections nearly hexagonal in outline, with a dark brown streak. Ti=4.76%, Fe=44.24% (analyzed by T. Mizuma).

29. Spinel

Locality: Samhwa Iron Mine, Samhwa-ri, Puksam-myŏn, Samch'ŏk-kun, Kangwŏn-do
Sŏngdŏk, Ch'unhŭng-dong, Yangsa-myŏn, Kilchu-gun, Hamgyŏng-pukto

Spinel[10] from the Samhwa Iron Mine, Samch'ŏk-kun is found sticking to magnetite. It is black and consists only of o(111), the diameter being 1 mm or so; N≒1.77.

Spinel[4] from Sŏngdŏk, Kilchu-gun occurs in metamorphosed limestone and is associated with diopside, phlogopite and calcite; N=1.73, diameter=1–2 mm.

30. Picotite

Locality: T'ongch'ŏn coal field, T'ongch'ŏn-gun, Kangwŏn-do

Picotite[2] from the T'ongch'ŏn coalfield occurs as a rock-forming mineral in olivine basalt.

31. Ilmenite

Locality: Kŭmsok Mine, Yonghwa-dong, Chip'o-ri, Kalmal-myŏn, Ch'ŏlwŏn-gun, Kangwŏn-do
Sach'ŏng-san, Haju-ri, Hyŏnnae-myŏn, P'yŏnggang-gun, Kangwŏn-do
Tomok-tong, Tŏksan-myŏn, Kilchu-gun, Hamgyŏng-pukto

Ilmenite[28] from the Kŭmsok Mine, Ch'ŏlwŏn-gun is black. G.≒4.1, H.=5.5. It is associated with columbite and garnet, and occurs as short prism, showing the following crystal planes: c(0001), a(11$\bar{2}$0), n(22$\bar{4}$3), n'($\bar{2}$4$\bar{2}$3), π($\bar{1}$2$\bar{1}$3), π(11$\bar{2}$3). The c-plane is well developed and, in consequence, the crystals are often tabular, having n-and n'- planes and a-and a'- planes always in symmetry. One to three pairs of a-planes are seen. The basal diameter is about 1 cm and the prismatic length 7 mm.

Ilmenite from Sach'ŏng-san, P'yŏnggang-gun is associated with lepidomelane and titanite, and is about 10 cm in diameter. It shows partings of three different directions.

Ilmenite[10] from Tomok-tong, Kilchu-gun occurs as fine grains in pegmatite in limestone and dolomite and is black. The grains are irregular in form and 5 mm in diamter. Ti=31.53%, Fe=36.61% (analyzed by T. Mizuma).

32. Magnetite

Locality: Samhwa Mine, Samhwa-ri, Puksam-myŏn, Samch'ŏk-kun, Kangwŏn-do

Magnetite[10] from the Samhwa Mine, Samch'ŏk-kun occurs in the contact deposits and shows crystal forms which consist of o(111) and d(110), some crystals being 5 cm in diameter. It is covered by spinel and delessite.

33. Braunite

Locality: Kŭmjik-san Mine, Nam-myŏn, Chŏngsŏn-gun, Kangwŏn-do

Braunite[28] from the Kŭmjik-san Mine, Chŏngsŏn-gun is associated with goethite, spessartite, etc., and is iron black in color and metallic in luster. It occurs as micro-crystals which are generally irregular in external form, but in cases bi-pyramidal, showing in section, tetragonal or octagonal outlines and perfect partings of three different directions. It is soluble in HCl.

34. Ilmeno-rutile

Locality: Tallok Mine, Kunt'al-li, Kalmal-myŏn, Ch'ŏlwŏn-gun, Kangwŏn-do
Samsal-li, Yangdong-myŏn, Yangp'yŏng-gun, Kyŏnggi-do

Ilmeno-rutile from the Tallok Mine, Ch'ŏlwŏn-gun occurs in pegmatitic veins, associated with columbite and beryl. It is composed of the following crystal planes: s(111), a(100), h(210), m(110).

There are three types of crystals: (1) single crystals, flattened in the a-plane,

(2) crystals which show contact-twins with (101) as the twinning plane, and terminal planes of a-and m-plane and (3) crystals which consist of a terminal-plane of h.

Ilmeno-rutile from Samsal-li, Yangp'yŏng-gun occurs in pegmatitic veins, associating with beryl, a variety of zircon, etc. TiO_2=21.77%, Ta_2O_3=21.67%, Nb_2O_5=41.31% (analyzed by K. KIMURA).

35. Pyrolusite

Locality: Kyŏngsang Mine, Kyŏn'gong-myŏn, Kyŏngju-gun, Kyŏngsang-pukto
Chisa-ri, Noksan-myŏn, Kŭmhae-gun, Kyŏngsang-namdo
Kasa-ri, Sindong-myŏn, Ch'ŏngsŏn-gun, Kangwŏn-do
"Kōshūha" Mine and Kanggyŏng Mine, Wŏnnam-myŏn, Kŭmhwa-gun, Kangwŏn-do

Pyrolusite[33] from the Kyŏngsang Mine, Kyŏngju-gun is found in the Taikyū (Taegu) formation of Shiragi (Silla) series and is associated with psilomelane and manganite.

Pyrolusite[33] from Chisa-ri, Kŭmhae gun is found deposited along joints of quartz-porphyry and is associated with psilomelane, manganite, pyrite, galena and zinc blende. Mn=23.4% (analyzed by the Geological Survey, Government-General of Korea).

Pyrolusite[33] from Kasa-ri, Ch'ŏngsŏn-gun occurs as lenses in a limestone of the Chōsen (Chosŏn) system, associated with psilomelane and manganite.

Pyrolusite[33] from Wŏnnam-myŏn, Kŭmhwa-gun occurs as veinlets or tabular masses in alternating beds of limestone, dolomite and phyllite of the Syōgen (Sangwŏn) system, associated with psilomelane, rhodonite, garnet, olivine, pyrite and quartz.

36. Manganite

Locality: Kyŏngsang-Mine, Kyŏn'gong-myŏn, Kyŏngju-gun, Kyŏngsang-pukto
Chisa-ri, Noksan-myŏn, Kŭmhae-gun, Kyŏngsang-namdo
Kasa-ri, Sindong-myŏn, Ch'ŏngsŏn-gun, Kangwŏn-do

Manganite[33] from the Kyŏngsang Mine, Kyŏngju-gun is found in the Taikyū (Taegu) formation of the Shiragi (Silla) series, associated with psilomelane and pyrolusite.

Manganite from Chisa-ri, Kŭmhae-gun occurs as lenses along joints of quartz porphyry, and is associated with psilomelane, pyrolusite, pyrite, galena and zinc blende.

Manganite from Kasa-ri, Ch'ŏngsŏn-gun occurs as lenticular masses in limestone of the Chōsen (Chosŏn) system, associated with psilomelane, Pyrolusite and calcite.

37. Psilomelane

Locality: Kyŏngsang Mine, Kyŏn'gong-myŏn, Kyŏngju-gun, Kyŏngsang-pukto

Chisa-ri, Noksan-myŏn, Kŭmhae-gun, Kyŏngsang-namdo
"Nippon Kōshūha" and Kanggyŏng Mines, Wŏnnam-myŏn, Kŭmhwa-gun, Kangwŏn-do
Kasa-ri, Sindong-myŏn, Chŏngsŏn-gun, Kangwŏn-do
Sinp'yŏng-dong, Agan-myŏn, and Hago-myŏn, Myŏngch'ŏn-gun, Hamgyŏng-pukto

Psilomelane[33] from the Kyŏngsang Mine, Kyŏngju-gun is associated with pyrolusite and manganite in the Taikyū (Taegu) formation of the Shiragi (Silla) series.

Psilomelane[33] from Chisa-ri, Kŭmhae-gun is found deposited along joints of quartz porphyry and is associated with pyrolusite and manganite.

Psilomelane[33] from Wŏnnam-myŏn, Kŭmhwa-gun occurs forming veinlets or tabular masses in alternating bed of limestone, dolomite and phyllite of the Shōgen (Sangwŏn) system. It is accompanied by psilomelane, rhodonite, garnet, olivine, pyrite and quartz. It contains manganese as follows (analyzed by Geological Survey, Government-General of Korea):

Table 3

	Kōshūha Mine	Kanggyŏng Mine
Mn	38.89%	40.76%

Psilomelane[33] from Kasa-ri, Ch'ŏngsŏn-gun occurs as lenses in the Great limestone series of the Chōsen (Chosŏn) system and is associated with manganite, pyrolusite and calcite. Mn=32.52% (analyzed by Geological Survey, Government-General of Korea).

Psilomelane from Myŏngch'ŏn-gun occurs in the Shichihōzan (Ch'ilbongsan) alkali trachyte. That of Sinp'yŏng-dong contains 35.86% Mn (Analyzed by Geological Survey, Government-General of Korea).

38. Wad

Locality: Kŭmch'ŏn-gun, Hwanghae-do
Chunghwa-gun, P'yŏngan-namdo
Kŏmun-dong, Majang-myŏn, Ch'ŏlwŏn-gun, Kangwŏn-do
Kŭmjik-san Mine, Sindong-myŏn, Ch'ŏngsŏn-gun, Kangwŏn-do

Wad from Kŭmch'ŏn, Chunghwa and Ch'ŏlwŏn-gun forms beds in limestone of the Shōgen (Sangwŏn) system. That of Kŏmun-dong contains 15.75% Mn (analyzed by Geological Survey, Government-General of Korea).

Wad[28] from the Kŭmjik-san Mine, Ch'ŏngsŏn-gun is found as small scales, one degree or so in hardness, more or less porous and light. It shows a brown streak and is easily decomposed by HCl. Under the microscope, it shows straight

extinction parallel to elongation of the scale. Elongation Z′, X′ ⊥ Z′, Z′=deep brownish, X′=brownish. $1.77<N_1$, $N_2 \fallingdotseq 1.8$.

The chemical composition of the mineral, accompanied by much calcite and sericite, is as follows (analyzed by T. MIZUMA):

Table 4

SiO_2	FeO	Al_2O_3	CaO	MgO	MnO	lg. loss
11.72	2.52	11.76	32.70	1.01	21.47	18.40

39. Calcite

Locality: Taeya-ri, Kŏch'ang-gun, Kyŏngsang-namdo
Ilwŏl Mine, Ilwŏl-myŏn, Subi-myŏn, Yŏngyang-gun, Kyŏngsang-pukto
Kohyŏn Mine, Ibam, Simch'ŏn-dong, Koan-myŏn, Chŏngju-gun, P'yŏngan-pukto
Somin-dong, Yongsan-myŏn, Yŏngbyŏn-gun, P'yŏngan-pukto
Ŏbok-tong, Haksŏ-myŏn, Haksŏng-gun, Hamgyŏng-pukto

Calcite[55] from Taeya-ri, Kŏch'ang-gun occurs in cavities in gold veins. It shows hexagonal prismatic crystals with c(0001) and m(10$\bar{1}$0), the basal plane a little curving. H.=3, G.=2.8. The chemical composition is as follows (analyzed by Y. TANIYAMA):

Table 5

CaO	MnO	CO_2	Insoluble	H_2O	Total
54.54	1.21	43.20	0.07	0.96	99.98

Calcite[49] from the Ilwŏl Mine, Yŏngyang-gun occurs as a gangue mineral or in druses. That in druses forms, in cases, crystal aggregates composed of large crystals with r(10$\bar{1}$1), exceeding 10 cm on an edge length. Some show f(02$\bar{2}$1) and e(01$\bar{1}$2), but these are smaller, being 2–3 mm in edge length and later in crystallization than the former.

Calcite[10] from Somin-dong, Yŏngbyŏn-gun occurs in druses in country rock of zinc deposite in limestone of the Chōsen (Chosŏn) system and is colorless, white or light brown, transparent to translucent, showing the following crystal planes: m(10$\bar{1}$0), a(11$\bar{2}$0), r(10$\bar{1}$1), σ(51$\bar{6}$4), ν(21$\bar{3}$1), ω(31$\bar{4}$5).

