minerals. At present, sphalerite, chalcopyrite, stannite, cassiterite, sulfostannates and, in some cases, apparently galena constitute valuable sources of indium.

TABLE 379

Principal indium-bearing minerals

Mineral	Maximum content of indium,%	Most common content of indium,%	Mineral	Maximum content of indium,%	Most common content of indium,%
Sphalerite	0.83	0.004	Franckeite	0.1	?
Chalcopyrite	0.15	0.002	Cylindrite	0.054	?
Stannite	0.12	0.005 -0.05	Cassiterite	0.052	0.002
Pyrrhotite	0.005	0.0001-0.0005	Colloform cassiterite	1.35*	0.1-0.5
Pyrite	0.005	?	Siderite	0.006	?
Galena	0.01	?	Tourmaline	0.0008	?
Bornite	0.01	?	Chlorite	0.0004	?

* According to G. N. Komarova and L. E. Novorossova.

Native indium In

Discovered in 1963 by N. E. Zalashkova and V. V. Ivanov (IMGRE).

Chemical composition. Indium was determined microspectroscopically in amounts comparable with its content in synthetic metallic indium.

Structure. Tetragonal. a_0 = 3.25, c_0 = 4.95 Å, Z = 2.

The results of X-ray analysis of native and synthetic metallic indium are given in Table 380.

TABLE 380

Calculation from X-ray powder patterns of native indium (according to N. E. Zalashkova and V. V. Ivanov)

Native indium		Synthetic indium (Swanson and Fuyat, 1953)		Native indium		Synthetic indium (