It shows two sorts of crystal forms, one rhombohedral and the other dog-tooth-shaped scalenohedron. The rhombohedral forms occur in two further types of crystal as follows:

(a) The crystals mainly consist of well-developed r and small ν, together with very small m, σ and ω. Crystals belonging to this type are most common and

are colorless, white or light brown, the diameter being 12 cm or more. The crystals are simple or twinned. In the twinning forms, there are two types; a symmetric form with a common axis and c-plane as boundary, and another which has c-planes in common and interpenetrates.

(b) The crystals are white to grayish white, the surface being partly stained with brown. The planes, excepting the m-plane, are more or less chemically affected and dull; the m-plane is covered with a yellowish brown incrustation and is bright.

Crystal planes are m, r, σ, ω and ν. The σ-plane is the best developed; the ω-plane is next; the r-plane is small; the m-and ν-planes are smaller and the ν-plane is barely visible. The ω-plane shows striations, which are considered to be the cause of the repetition of the r-plane, and is generally curved.

Some large crystals reach 8 cm in diameter. Simple crystals are common, but show, in some cases, twinning, with symmetrical attachment to the c-plane and the c-axis in common.

Two types are also seen in the scalenohedral forms. One consists mainly of scalenohedral planes, with r-, f-and m-planes. It is colorless or white, transluscent, and 3 cm in the length of the c-axis. The other consists mainly of the ν-plane, with m-and f-planes also present. The c-axis are 8 cm in length.

Calcite[4] from Ŏbok-tong, Haksŏng-gun occurs as calcite veins in hornblende schist, and is colorless and translucent. It shows prismatic crystals, composed of e$(01\bar{1}2)$ and m$(10\bar{1}0)$, the prismatic length being 1 cm and prismatic diameter 0.5 cm.

40. Mangano-calcite

Locality: Paegyang-ni, Namsan-myŏn, Ch'unch'ŏn-gun, Kangwŏn-do

Mangano-calcite[10] from Paegyang-ni, Ch'unch'ŏn-gun occurs as a rock-forming mineral of limestone in crystalline-schist, associated with diopside, spessartite, titanite, kali-feldspar, quartz, sericite, prehnite, pyrrhotite, apatite, tremolite, epidote and zinc blende. N=1.685.

41. Mangano-dolomite

Locality: "Suganuma" Kŭmhwa Mine, Tul-li, Wŏnnam-myŏn, Kŭmhwa-gun, Kangwŏn-do

Mangano-dolomite[8] from the "Suganuma" Kŭmhwa Mine, Kŭmhwa-gun forms manganese deposit, associated with spessartite and rhodonite. It is white or lights red. Under the microscope, it generally shows no pleochroism, but is rarely pleochroic as follows: Ng=light brownish, Np=colorless~transparent. The mineral occurs as aggregations of small crystals in a mosaic structure, each crystal having polysynthetic twinning. N_0=1.690—1.742.

42. Brugnatellite

Locality: Namch'ŏl-li, Pongsan-myŏn, P'yŏngsan-gun, Hwanghae-do

Brugnatellite[10] from Namch'ŏl-li, P'yŏngsan-gun occurs in contact deposit of magnetite and is associated with magnetite, dolomite, chondrodite (?) and vesuvianite. The crystals are thinly tabular and arranged more or less radially. In the interstitial spaces crystallized magnetite is seen. The mineral is white and flexible, the crystal plate is 0.5–1.0 mm in diameter, 0.01–0.03 mm in thickness, and shows an imperfect cleavage parallel to the basal plane and a parting perpendicular to the cleavage. Uniaxial negative. Ng=1.538, Np=1.510.

43. Breunnerite

Locality: "Hōkoku" Cobalt Mine, Amnyang-myŏn, Kyŏngsan-gun, Kyŏng-sang-pukto

Breunnerite[43] from the Hōkoku Cobalt Mine, Kyŏngsan-gun occurs as a gangue mineral in the cobalt deposits.

44. Orthoclase

Locality: Nojŏn-dong, Ch'ŏngnyong-myŏn, Pakch'ŏn-gun, P'yŏngan-pukto
Taedang Mine, P'anhang-ni, Hwach'ŏn-myŏn, Hongch'ŏn-gun, Kang-wŏn-do

Orthoclase[8] from Nojŏn-dong (Nojŏl-li), Pakch'ŏn-gun shows prismatic crystals which elongate generally along the a-axis and rarely along the c-axis, and is tabular parallel to the b-plane.

The crystals elongated to the a-axis show two habits, long and short. The long prismatic crystals are as much as 1 cm in diameter and 3.5 cm long, showing baveno twins, though terminel planes are imperfect, showing no distinct plane.

The short prismatic crystals are simple, 1.5 cm in diameter, 2 cm long and clearly show both terminal planes as follows: b(010), c(001), m(110), z(130), y($\bar{2}$01), n(021), o($\bar{1}$11).

The c- and b-planes are well developed, the m-and y-planes follow, and the z, n- and o-planes are small. Crystals, tabular parallel to b-plane, show carlsbad twins, with b-, m-, z- and o-planes (Fig. 1, Pl. 1).

Orthoclase from the Taedang Mine, Hongch'ŏn-gun is a rock-forming mineral of granite. In this case, the prismatic and terminal planes are perfectly developed (Fig. 2, Pl. 1).

There are short prismatic crystals (a-axis=2 cm, b-axis=1 cm, c-axis=1 cm) and long ones (a-axis=1.5 cm, b-axis=1 cm, c-axis=2 cm); in both cases the crystals are tabular to the b-plane. The recognized crystal planes are as follows: b(010), c(001), m(110), y($\bar{2}$01).

45. Microcline

Locality: Ka-dong, Unsan-gun, P'yŏngan-pukto

Microcline[7] from Ka-dong, Unsan-gun occurs as a phenocryst in granite-gneiss. The crystals are simple or twinned, 2–8 cm in long diameter, grayish white,

rough on the surface and include hornblende and biotite. The crystal planes are as follows: b(010), c(001), m(110), y($\bar{2}$01).

In simple crystals, the b-and c-planes are especially well developed, the crystals being elongated along the a-axis. These often show carlsbad twins and rarely trilling twins due to combination of carlsbad and baveno twins. (−) 2V=80−88°. α=1.521, β=1.524, γ=1.526, $\gamma-\alpha$=0.005±0.001.

The marginal portion of the crystals commonly shows narrow a zonal structure.

46. Microcline-perthite

Locality: "Tanryoku" (Tallok) Mine, Kunt'al-li, Kalmal-myŏn, Ch'ŏlwŏn-gun, Kangwŏn-do

Microcline-perthite[28] from the Tanryoku Mine, Ch'ŏlwŏn-gun occurs in association with beryl and columbite, in pegmatite in granite. These are 19 cm (horizontal) and 16 cm (vertical) in prismatic diamters, 20 cm in prismatic length, white and a little rough on the crystal planes. $N_2 \fallingdotseq 1.522$, $N_1 \fallingdotseq 1.515$. The crystal planes are as follows: b(010), c(001), m(110), f(1$\bar{3}$0), M(1$\bar{1}$0), z(130), x($\bar{1}$01), y($\bar{2}$01), **m**(111), p($\bar{1}$11), o($\bar{1}$11), a(100).

Of these, the b-and c-planes are best developed, to almost the same extent, and the terminal planes **m** and M are also developed to the same extent. Next come the f-, z-and x-planes, while the p- and o-planes are small (Fig. 3, Pl. 1).

47. Amazonstone

Locality: Chungjŏng Mine, lmnam-myŏn, T'ongch'ŏn-gun, Kangwŏn-do

Amazonstone[31] from the Chungjŏng Mine, T'ongch'ŏn-gun occurs as a gangue mineral in molybdenite-bearing pegmatitic quartz veins, associated with beryl, fluorite, biotite and garnet. In most cases, the mineral is irregularly massive, grass-green, and shows carlsbad twins. It encloses quartz, beryl and biotite. γ=1.525.

48. Cleavelandite

Locality: Sinnamch'ŏl-li, Namch'ŏn-ŭp, P'yŏngsan-gun, Hwanghae-do

Cleavelandite from Sinmanch'ŏl-li, P'yŏnsan-gun forms a rock-forming mineral of pegmatite which intrudes into an alternation of limestone and slate and is associated with amazonstone, quartz, albite, lepidolite and zinnwaldite.

49. Oligoclase

Locality: Samhwa Mine, Saenggŭm-ni, Segong-myŏn, P'yŏngsan-gun, Hwanghae-do

Oligoclase[10] from the Samhwa Mine, P'yŏngsan-gun is found as a rock-forming mineral of pegmatite in limestone, associated with quartz, zoisite, fluorite, epidote and bismuthinite(?). The mineral is white and shows prismatic crystals consisting of the following planes: m(110), M(1$\bar{1}$0), b(010), x($\bar{1}$01), c(001).

In general aspect, the crystals are rhombic prisms, composed largely of m-and

M-planes, with small b-and c-planes and a well developed x-plane. The prism is 4 mm in short diameter, 7 mm in long diameter and 20 mm in prismatic length. G.=2.56. N_1=1.539, N_2=1.544. CaO=3.35% (analyzed by T. MIZUMA).

50. Diopside

Locality: Holgol Mine, Suan-gun, Hwanghae-do

Diopside[48] from the Holgol Mine, Suan-gun is found accompanying tremolite, calcite, quartz, orthoclase, titanite and brucite in the contact-zone of limestone and shows prismatic or teragonal tabular crystals. The prismatic crystals consist of (100), (001) and (110)? showing a penetration-twin with c-axis as the twinning axis or a polysynthentic twin with the composition-plane of basal planes.

In the tabular crystals (100) and (001) only are developed, and a polysynthetic twin with the basal plane as the composition-plane is seen. The mineral is light brown, green or white, subglassy in luster and shows scaly or, at times, uneven fracture. G.=3.279 (D20°C). $c \wedge Z = 38°42'$. Optical plane=(110), (+) $2V \fallingdotseq 60°$, $\nu < \rho$, Np=1.6690, Nm=1.6800, Ng=1.6986.

The chemical composition (analyzed by S. MURATA) is as follows:

Table 6

SiO_2	CaO	MgO	Fe_2O_3	MnO	Ig. loss	Total
54.79	26.59	16.21	2.27	tr.	0.22	100.08

$Ca\,Mg\,Si_2O_6$ 94% (diopside mol.)
$Ca\,Fe\,Si_2O_6$ 6% (hedenbergite mol.)

51. Mangano-diopside

Locality: Paegyang-ni, Namsan-myŏn, Ch'unch'ŏn-gun, Kangwŏn-do

Mangano-diopside[10] from Paegyang-ni, Ch'unch'ŏn-gun is found in limestone and is associated with mangano-calcite, spessartite, titanite, kali-feldspar, quartz, sericite, prehnite, pyrrhotite, apatite, tremolite, epidote and zinc blende. It is light green in color. Mangano-diopside of 0.1% Mn: $c \wedge Z \fallingdotseq 33°$, $Np \fallingdotseq 1.685$, Mangano-diopside of 1.78% Mn: $c \wedge Z \fallingdotseq 43°$, $Np \fallingdotseq 1.685$.

52. Mangan-hedenbergite

Locality: Kalgŭm-ni, Yŏnp'ung-myŏn, Koesan-gun, Ch'ungch'ŏng-pukto

Mangan-hedenbergite[10] from Kalgŭm-ni, Koesan-gun occurs in the contact-zone between limestone and granite, and is associated with stilpnomelane(?) and

Table 7

SiO_2	Fe_2O_3	FeO	MnO	CaO	Total
46.70	7.73	13.11	7.67	19.65	94.86

goethite. It is brownish and shows prismatic cleavage, but no distinct crystal form. (+) 2V large, $c \wedge Z = 54°$, $N_2 \fallingdotseq 1.742$, $N_1 \fallingdotseq 1.723$. The chemical composition is as Table 7 (analyzed by T. MIZUMA).

53. Wollastonite

Locality: Hwach'ŏn Mine, Hwach'ŏl-li, Sangmu-myŏn, Koesan-gun, Ch'ungch'ŏng-pukto

Wollastonite from the Hwach'ŏn Mine, Koesan-gun is associated with calcite and prehnite. It is white and has a silky luster. The fiber is 2 cm. $Z \fallingdotseq 1.631$, $Y \fallingdotseq 1.629$, $X \fallingdotseq 1.614$.

54. Cummingtonite

Locality: Paegun-san, Kwangyang-gun, Chŏlla-namdo

Cummingtonite[8] from Paegun-san, Kwangyang-gun accompanies zircon, actinolite, hornblende, apatite and magnetite.

It is hypidiomorphic and shows no distinct crystal forms, but its prism plane is considered to be constructed of m(110); perfect cleavage parallel to m-plane and marked polysynthetic twins having a contact plane of (100) are observed. Diameters of the prisms are 0.07–0.15 mm and the lengths are 0.2 mm or less. It is colorless, transparent or faintly yellowish brown. X=colorless, Y=Z=light yellowish brown ($\fallingdotseq$ colorless), $X < Y < Z$, Y//b, Optical plane // (010), $c \wedge Z = 15°$. (−) 2V large. $N_2 = 1.720$, $N_1 = 1.684$.

55. Rhodonite

Locality: "Suganuma" Kŭmhwa Mine, Tul-li, Wŏnnam-myŏn, Kŭmhwa-gun Kangwŏn-do

Rhodonite from the "Suganuma" Kŭmhwa Mine, Kŭmhwa-gun is associated with mangano-dolomite and spessartite, and is light red in color. Under the microscope it is colorless, transparent and granular. (+) 2V large, $Nm \fallingdotseq 1.725$. The margins of the crystals are altered into mangano-dolomite.

56. Beryl

Locality: Samsal-li, Yangdong-myŏn, Yangp'yŏng-gun, Kyŏnggi-do
Taehwa Mine, Nŭngam-ni, Angsŏng-myŏn, Ch'ungju-gun, Ch'ungch'ŏng-pukto
Munŭi-myŏn, Ch'ŏngju-gun, Ch'ungch'ŏng-pukto
Kumi-ri, Chungoebang-ni, Tanyang-myŏn, Tanyang-gun, Ch'ungch'ŏng-pukto
Sujung Mine, Chŏkkong-ni, Susan-myŏn, Chech'ŏn-gun, Ch'ungch'ŏng-pukto
"Nakamura-machi", Taejŏn-bu, Ch'ungch'ŏng-namdo
Chindong-myŏn, Pung-myŏn, Taedŏk-kun, Ch'ungch'ŏn-namdo
Ch'angnak Mine, Ch'angnak-tong, P'unggi-myŏn, Yŏngju-gun, Kyŏngsang-pukto

Taedang Mine, P'anhang-ni, Hwachŏn-myŏn, Hongch'ŏn-gun, Kangwŏn-do
Kunt'al-li, Kalmal-myŏn, Ch'ŏlwŏn-gun, Kangwŏn-do
Turyu-san, Yongdam-ni, Sanae-myŏn, Ch'unch'ŏn-gun, Kangwŏn-do
Hach'owŏl-li, Konggŭn-myŏn, Hoengsŏng-gun, Kangwŏn-do
"Oku-banbutsusō", Kŭmgang-san, Chugŏm-ni, Oegŭmgang-myŏn, Kosŏng-gun, Kangwŏn-do
Chungjŏng Mine, Oegŭmgang-myŏn, Imnam-myŏn, T'ongch'ŏn-gun, Kangwŏn-do

Beryl from Samsal-li, Yangp'yŏng-gun is found in pegmatite, associated-with a special variety of zircon, ilmeno-rutile, etc. It is 6 cm in diameter and 13 cm in length. The mineral is generally weathered, accompanying mica on the crystal surface. Rarely, it is green and transparent.

Beryl from Kumi-ri, Tanyang-gun occurs in pegmatite with lepidolite and shows a zonal structure of red, green or light blue, and light-red. Ng=1.569, Np=1.564.

Beryl[28] from the Sujung Mine, Chech'ŏn-gun occurs in wolframite-bearing quartz veins as a gangue mineral. It is light green, long and prismatic, consisting of m$(10\bar{1}0)$, the terminal planes not being clear. Ng=1.569, Np=1.564.

Beryl from the Ch'angnak Mine, Yŏngju-gun occurs as a gangue mineral in wolframite-bearing quartz veins in gray granite-gneiss and is associated with molybdenite, bismuthinite, siderite, calcite and fluorite. The crystals are hexagonal prismatic, large crystals exceeding 3 cm in length, light blue. Ne$\fallingdotseq$1.567, No=1.572, No−Ne=0.005.

Beryl[32] from the Taehwa Mine, Ch'ungju-gun occurs as small prismatic crystals in wolframite-bearing quartz veins as a gangue mineral and is light green and transparent. The crystals consist of c(0001), s$(11\bar{2}1)$ and m$(10\bar{1}0)$, and are longitudinally striated on the m-plane (Fig. 4, Pl. 1).

Beryl from the Taedang Mine, Hongch'ŏn-gun occurs in tungsten-bearing quartz veins or pegmatite veins in granite, associated with molybdenite, chalcopyrite, dolomite and fluorite. The mineral is light blue and shows hexagonal prismatic crystals, consisting of a prismatic plane m$(10\bar{1}0)$; the terminal planes are lacking. Prismatic diameter 1–2mm. Prismatic length 5 mm. Uniaxial negative. Z=1.574, X=1.570, Z−X=0.004.

Beryl[28] from Kunt'al-li, Ch'ŏlwŏn-gun occurs in pegmatite veins and is light yellow. The crystals are hexagonal prismatic, showing no terminal planes. Prismatic diameter 2 cm or so. Vertically striated on the prismatic plane. Sometimes small scales of muscovite are seen on the crystal surface. H.=7.5. Uniaxial negative. Z=1.574, X=1.570, Z−X=0.004.

Beryl[28] from Turyu-san, Ch'unch'ŏn-gun (Fig. 5, Pl. 1) is light yellow and translucent showing hexagonal prismatic crystals with the basal plane as the terminal plane. Prismatic diameter 2.5 cm. Prismatic length 1.5 cm. Cleavages

parallel to the basal plane are more or less distinct. The crystals also show cracks running parallel to the basal plane. Ng=1.573, 1.569>Np>1.564.

Beryl[28] from Hach'owŏl-li, Hoengsŏng-gun (Fig. 6, Pl. 1) is found is pegmatite veins in granite, and is light yellow to light yellowish green and prismatic or tabular in habit. Prismatic length 7 cm. Prismatic diameter 7 cm. The observed crystal planes are m(10$\bar{1}$0), c(0001), s(11$\bar{2}$1), δ(5.5.$\bar{1}$0.7) and ν(51$\bar{6}$1). No=1.572, Ne=1.568.

Beryl[3] from Chungŏm-ni, Kosŏng-gun occurs in pegmatite veins, about 30 cm wide, and is associated with cassiterite and topaz.

Beryl[3] from the Chungjŏng Mine, T'ongch'ŏn-gun occurs in pegmatitic quartz veins with molybdenite, in injection gneiss or in biotite granite, as a gangue mineral of the molybdenite deposits, and is associated with amazonstone, fluorite, biotite, garnet, pyrite and chalcopyrite. In this locality, two types of beryl are observed. One is light green, translucent, idiomorphic and is enclosed in amazonstone, while the other is light blue, translucent, prismatic and forms veins which consist almost entirely of beryl. In the latter, prismatic planes are well developed, and many enclosures of biotite are seen. No$\fallingdotseq$1.568. Ne=1.565.

57. Nepheline

Locality: Sangp'al-tong, Changbaeng-myŏn, Kilchu-gun, Hamgyŏng-pukto

Nepheline[27] from Sangp'al-tong, Kilchu-gun has the following chemical composition (analyzed by E. IWASE and Y. KANEMURA):

Table 8

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	Total	D $^{12°C}_{4°C}$
1*	41.99	34.35	1.21	1.21	0.37	16.45	4.38	99.96	2.62
2**	41.63	36.11	1.14	1.06	0.37	16.04	4.35	100.70	2.63

Notes: *Nepheline from Chikchŏn-dong: brownish black, translucent.
**Nepheline from Yongso-dong: grayish white, translucent.

Chemical formula: (1) $(Na, K \ldots)_{0.96}\ Al_{0.97}\ Si_{1.01}\ O_{4.00}$
(2) $(Na, K \ldots)_{0.93}\ Al_{1.01}\ Si_{0.99}\ O_{4.00}$

58. Cancrinite

Locality: Maengyang-dong, Changbaeng-myŏn, Kilchu-gun, Hamgyŏng-pukto

Cancrinite[27] from Maengyang-dong, Kilchu-gun occurs as fine veins, 4 mm across, in feldspar and is honey yellow or light red, transparent or translucent and has the following chemical composition (analyzed by E. IWASE and Y. KANEMURA):

l/m=5.6~4.5, l/n=4.2~3.6, Na is replaced by K, Al by Fe^{III}, Ca by Mg, NaH and KH.

Table 9

	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	CO_2	H_2O (+)	H_2O (−)	Total	$D^{13°C}_{4°C}$
1*	37.55	27.72	0.43	0.61	2.71	18.63	1.82	5.58	1.73	1.61	98.39	2.51
2**	35.38	29.91	0.35	0.81	5.69	18.57	0.73	5.66	2.12	0.63	99.85	2.45

Note: *Honey-yellow (No ≒ 1.523, Ne ≒ 1.499)
**Light red

Chemical formula: $lNaAlSiO_4 . m\,CaCO_3 . nH_2O$

59. Grossularite

Locality: Simgi-ri, Yŏnp'ung-myŏn, Koesan-gun, Ch'ungch'ŏng-pukto
Samul-li, Sangmo-myŏn, Koesan-gun, Ch'ungch'ŏng-pukto
Kumi-ri, Oejungbang-ni, Tanyang-myŏn, Tanyang-gun, Ch'ungch'ŏng-pukto
Pusung-dong, Kungno-dong, P'an-myŏn, Ch'osan-gun, P'yŏngan-pukto

Grossularite[8] from Simgi-ri, Koesan-gun occurs in contact zones of granite and limestone and is light yellow. Its crystals consist of d(110), some being 2 cm in diameter. Under the microscope, the mineral shows a striking optical anomaly. N > 1.78.

Grossularite from Samul-li, Koesan-gun occurs as a contact mineral in limestone and is grayish green; its crystals consist of d(110) and are 2–5 mm in diameter; it shows optical anomaly. N ≒ 1.750.

Grossularite[8] from Kumi-ri, Tanyang-gun is light brownish and consists of d(110) and n(211).

Grossularite[8] from Pusung-dong and Kungno-dong, Ch'osan-gun is found as a contact mineral in limestone caught as xenoliths in granite-gneiss and is associated with scapolite, sphene and diopside.

Grossularite from Pusung-dong is light red. N = 1.741. In that of Kungno-dong, the measurements are as follows: N = 1.741. G. = 3.605.

60. Spessartite

Locality: "Suganuma" Kŭmhwa Mine, Tul-li, Wŏnnam-myŏn, Kŭmhwa-gun, Kangwŏn-do

Spessartite from the "Suganuma" Kŭmhwa Mine, Kŭmhwa-gun, together with mangano-dolomite and rhodonite, forms a banded structure and is brownish yellow. Under the microscope, it is olivine yellow and granular. N > 1.78. Often it encloses abundant black minerals and shows a crystal plane of d(110).

61. Scapolite

Locality: Sach'i-ri, Sugu-myŏn, Suan-gun, Hwanghae-do

Scapolite[29] from Sach'i-ri, Suan-gun belongs to dipyre. $\omega = 1.5542$, $\varepsilon = 1.5400$. Ma 70, Me 30 (by KITAMURA).

62. Vesuvianite

Locality: Changhyŏl-li, Kŭmsan-myŏn, Yŏnbaek-kun, Hwanghae-do

Vesuvianite[8] from Changhyŏl-li, Yŏnbaek-kun is found as brownish prismatic crystals, consisting of c(001), a(100), m(110) and p(111).

The prismatic plane (Fig. 7, Pl. 1) consists mainly of the m-plane which is uneven and shows striations due to the repeating of the m-and a-planes, the a-plane being very small. The basal plane consists mainly of a small p-plane; prismatic diameter 1 cm; prismatic length 2.5 cm; uniaxial negative. X and $Y<1.720$.

63. Zircon

Locality: Paegun-san, Kwangyang-gun, Chŏlla-namdo
Poksin-san, Sŏ-myŏn, P'yŏnggang-gun, Kangwŏn-do
Iha-ri, Namduil-myŏn, Tanch'ŏn-gun, Hamgyŏng-namdo
Talli-dong, Hangnam-myŏn, Haksŏng-gun, Hamgyŏng-namdo

Zircon[8] from Paegun-san, Kwangyang-gun occurs in association with cummingtonite, magnetite, hornblende and actinolite. It shows tetragonal prisms, 0.5–1.00 mm in length and 0.2–0.5 mm in diameter. It is light brownish in color, vitreous in luster, transparent and consists of m(110), p.(111) and u(331), the u-plane being small; uniaxial positive (Fig. 8, Pl. 1). $X>1.77$, $Z-X\fallingdotseq 0.03-0.05$. Under the microscope, a perfect cleavage of (110) is seen.

The chemical compositionof zircon[36] from Poksin-san P'yŏnggang-gun is as follows (analyzed by J. Takubo):

Table 10

	SiO_2	rare earth	Fe_2O_3	MnO	Al_2O_3	MgO	CaO	$(ZrHf)O_2$	TiO_2	$(NaK)_2O$	Total
1	32.18	0.08	2.39	0.08	0.67	0.05	0.29	63.85	0.00	—	99.59
2	33.83	0.05	3.46	0.10	0.99	0.09	0.33	60.8	0.00	0.06	99.76

Zircon[8] from Iha-ri, Tanch'ŏn-gun occurs in pegmatite, associated with feldspar, magnetite and quartz. It is brown and shows tetragonal prisms in its crystal habit, some being 1 cm in diameter and 3 cm in length. $H.\fallingdotseq 7.5$.

The crystal planes observed are as follows (Fig. 9, Pl. 1): a(100), m(110), p(111), x(311), u(331).

The prismatic planes are represented by m, the a-plane being rare and small, and the terminal planes by p- and x-, the u-plane being small.

Zircon[8] from Talli-dong, Haksŏng-gun occurs as long and short prisms in pegmatite, and shows the following crystal planes (Fig. 10, Pl. 3): a(100), m(110), p(111), u(331), x(311).

Of these, the m-, p- and u-planes are common, and the a- and z-planes are very small. The chemical composition is as follows (analyzed by T. Mizuma):

Table 11

ZrO_2	SiO_2	Fe_2O_3	Total
65.93	32.30	0.78	99.01

According to Nobufusa SAITO[30] the specific gravity and radium content of the mineral from Talli-dong are as follows: G.=4.58—4.60. Ra= 72.39—94.48 × 10^{-12} g.

64. Uranothorite

Locality: Talli-dong, Hangnam-myŏn, Haksŏng-gun, Hamgyŏng-pukto

Uranothorite[56] from Talli-dong, Haksŏng-gun is found in association with allanite, zircon, etc. It is orange yellow, translucent or opaque and has a resinous luster. G.=4.56 (11° C). The chemical composition is as follows (analyzed by S. IIMORI):

Table 12

SiO_2	PbO	Fe_2O_3	Al_2O_3	MgO	ThO_2	ΣCe_2O_3	ΣY_2O_3	UO_3
15.12	0.80	0.77	0.56	0.13	58.75	5.53	0.12	7.56

$H_2O(+)$	$H_2O(-)$	Total
7.70	2.44	99.48

Chemical formula: $(ThU)O_2 . SiO_2 . 2H_2O$. Pb/U=0.03 (about 230×10^6 years).

65. Topaz

Locality: Yongyŏl-li, Mun'gyŏng-myŏn, Mun'gyŏng-gun, Kyŏngsang-pukto

Topaz[57] from Yongyŏl-li, Mun'gyŏng-gun occurs in druses of pegmatite, associated with kali-feldspar, albite and quartz. It is light brownish, transparent to translucent and shows short prismatic crystals. It shows the following planes (Fig. 11, Pl. 2): m(110), l(120), Q(540), b(010), f(021), u(111).

In general terminal planes are not seen, the m-plane is largest, l-plane large or small and Q-plane rare and narrow. The size of the crystals varies from 1.8 × 2 cm to 3 × 2.3 cm. Sometimes etched figures are seen on the well developed basal plane.

66. Andalusite

Locality: Munŭi-ri, Munŭi-myŏn, Ch'ŏngju-gun, Ch'ungch'ŏng-pukto

Andalusite[41] from Munŭi-ri, Ch'ŏngju-gun occurs in mica-schist in siliceous schists or granulite and is associated with cyanite and muscovite.

67. Cyanite

Locality: Yangsal-li (Tŏngmong-ni), Pŏlgong-myŏn, Nonsan-gun, Ch'ung-ch'ŏng-namdo
Hugong-ni (Sansŏ-ri), Yonghŭmg-myŏn and Munŭi-ri, Munŭi-myŏn, Ch'ŏngju-gun, Ch'ungch'ŏng-pukto
Sinp'ung-ni, Mi-myŏn, Okku-gun, Chŏlla-pukto
Tahak-tong, Chinsa-ri, Sinhŭng-myŏn, Kangsŏ-gun, P'yŏngsan-namdo

Cyanite from Sansŏ-ri, Ch'ŏngju-gun, and Tŏngmong-ni, Nonsan-gun occurs in a coarse chiastolite-schist in mica-schist and graphite-schist of the Yokusen (Okch'ŏn) system and commonly shows large crystals of 20–50 cm in length.

Cyanite from Munŭi-ri, Ch'ŏngju-gun[26] occurs in a mica-schist in siliceous-schist or granulite and is associated with andalusite and muscovite.

Cyanite[26] from Sinp'ung-ni, Okku-gun occurs in chlorite-phyllite of the crystalline schist system and is associated with magnetite. The crystals are small and difficult to see with the naked eye.

Cyanite[26] from Tahak-tong, Kangsŏ-gun is found in blocks on the grounds accompanying muscovite, sillimanite and corundum. It is light blue and shows prismatic crystals but no distinct forms. It shows, however, cleavages parallel to (100), (001) and (101). In size, it is 1–1.5 cm along the c-axis, and 0.5–1 cm normal to the c-axis. (−) 2V=large. Nm$\fallingdotseq$1.723.

68. Beta-zoisite

Locality: Samhwa Mine, Saenggŭm-ni, Segong-myŏn, P'yŏngsan-gun, Hwanghae-do

Beta-zoisite[10] from the Samhwa Mine, P'yŏngsan-gun is pink and shows no distinct crystal forms. It is associated with labradorite. Under the microscope, it is colorless and transparent; (+) 2V=middle; dispersion of optical angles distinct; $\rho>\nu$; Nm=1.705; and cleavage of (010) is perfect and shows straight extinction.

69. Epidote

Locality: Panghyŏn Mine, Imgi-ri, Soch'ŏn-myŏn, Ponghwa-gun, Kyŏngsang-pukto
Kŭmgang "Tokushu" Mine, Sinp'ung-ni, Naegŭmgang-myŏn, Hoeyang-gun, Kangwŏn-do
Murŭng-ni, Sŏsang-myŏn, Puryŏng-gun, Hamgyŏng-pukto

The chemical composition of epidote[8] from the Panghyŏn Mine, Ponghwa-gun is as table 13 (analyzed by T. Mizuma).

Epidote[4] from the Kŭmgang "Tokushu" Mine, Hoeyang-gun occurs in cavities or fissures of quartz veins and shows three types as follows:

(1) More or less weathered epidote which is brownish and earthy.
(2) Yellowish green epidote showing fibrous or radiated crystals.

(3) Lustrous epidote which is yellowish-green or black-green and sometimes partially translucent.

Table 13

	SiO_2	Al_2O_3	Fe_2O_3	CaO	Ig. loss	Total	S. G.
1	37.70	29.10	7.1	23.61	2.15	99.66	3.39
2	62.83	28.53	4.44	42.16	11.94		
3	10.44	9.51	1.48	10.54	11.94		

Notes: 1—Chemical composition; 2—molecule percentage; 3—values derived from the molecule percentages of 2, by dividing respectively by 6, 3, 3 and 4.

Chemical formula: $H_2O.\ 4CaO.\ 3Al_2O_3.\ Fe_2O_3.\ 6\ SiO_2$.

The crystals are generally 1–2 mm in both thickness and length, and at times 4–5 mm in length.

Epidote[4] from Murŭng-ni, Puryŏng-gun occurs as a contact mineral in association with garnet and is 1–10 mm in length. It shows good crystals with the following crystal planes: a(100), c(001), m(110), r(101), o(011), n($\bar{1}$11).

70. Allanite

Locality: P'ano-ri, Anang-myŏn, Anak-kun, Hwanghae-do
Sanhyŏl-li, Kŭmbung-myŏn, Kŭmhwa-gun, Kangwŏn-do
Talli-dong, Haksŏng-myŏn, Haksŏng-gun, Hamgyŏng-pukto

Allanite[16] from P'ano-ri, Anak-kun has the following chemical composition (analyzed by T. NAKAI):

Table 14

MgO	CaO	MnO	FeO	Fe_2O_3	Al_2O_3	Ce_2O_3	$(La,Y)_2O_3$ etc.	ThO_2
1.11	10.60	1.28	10.83	4.65	15.67	6.78	15.63	0.60

SiO_2	H_2O	Total	S. G.
31.23	1.54	99.92	$D^{17°C}_{4°C} = 3.81$

Chemical formula: $(Ca, Mn, \Sigma\ Ce, Th)_2.\ (Al, Fe''', Fe'', Mg)_3.\ Si_3(O,OH)_{13}$ $4.4R^{II}O \cdot 3R_2^{III}O_3 \cdot 6SiO_2 \cdot H_2O$ when the elements of two and three atom value are respectively grouped together. The radium content of the mineral of 1 gr: 1.86×10^{-11} g/g. Rate percent: 1.86×10^{-9}%.

Allanite[8] from Sanhyŏl-li, Kŭmhwa-gun is found with lepidomelane on the

weathering surface of nepheline syenite. It occurs as masses the size of a man's fist or less, with earthy encrustments, less than 1 mm thick and brown in color. Sometimes scales of lepidomelane are found on the surface. In a fresh section, it has a glassy luster and is black; it shows no crystal form; H.=6. G.≒4.1. (—) 2V= small; dispersion of light large, $\rho>\nu$; Nm≒1.78; pleochroism strong; Z=dark brown; Y=light brown. The chemical composition is as follows (1. analyzed by T. MIZUMA, 2. by N. SAITO[12]):

Table 15

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Ce_2O_3	Rare earth oxide (except Ce)
1	27.80	14.84	5.29	9.82	2.10	9.35	13.79	11.94
2	28.12	14.01	7.98	7.65	0.39	9.16	14.21	12.84

ThO_2	MnO	H_2O (+)	H_2O (−)	Total	S.G.
	3.15	1.35		99.43	
1.02	3.10	1.03	0.57	100.08	$3.7\left(D^{22°C}_{4°C}\right)$

According to N. SAITŌ, the presumptive amount of beryllium content is 10^{-3}—10^{-4}%, and the chemical formula is as follows:

$$(Ca, Mn, \Sigma Ce, Th)_{2.0}\ (Al, Fe^{II}, Fe^{III}, Mg)_{3.1}\ Si_{2.9}$$
$$(O{\cdot}OH)_{13.5} \text{ or } 4.2R^{II}\,O \cdot 3.4R_2^{III}\,O_3 \cdot 6SiO_2 \cdot 1.1H_2O$$

Table 16

	SiO_2	Al_2O_3	FeO	Fe_2O_3	CaO	MgO	Ce_2O_3	$(La, Y)_2O_3$ etc.
1	28.26	16.32	10.88	8.01	13.49	1.24	12.84	5.56
2	30.48	16.16	11.82	7.05	10.83	0.34	9.81	11.16
3	28.30	16.34	10.74	7.55	13.60	1.12	12.52	6.76

ThO_2	MnO	H_2O (+)	H_2O (−)	TiO_2	Total
1.29	0.81	1.05	0.89		99.74
0.25	0.31	1.59	0.11	0.40	100.50
	1.46	1.60			99.99

Allanite from Talli-dong, Haksŏng-gun is black and has strong glassy luster and radioactivity. The chemical composition is as Table 16 (1. analyzed by N. SAITO[12]; 2. by J. TAKUBO[14]; 3. by T. MIZUTA):

The chemical formula derived from the chemical composition 1 in the above table is as follows: $(Ca, Mn, \Sigma Ce, Th)_{2.1}$, $(Al, Fe^{II}, Fe^{III}, Mg)_{3.4}$, $Si_{2.6}$, $(O \cdot OH)_{12.8}$

71. Prehnite

Locality: Hwach'ŏn Mine, Hwach'ŏl-li, Sangmo-myŏn, Koesan-gun, Ch'ung-ch'ŏng-pukto

Paegyang-ni, Namsan-myŏn, Ch'unch'ŏn-gun, Kangwŏn-do

Prehnite[9] from the Hwach'ŏn Mine, Koesan-gun forms veins together with calcite in limestone, and is associated with quartz and wollastonite. It is light green to green, translucent, massive, showing no distinct crystal form. Some crystals, however, exceed 5 cm in diameter. (+) $2V \fallingdotseq 60°$. $X \fallingdotseq 1.616$, $Y \fallingdotseq 1.622$, $Z \fallingdotseq 1.645$.

Prehnite[9] from Paegyang-ni, Ch'unch'ŏn-gun occurs in manganese deposits in granite-gneiss, associated with diopside, garnet, orthoclase and quartz. It is colorless, transparent and has perfect cleavage parallel to 100. In cases, the mineral aggregates into tabular bundles of 0.1–1 mm in diameter. (+) 2V and Z are normal to cleavage piece. X//a. Y//b. Z//c. $Ng = 1.644$, $Nm = 1.623$, $Np = 1.616$.

72. Chondrodite

Locality: Namch'ŏn Mine, Namch'ŏn-li, Pongsan-myŏn, P'yŏngsan-gun, Hwanghae-do

Chondrodite[10] from the Namch'ŏn Mine, P'yŏngsan-gun occurs in contact deposits of magnetite, associated with brugnatellite and dolomite. The mineral is white to light brown and shows crystals of 1 mm across or so. (+) 2V not large. $Ng = 1.635$, $Nm = 1.617$, $Np = 1.604$.

73. Clinohumite

Locality: Chung-bong, Chil-li, Yŏnp'ung-myŏn, Koesan-gun, Ch'ung-ch'ŏng-pukto

Clinohumite[9] from Chŭng-bong, Koesan-gun is found as a contact mineral of iron deposits, associated with magnetite and clinochlorite. It occurs as small grayish crystal aggregates. Under the microscope, the crystals show polysynthetic twinning and distinct cleavages parallel to the composition plane (001) or nearly normal to the same plane. If the plane (001) is taken as the composition plane, X inclines to (001) at an angle of 10°. (+) 2V large. $Ng = 1.650$, $Np = 1.625$.

74. Lessingite

Locality: Yangjang Mine, Songna-san, Ch'ŏnma-ri, Nam-myŏn, Pyŏng gang-gun, Kangwŏn-do

Lessingite[15] from Songna-san, Pyŏnggang-gun is found in syenite, associated with fluorite, alkali-hornblende, molybdenite and allanite. It is dark red, and the chemical composition is as follows (analyzed by J. TAKUBO):

Table 17

SiO_2	FeO	Fe_2O_3	MnO	Al_2O_3	ThO_2	Ce_2O_3	Σ La_2O_3	Σ Y_2O_3	CaO
19.02	1.86	—	1.79	0.36	0.00	30.71	27.76	2.80	12.47

MgO	K_2O	Na_2O	CO_2	P_2O_5	H_2O (+)	H_2O (−)	F		$F_2=O$	Total
0.15	—	—	—	0.87	0.57	0.04	2.51	100.91	−1.06	99.85

Chemical formula: $(Ca, Fe, Mn)_2 [(Ce, Na....)O]_2 (Ce, Na...)_2 (SiO_4)_3$

75. Tourmaline

Locality: Chuch'ŏl-li, Unbong-myŏn, Namwŏn-gun, Chŏlla-namdo
Myŏngbong-dong, Chinsa-ri, Tongno-myŏn, Mungyŏng-gun, Kyŏngsang-pukto

Tourmaline[28] from Chunch'ol-li, Namwŏn-gun is lacquer black, short prismatic, showing both terminal planes, 2.3 cm in length and 2 cm in diameter. Its crystals consist of the following planes: m(10$\bar{1}$0), a(11$\bar{2}$0), r(10$\bar{1}\bar{1}$), e(01$\bar{2}$1). No$\fallingdotseq$1.650, Ne$\fallingdotseq$1.628. Z=dark brown, X=colorless to light brown.

Tourmaline[51] from Myŏngbong-dong, Mungyŏng-gun occurs with almandite, in pegmatite in gneiss. It is black opaque, and shows prismatic crystals with the following crystal planes: m(10$\bar{1}$0), a(11$\bar{2}$0), r(10$\bar{1}$1), e(01$\bar{1}$2), o(0$\bar{2}$1$\bar{2}$), c(0001).

In the crystal forms, there are three types, as follows:

(1) Nearly hexagonal prisms with well-developed terminal planes r and o, and prismatic plane a, the m-plane being small.
(2) Nearly hexagonal prisms with well-developed terminal plane e and prismatic plane a, the planes r and c being small.
(3) Nearly trigonal prisms, with well-developed terminal plane r, with narrow plane of e on the edge.

In size, these crystals are 4 cm in diameter, 4–5 cm in length and sometimes 2 cm in diameter and 7–8 cm in length. N_{OD}=1.652, N_{ED}=1.627, $N_{OD}-N_{ED}$=0.025.

76. Stellerite

Locality: Chewŏn Mine, Tonggong-ni, Chewŏn-myŏn, Kŭmsan-gun, Chŏlla-pukto

Stellerite[8] from the Chewŏn Mine, Kŭmsan-gun is found forming veins in granite, white and massive, showing no distinct crystal forms. It shows cleavages, however,

one of which is perfect along (101)?, while the others are distinct respectively along (100), (001), and (111). The cleavage planes have a glassy to pearly luster. H=3. G=2.1—2.2.

Sometimes the crystal is tabular and shows crystal planes of a(100), b(010), c(001) and p(111). In general, it shows parallel growth that has the b-plane as its composition plane and is 5 mm on the a-axis, 2 mm on the b-axis and 7 mm on the c-axis. X // C, Z // a, Y // b. Z=1.497, X=1.488.

77. Hydromica

Locality: Kumi-ri, Oejungbang-ni, Tanyang-myŏn, Tanyang-gun, Ch'ungch'ŏng-pukto

Hydromica[28] from Kumi-ri, Tanyang-gun occurs in pegmatite with lepidolite. It is yellow, massive or micro-crystalline and more or less resinous in luster. (—) 2V small. Ng=Nm=1.578, Np=1.547.

78. Lepidolite

Locality: Songgye-ri, Hansu-myŏn, Chech'ŏn-gun, Ch'ungch'ŏng-pukto
Kumi-ri, Oejungbang-ni, Tanyang-myŏn, Tanyang-gun, Ch'ungch'ŏng-pukto
Onjŏng-ni, Chŏgam-myŏn, P'yŏngsan-gun, Hwanghae-do

Lepidolite[9),19)] from Songgye-ri, Chech'ŏn-gun is found in pegmatite in limestone, associated with quartz, amazonstone and red tourmaline. In some cases it is light violet or light russet. The light violet crystals are scaly, some large ones being 1 cm in diameter. (—) 2E=0°—60°. 2V≒38°; Ng=1.554 and Np=1.551 in the case of 2E≒60°, and Ng≒1.548 in the case of 2E≒0°; both cases being at times observed in the same section.

The light russet crystals are smaller than the preceding one, being about 5 mm or less in diameter. (—)2E≒60°. (—)2V≒38°. Ng=1.554.

Lepidolite from Kumi-ri, Tanyang-gun shows the following chemical composition (analyzed by M .ISHIBASHI and T. ISHIHARA):

Table 18

SiO_2	Al_2O_3	Fe_2O_3	MnO	CaO	MgO	SrO	Na_2O	K_2O	LiO_2
50.65	23.75	0.73	3.42	0.58	0.24	0.01	1.12	6.80	3.97

Rb_2O	Cs_2O	F	H_2O		$F_2=0$	Total
2.96	0.10	6.23	1.96	102.52	—2.63	99.89

$\frac{1}{2}O=F-2.63$ Total 99.89

The age of lepidolite calculated from the amount of Pb and Sr in the above table is about $1{,}060\times10^6$ years.

Lepidolite[5] from Onjŏng-ni, P'yŏngsan-gun occurs in pegmatite in biotite granite associated with zinnwaldite, amazonstone, muscovite, orthoclase, albite and quartz, some large crystals being 6 cm in diameter.

79. Phlogopite

Locality: I-ri and Pudong-ni, Huch'ang-myŏn, Pukch'ŏng-gun, Hamgyŏng-pukto
Yŏnju-ri, Sokhu-myŏn, Pukch'ŏng-gun, Hamgyŏng-pukto
Homal-li, Yanghwa-myŏn, Pukch'ŏng-gun, Hamgyŏng-pukto

Phologopite[10] from Pukch'ŏng-gun forms beds or lenses rich in the mineral in gneiss and is associated with diopside or actinolite. When it is associated with diopside, its crystals are generally large, up to 20 cm in diameter. The central portion of these crystals is grayish white, while the marginal portion is brownish. $(-)2V \fallingdotseq 0$ in both parts. Ng=1.572 (grayish white*), Ng=1.574 (brownish).

The grayish white portion encloses microcrystals of rutile and is therefore difficult to strip off and is brittle.

80. Lepidomelane

Locality: Yŏngyu Mine, Wŏnnyu-ri, P'yŏngwŏn-myŏn, P'yŏngwŏn-gun, P'yŏngan-namdo

Lepidomelane[43] from the Yŏngyu Mine, P'yŏngwŏn-gun occurs in apatite deposits, associated with apatite, quartz and calcite. The mineral is dark green and tabular or scaly. Nm=1.606, Ng=1.661. $(-)2E=22°$.

81. Clinochlore

Locality: Chŭng-bong, Chil-li, Yŏnp'ung-myŏn, Koesan-gun, Ch'ungch'ŏng-pukto

Clinochlore[9] from Chŭng-bong, Koesan-gun occurs in iron deposits in limestone and is associated with magnetite and clinohumite. The crystals are grass green, tabular, often hexagonal, some having a basal plane 5 mm in diameter. Cleavages along the basal plane are perfect. (+) 2V variable. $2E \fallingdotseq 10°-35°$. Weak clino-dispersion is seen. Optical plane parallel to $(10\bar{1}0)$. Z is nearly vertical to the basal plane. $Ng \fallingdotseq Nm \fallingdotseq 1.575$.

82. Delessite?

Locality: Samhwa Iron Mine, Samhwa-ri, Puksam-myŏn, Samch'ŏk-kun, Kangwŏn-do

Delessite[10]? from the Samhwa Iron Mine, Samch'ŏk-kun is found adhering to magnetite and is represented by whitish aggregations of crystals which are about 1 mm in diameter and easily stripped off, the cleavage pieces having a pearly luster. $H. \fallingdotseq 2$, $(-)\ 2V \fallingdotseq 0°$. X is nearly normal to cleavage plane. Ng=Nm=1.656, Ng−Np=0.005.

* Phlogopite from I-ri contains 0.59% TiO_2 (analyzed by T. Mizuma).

83. Stilpnomelane

Locality: Kalgŭm-ni, (Ibsŏng-ni), Yŏnp'ung-myŏn, Koeasan-gun, Ch'ung-ch'ŏng pukto
Sinhŭng Mine, Yŏnch'ŏn-myŏn, Puryŏng-gun, Hamgyŏng-pukto

Stilpnomelane[10] from Kalgŭm-ni, Koesan-gun fills up interstices of crystals of mangan-hedenbergite in a contact zone. X is nearly normal to the cleavage which seems to be parallel to its basal plane. $(-)2V \fallingdotseq 0°$; dispersion of optic axes is large. Z=Y=deep green, X=yellow, Z=Y>X, 1.74> Z=Y>1.72, Z−X=0.05.

Stilpnonelane[47] from the Sinhŭng Mine, Puryŏng-gun occurs as a constituent of magnetite-mangan-grunerite-stilpnomelane-apatite-quartz schist. $\beta \fallingdotseq \gamma =$ 1.694, $\alpha = 1.611$. $(-)2V = 0-5°$. X=yellow, in cases gold yellow, Y=Z= reddish brown−dark brown.

84. Thuringite

Locality: Yonghwa-dong, Ilwŏl-myŏn, Yŏngyang-gun, Kyŏngsang-pukto

Thuringite[10] from Yonghwa-dong, Yŏngyang-gun is accompanied by zinc blende, chalcopyrite and quartz. It is dark green or olive in color. The dark green crystals are tabular, hexagonal in outline, 0.1 mm across, and have strong pleochroim. X=pale yellow (almost colorless), Y=Z=deep green. $(-)\ 2V \fallingdotseq 0°$. Dispersion of the optic axes is large. The axis is nearly normal to basal cleavage. Z=1.680, Z−X=0.01.

85. Montmorillonite

Locality: Kumi-ri, Oejungbang-ni, Tanyang-myŏn, Tanyang-gun, Ch'ung-ch'ŏng-pukto
Sanae Fluorite Mine, Sach'ang-ni, Sanae-myŏn, Ch'unch'ŏn-gun, Kangwŏn-do

Montmorillonite[28] from Kumi-ri, Tanyang-gun is found partly replacing feldspar in pegmatite. It is red, translucent, and more or less massive (several millimeters to 1 cm). $N \fallingdotseq 1.540$.

Montmorillonite from the Sanae Fluorite Mine, Ch'unch'ŏn-gun occurs in fluorite-bearing quartz veins cutting granite, and is pink.

86. Gageite

Locality: Kŭmjik-san Mine, Nam-myŏn, Ch'ŏngsŏn-gun, Kangwŏn-do

Gageite[28] from the Kŭmjik-san Mine, Ch'ŏngsŏn-gun is brown, fibrous, about 2 mm long, about 0.1 mm wide and is associated with braunite and spessaritite. Two prismatic cleavages almost at right angle to each other are well developed. Z=c, Y=b, X=a. X, Y plane is normal to the cleavages, and in the section normal to Z, the X−Y plane bisects the angle between the cleavages. $(-)2E \fallingdotseq 90°$. $Z' \fallingdotseq 1.72$, $X' \fallingdotseq 1.71$, $Y' \fallingdotseq Z'$. H.≒3. G.=3.5±. The chemical composition is as follows:

Table 19

SiO_2	FeO	Al_2O_3	CaO	MgO	MnO	ZnO	Ig. loss	Total
38.05	10.13	4.45	11.50	1.23	20.81	10.37	5.45	101.99

(Analyst: T. MIZUMA. The sample is relatively impure.)

87. Bourlingite

Locality: Nabu-dong, Nodong-ni, Wangjing-myŏn, Yŏnch'ŏn-gun, Kyŏnggi-do

Bourlingite[9] from Nabu-dong, Yŏnch'ŏn-gun is contained in violarite-bearing hornblende periodotie, as an alteration product of olivine. It varies from deep green to deep brown in thin section; the cleavage, which is nearly normal to X and seems to be parallel to the basal plane is perfect and shows strong pleochroism. $X=Z$=yellowish-green, Y=deep brownish-yellow. (−)2V small. Nm=1.6±.

88. Titanite

Locality: Talli-dong, Haksŏng-myŏn, Haksŏng-gun, Hamgyŏng-pukto
Pultanggol, Ŏbok-tong, Haksŏ-myŏn, Haksŏng-gun, Hamgyŏng-pukto
Tomok-tong, Tŏksan-myŏn, Kilchu-gun, Hamgyŏng-pukto

The chemical composition of the titanite from Talli-dong[8], Haksŏng-gun is as follows (analyzed by T. MIZUMA):

Table 20

TiO_2	SiO_2	CaO	Rare earths	Total
37.60	30.60	25.30	0.00	93.50

According to N. SAITŌ, the specific gravity of the mineral is 3.50—3.52 and Ra content $16.47-28.15\times10^{-12}$ g/g.

Titanite from Pultanggol, Haksŏng-gun is found in the pegmatite in limestone, is macroscopically pale brown and is lamellar on η (221) with rhombic cross section, the terminal plane being indistinct. The parting parallel to the (221) plane is well developed. Some crystals are 2 cm in length and 1 cm in width.

Titanite[10] from Tomok-tong, Kilchu-gun occurs in pegmatite in limestone. It is macroscopically brown and shows the rhombohedron crystal form, consisting only of η(221) and wanting in terminal planes. In some crystals, it is 9 cm in long diameter and 4 cm in short diameter. The partings parallel to the η-plane are common, and quartz and feldspar are seen crystallized out along the parting.

89. Fergusonite

Locality: Chunggye-ri and Pongjil-li, Hongbung-myŏn, Hongsŏng-gun, Ch'ungch'ŏng-namdo

Kukkun Mine*, Songgye-ri, Kŭmsal-li, Unsal-li, Haewŏl-myŏn, Yŏnbaek-kun, Hwanghae-do

Fergusonite[38] from Hongbong-myŏn, Hongsŏng-gun is found in gold placer, black with light streaks, conchoidal fracture, and resinous luster. G.=6.04. The chemical composition is as follows (analysed by S. HATA and T. IIMORI):

Table 21

BeO	MgO	CaO	MnO	FeO*	PbO	Al_2O_3	Ce_2O_3	$(La, Nd)_2O_3$
0.03	0.10	1.21	0.21	0.28	0.20	0.18	0.0	0.0

Y_2O_3	TiO_2	ZrO_2	ThO_2	UO_2*	SnO_2	SiO_2	Nb_2O_5	Ta_2O_5	Total
40.68	1.11	0.07	0.91	7.49	0.01	0.07	35.16	12.38	100.09

Chemical Formula: $Y(Nb, Ta)O_4$. The age of the mineral determined by the Pb/U ratio is 260×10^6 years.

Fergusonite[37] from the Kukkun Mine, Yŏnbaek-kun is contained in gold placer. It is black, submetallic luster, subconchoidal in fracture, and light in streak (Fig. 12, Pl. 2). G.=5.82. H.=6.0–6.5.

The chemical composition is as follows (analyzed by S. HATA and K. SHIMMI):

Table 22

MgO	CaO	MnO	FeO	Al_2O_3	Ce_2O_3	Y_2O_3	TiO_2	ZrO_2	ThO_2
0.3	2.6	0.1	0.6	0.1	1.5	33.5	0.6	0.6	3.4

UO_2	SiO_2	SnO_2	Nb_2O_5	Ta_2O_5	Total
8.4	0.1	0.2	31.1	17.4	100.5

Chemical Formula: $6Y(Nb, Ta)O_4 + (Ca, UO)_2(Nb, Ta)_2O_7$.

90. Columbite

Locality: Sujung Mine, Chŏkkong-ni, Susan-myŏn, Chech'ŏn-gun, Ch'ungch'ŏng-pukto

Chaeil Mine, Ch'ach'ang-myŏn, Hŭich'ŏn-gun, P'yŏngan-pukto

Columbite[28] from the Sujung Mine is contained in wolframite veins, intruding granite and is associated with galena, zinc blende, cassitarite and fluorite. It is

* Iron and uranium were assumed to be present as FeO and UO_2.

macroscopically iron black, incomplete in its crystal forms, and 2 mm across. H.=5.5. G.≒5.5. In thin section it is brown with intense pleochroism. $Z'>X'$. (−) $2V\fallingdotseq 90°$. $N>1.8$.

Columbite from the Chaeil Mine, Hŭich'ŏn-gun is found in small quantity in pegmatite, and shows no crystal form. It is dark brown and intimately associated with green mica.

91. Yttro-tantalite

Locality: Pongjil-li and Chunggye-ri, Hongbung-myŏn, Hongsŏng-gun Ch'ung-ch'ŏng-namdo

Yttro-tantalite[38] from Hongbung-myŏn, Hongsŏng-gun is found in placer gold. It is black and shows subconchoidal fracture and a resinous luster. The chemical composition (analyzed by S. HATA and T. IIMORI) is as follows:

Table 23

CaO	MnO	FeO*	PbO	$Ce_2O_3+(La,Nd)_2O_3$	Y_2O_3	TiO_2	ThO
0.02	1.89	5.58	1.50	tr.	19.71	0.89	2.59

UO_2*	SnO_2	SiO_2	Nb_2O_5	Ta_2O_5	Total
4.60	1.10	0.89	20.27	37.48	96.52

* Iron and uranium were assumed to be present as FeO and UO_2.

92. Tantal-euxenite

Locality: Ditto.

Tantal-euxenite[38] from Hongbung-myŏn, Hongsŏng-gun is contained in gold placer and is black, has pale brown streaks, a submetallic luster and uneven fracture. G.=5.15.

The chemical composition is as follow (analyzed by S. HATA and T. IIMORI):

Table 24

BeO	MgO	CaO	MnO	FeO*	PbO	Al_2O_3	Ce_2O_3	$(La,Nd)_2O_3$
0.00	0.03	0.00	2.66	5.13	0.18	0.10	1.27	6.46

Y_2O_3	TiO_2	ZrO_2	ThO_2	UO_2*	SnO_2	SiO_2	Nb_2O_5	Ta_2O_5	Total
7.46	19.80	0.30	2.30	4.18	0.02	0.04	26.92	23.46	100.31

* Iron and uranium were assumed to be present as FeO and UO_2.

Chemical Formula: $Y_2Ti_4O_{11}+2.5$ (Fe, Mn) $(Nb,Ta)_2O_6$

The age of the mineral determined by the Pb/U ratio is 260×10^6 years.

93. Monazite

Locality: Kŭmsal-li, Haewŏl-myŏn, Yŏnbaek-kun, Hwanghae-do
Changp'yŏng-ni and Kŏjil-li, Odae-myŏn and Taejil-li Changnae-myŏn Kosŏng-gun, Kangwŏn-do
Inhuung-myŏn, Yŏnghŭng-gun, Hamgyŏng-namdo

Monazite[4] from Kŭmsal-li, Yŏnbaek-kun is contained in gold placer and has the following crystal planes: a(100), m(110), n(120), w(101), x($\bar{1}$01) e(011) and υ($\bar{1}$11) (Fig. 13, Pl. 2).

The a-plane is well developed, followed by the m-plane. It is 1 cm in length and about 3 mm in thickness. (+)2V small. The optic plane is normal to (010). X//b. N>1.77.

Monazite[4] from Odae-myŏn and Changnae-myŏn, Kosŏng-gun occurs in coastal heavy sands, containing 1–15% monazite. The crystals are tabular and 0.10–0.16 mm across. There are two types of monazite, the yellowish brown and transparent type with glassy luster, and the reddish brown or dark brown type which is greasy to dull in luster. G.≒5.0.

Monazite[6] from Inhŭng-myŏn, Yŏnghŭng-gun is found in gold placers, is macroscopically black with a greenish tinge, opaque and has intense radioactivity. G.≒5.14–5.16.

The chemical composition of monazite with a specific gravity of 5.16 is as follows (analyzed by T. Iimori):

Table 25

SiO_2	P_2O_5	Ce_2O_3	$(La,Nd)_2O_3$ etc.	Y_2O_3 etc.	ThO_2	UO_3	Fe_2O_3	Al_2O_3
0.93	27.55	25.10	37.14	1.26	5.81	0.66	0.42	0.45

CaO	MgO	BeO	Total
1.58	0.00	0.00	100.90

94. Apatite

Locality: Sangp'al-tong, Changbaeng-myŏn, Kilchu-gun Hamgyŏng-pukto

Apatite[9] from Sangp'al-tong, Kilchu-gun occurs in phologopite deposits in limestone. It is pale green, translucent, and has perfect basal cleavage. It shows long prismatic crystals consisting mainly of m(10$\bar{1}$0), with well-developed terminal planes at both ends.

The terminal plane x(10$\bar{1}$1) is more or less rounded. No=1.639. In some cases, the crystals have a length of 55 mm and a diameter of 12 mm.

95. Pyromorphite

Locality: Taeryong-dong, Kunbung-myŏn, Tongnae-gun, Kyŏngsang-namdo

Pyromorphite[8] from Taeryong-dong, Tongnae-gun shows a crystal form of hexagonal prism with c(0001) and m(10$\bar{1}$0), 1 mm in diameter and commonly 1–3 mm in length. It is yellowish green, or greenish black (Fig. 19, Pl. 3)

96. Triplite

Locality: "Furukawa-Yamaguchi" Yŏnsu Mine, Chŏnch'ang-myŏn, Ch'ang-Sŏng-gun, P'yŏngan-pukto

Triplite[45] from Chŏnch'ang-myŏn, Ch'angsŏng-gun occurs in tungsten-bearing quartz veins and is associated with wolframite, zinc blende, cosalite and teallite. It is light brownish pink in color and is found as locally crowded aggregations of irregular grain in the quartz vein. Rarely, the aggregations are pierced by quartz veins and show a brecciated structure. Np=1.660, Nm=1.670, Ng=1.683, Ng−Np=0.023. (+) 2V=85°, Y=b, Z∧a=40°.

97. Pseudoheterosite

Locality: Kŭmgong-ni, Kyenae-myŏn, Ch'angsu-gun, Chŏlla-pukto

Pseudoheterosite[4] from Kŭmgong-ni, Ch'angsu-gun is found as small grains in heterosite. X=deep brown, Y=light brown, Z=deep brown, Z>X>Y. (+) 2V middle. $\rho > \nu$.

98. Strengite?

Locality: Kŭmgong-ni, Kyenae-myŏn, Ch'angsu-gun, Chŏlla-pukto

Strengite[4] (?) from Kŭmgong-ni, Ch'angsu-gun is a dark green to black mineral, associated with heterosite. It shows a streak of olive color. H.=5−5.5. Biaxially positive or negative; 2V large. $\rho > \nu$. Straight extinction on the cleavage direction. Z green, Y green, X light brown, Z>Y>X, Z>1.779, X≒1.760. Z−X>0.03. soluble in HCl.

99. Suanite*

Locality: Holgol Mine, Suan-gun, Hwanghae-do

Suanite from the Holgol Mine, Suan-gun is found in association with ludwigite and kotoite in contact-metamorphosed limestone. The mineral is white and occurs as aggregates of fibrous crystals with a silky luster, the fibers attaining 3 cm in length. The chemical composition of the mineral more or less accompanying calcite and forsterite is as Table 26 (analyzed by K. Isono).

G.=2.91. Np=1.596, Nm=1.639, Ng=1.670. (−)2V=70°. X′ direction coincides with the crystal axis.

* Named by Takeo Watanabe.

Table 26

MgO	CaO	Fe_2O_3	Al_2O_3	B_2O_3	SiO_2	Na_2O	K_2O	CO_2	H_2O	Total
46.48	3.70	0.33	0.97	38.20	0.70	0.90	0.00	5.70	3.50	100.48

Chemical formula: $2\,MgO\,B_2O_3 = Mg_2\,B_2O_7$

100. Jōhachidolite*

Locality: Sangp'al-tong, Ch'angbaeng-myŏn, Kilchu-gun, Hamgyŏng-pukto

Jōhachidolite[52] from Sangp'l-tong, Kilchu-gun is enclosed in nepheline, colorless, transparent and occurs usually as a laminated form, 1 mm in thickness and 1 cm in length. H.=6.5—7. G.≒3.4. 2V=72°. $\rho > \nu$. $\alpha_D = 1.715$; $\beta_D = 1.720$, $\gamma_D = 1.729$. It shows bluish fluorescence.

The chemical composition is as follows (analyzed by E. Iwase and N. Saitō):

Table 27

SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	Na_2O	P_2O_5	B_2O_5	Cl
0.34	28.34	0.09	—	0.23	24.77	8.27	0.03	24.21	—

F	H_2O (+)	H_2O (−)	SO_3			Total
12.21	6.52	0.07	—	105.08	$-O=F_2$	99.94

Chemical formula: $H_6\,Na_2\,Ca_3\,Al_4\,F_5\,B_6\,C_{20}$

101. Barite

Locality: Kŏnsang-dong and Inam-dong, Oegwi-myŏn, Kanggye-gun, P'yŏngan-pukto

Barite[53] from Inam-dong, Kanggye-gun occurs as irregular veins in limestone and shows in druses, good crystals exceeding 10 cm in diameter, which consists of c(001), m(110), d(102), o(011), a(100), etc.

102. Gypsum

Locality: Sangwŏl-tong, Haun-myŏn, Myŏngch'ŏn-gun, Hamgyŏng-pukto

Gypsum[33] from Sangwŏl-tong, Myŏngch'ŏn-gun is found as thinly tabular bodies 1 cm thick along the bedding plane of Tertiary shale. The length of the crystals is commonly less than 0.5 mm but at times reaches 1 cm.

103. Chalcanthite

Locality: Koraesu Mine, Koraesu-ri (Kyŏngsu-ri), Sobaeng-myŏn, Yŏngwŏn-gun, P'yŏngan-namdo

* Named by Eiichi Iwase.

Chalcanthite[9] from the Koraesu Mine, Yŏngwŏn-gun is found where mine water drops in the mining pits of the tungsten-bearing quartz veins. It is a beautiful colloid of deep greenish blue but becomes earthy from dehydration.

104. Wolframite

Locality: Taehwa Mine, Nŭngam-ni, Ch'ungju-gun, Ch'ungch'ŏng-pukto
Yangdŏk Mine, Yangdŏk-kun, P'yŏngan-namdo

Good crystals of wolframite from the Taehwa Mine, Ch'ungju-gun were reported in the second edition of the "Minerals of Korea" to be constructed of a(100), b(010), l(210), m(110), t(102), y($\bar{1}$02), f(011), o($\bar{1}$11) and σ(121).

In addition, Ryuji SUGIYAMA and Tomoshige MAKINO[32] have also observed the following crystal planes of this mineral from the same mine: h($\bar{3}$10), ($\bar{3}$1$\bar{0}$), x(101), c(001), w(111), s($\bar{1}$21), ($\bar{1}\bar{2}$1) Δ(112), z(113), (1$\bar{1}$3), m'($\bar{1}$10) a'($\bar{1}$00) b'(0$\bar{1}$0), h'($\bar{3}$10), h''($\bar{3}\bar{1}$0), m'''(1$\bar{1}$0), (122), (1$\bar{2}$2), ($\bar{5}$10), (230), (232), (1$\bar{2}$2), (2$\bar{1}$1), (520), ($\bar{7}$20), (5$\bar{2}$0), (3$\bar{1}$0), ($\bar{1}$05).

In a good crystal* collected by the author, moreover, Yoshio KINOSAKI[28] reported the presence of the following planes: a(100), c(001), m(110), t(102), f(011), s($\bar{1}$21), σ(121) (Fig. 14, Pl. 2).

The chemical composition of wolframite from the Yangdŏk Mine is as follows (analyzed by T. MIZUMA):

Table 28

SiO_2	FeO	CaO	MnO	WO_3	Total
1.90	5.48	0.90	15.88	75.70	99.86

105. Scheelite

Locality: Taehwa Mine, Nŭngam-ni, Angsŏng-myŏn, Ch'ungju-gun, Ch'ungch'ŏng-pukto
Ilgwang Mine, Wŏl-li, Ilgwang-myŏn, Tongnae-gun, Kyŏngsang-namdo
P'ungsu Mine, Ch'angnak Mine, Ch'angnak-tong and Such'ŏl-tong, P'unggi-myŏn, Yŏngju-gun, Kyŏngsang-pukto
Panggye Mine, Kyech'ol-li, Pangnim-myŏn, P'yŏngch'ang-gun, Kangwŏn-do

Scheelite[23),50] from the Taehwa Mine, Ch'ungju-gun shows good crystals and is apt to be abundant in a comparatively shallow zone of the wolframite veins. The mineral is white, light yellowish brown, grass green, grayish black, translucent or opaque and consists of the following planes (Fig. 15, Pl. 3): c(001), p(111), h(313), s(131), e(101). On the e-plane, etchingfigures and numerous striae parallel to (121) are seen.

* 3 cm in c-axis, 2 cm in b-axis, 0.8 cm in a-axis.

Scheelite[9),18)] from the Ilgwang Mine, Tongnae-gun occurs in a greisenized rock and is associated with tourmaline, chalcopyrite and magnetite. It is white, but shows a light flesh color on the surface. The crystals are pyramidal and up to 1.5 cm in breadth. The observed crystal planes are as follows (Fig. 16, Pl. 3): o(102), e(101), β(113), p(111). In some cases these crystals are partly replaced by wolframite.

Scheelite[28)] from the P'ungsu Mine, Yŏngju-gun occurs as simple crystals or as parallel growths of the mineral in wolframite-bearing quartz veins in granite gneiss. It is brownish, translucent, 2–2.5 cm in length on the c-axis and shows the following planes (Fig. 17, Pl. 3): e(101), p(111), k(515).

Scheelite[28)] from the Ch'angnak Mine, Yŏngju-gun occurs in quartz-veins in granite-gneiss, and is associated with siderite, beryl, bismuthinite, molybdenite and wolframite. It is yellowish brown and translucent, rarely light brown to white and translucent, 5–20 mm in length on the c-axis, and shows crystal planes of e(101) and p(111).

Scheelite[28)] from the Panggye Mine, P'yongch'ang-gun occurs in contact deposits, composed mainly of pyrrhotite, which are formed between limestone and granite. The mineral here is green and translucent or at times brown or white, showing crystal planes of e(101) and p(111), the length of the c-axis being 5–15 mm (Fig. 18, Pl. 3).

106. Wulfenite

Locality: Namyang Mine, Pugyang-ni, Ŭmdŏng-myŏn, Suwŏn-gun, Kyŏnggi-do

Wulfenite from the Namyang Mine, Suwŏn-gun occurs in wolframite-bearing molybdenite quartz veins and is associated with chalcopyrite, pyrite, galena, siderite, fluorite, zinc blende and secondary minerals such as cerussite, pyromorphite, limonite, azurite, etc.

It is yellowish and shows tabular crystals, and chiefly consists of c(001) together with insignificant planes of n(111) and ν? Under the microscope, it is yellow and shows strong pleochroism. $Z > X$. Uniaxial, negative; index and double refraction are large.

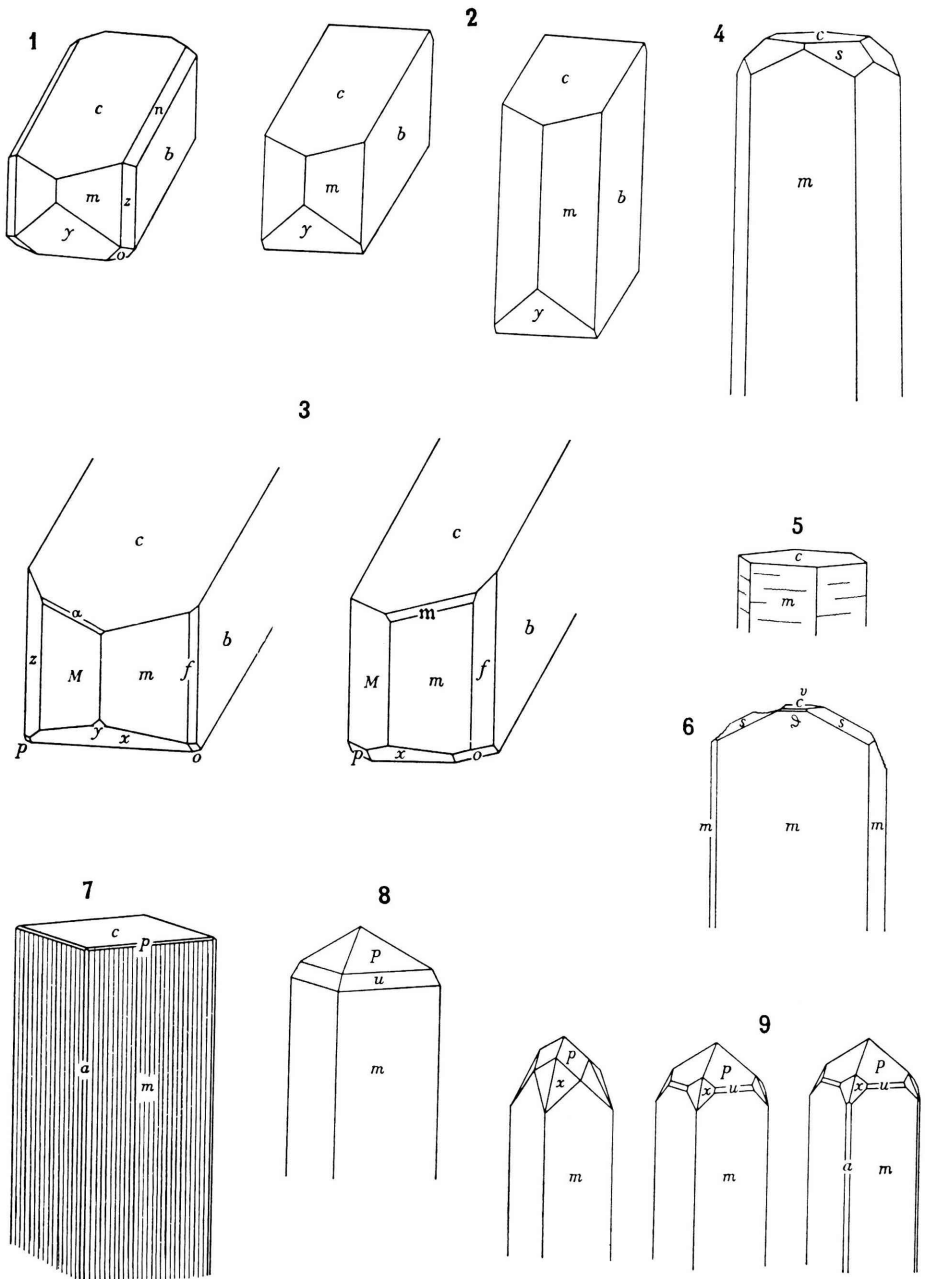

Plate 1

Fig. 1. Orthoclase. Nojŏn-dong (after Y. KINOSAKI)
2. Orthoclase. Taedang Mine (after Y. KINOSAKI)
3. Microcline-perthite. Tanryoku Mine (after Y. KINOSAKI)
4. Beryl. Taehwa Mine, Ch'ungju-gun (after R. SUGIYAMA)
5. Beryl. Turyu-san (after Y. KINOSAKI)
6. Beryl. Hach'owŏl-li (after Y. KINOSAKI)
7. Vesuvianite. Changhyŏl-li (after Y. KINOSAKI)
8. Zircon. Paegun-san (after Y. KINOSAKI)
9. Zircon. Iha-ri (after Y. KINOSAKI)

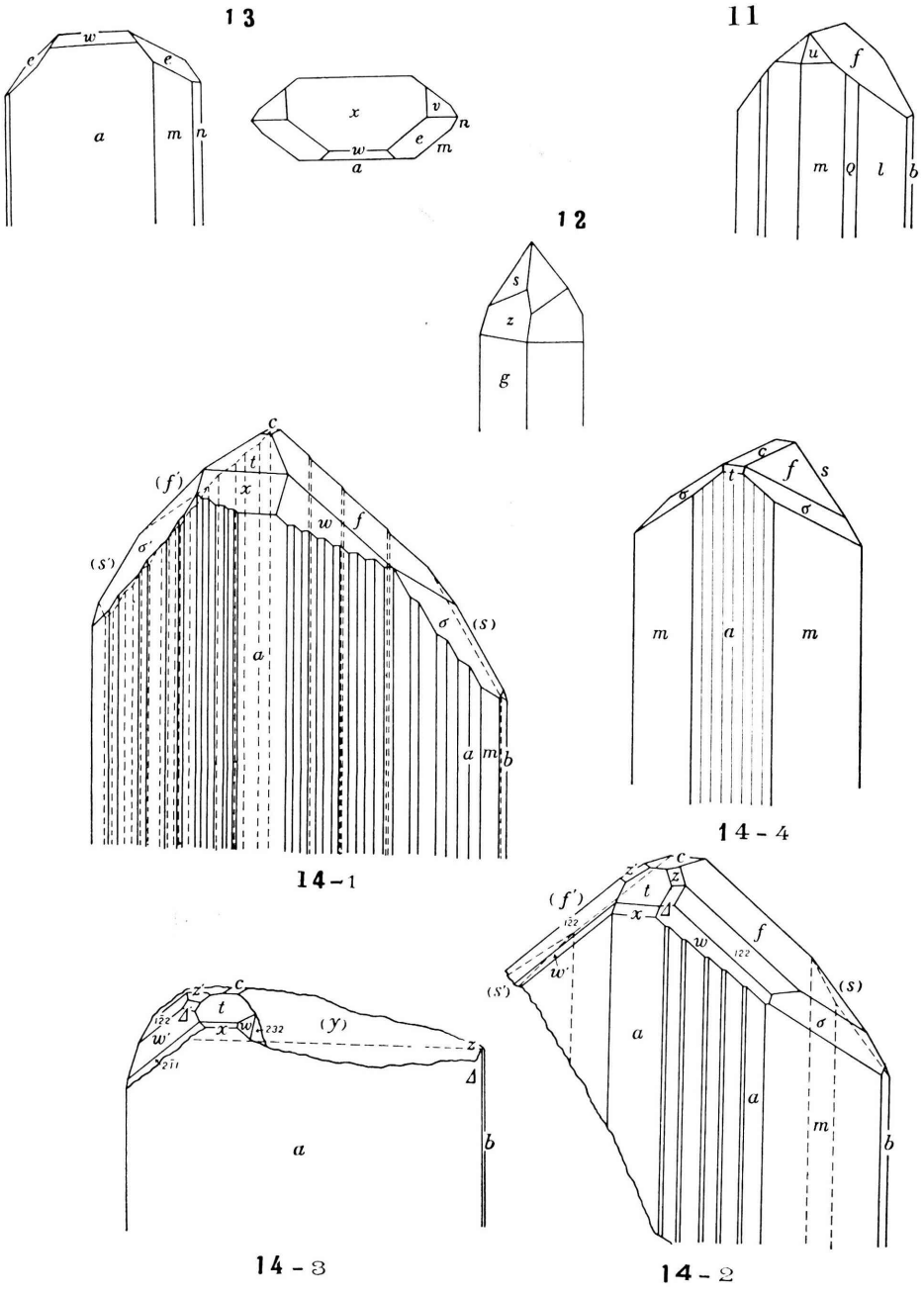

Plate 2

Fig. 11. Topaz. Yong'yŏl-li (after K. SAKURAI)
12. Fergusonite. Kukkun Mine (after Y. KINOSAKI)
13. Monazite. Kŭmsal-li (after Y. KINOSAKI)
14. Wolframite. Taehwa Mine (1–3; after R. SUGIYAMA; 4; after Y. KINOSAKI)

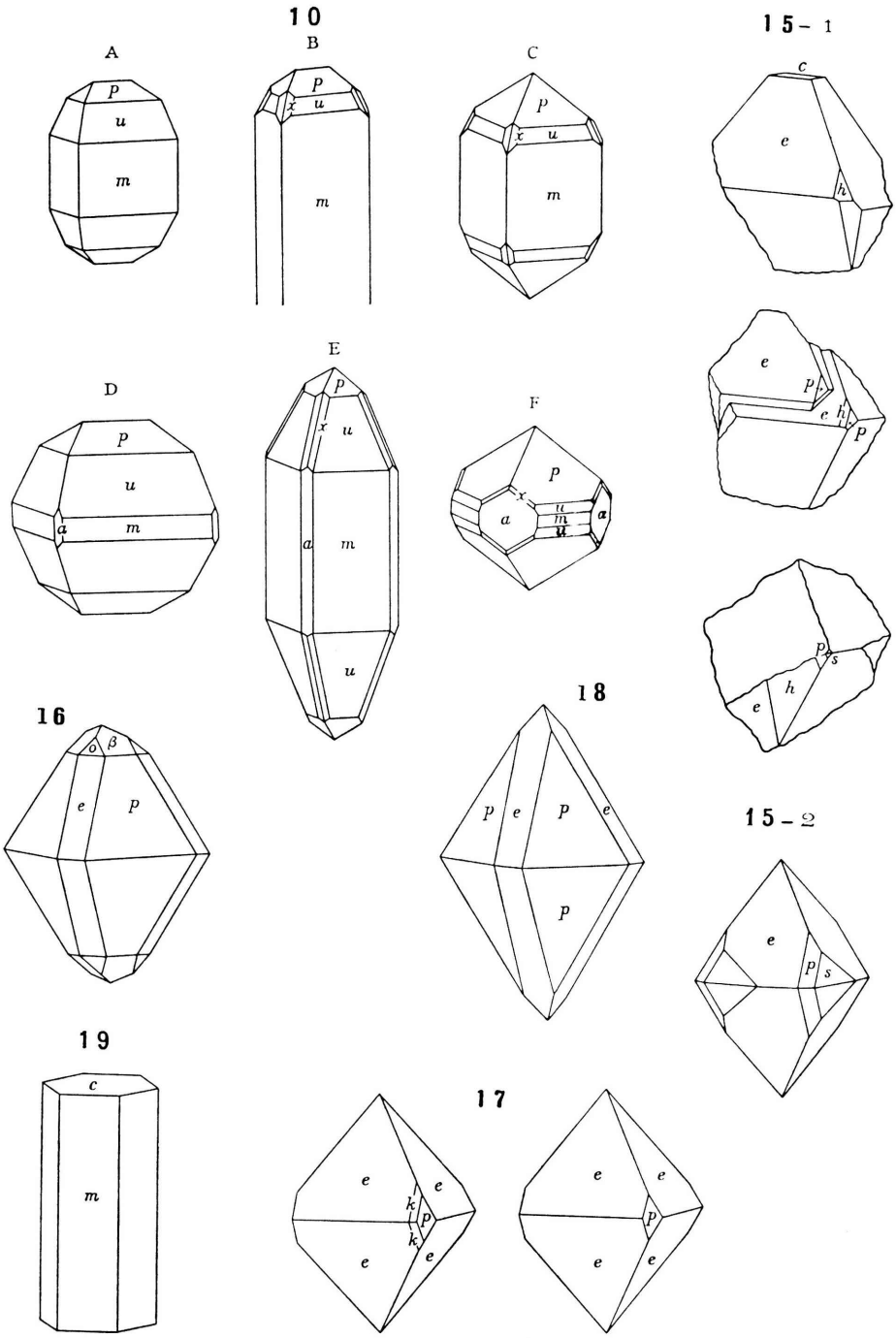

Plate 3

Fig. 10. Zircon. Talli-dong (after Y. KINOSAKI)
15. Scheelite. Taehwa Mine (1: after Z. HARADA; 2: after T. MAKINO)
16. Scheelite. Ilgwang Mine (after Y. KINOSAKI)
17. Scheelite. P'ungsu Mine (after Y. KINOSAKI)
18. Scheelite. Panggye Mine (after Y. KINOSAKI)
19. Pyromorphite. Taeryong-dong (after Y. KINOSAKI)

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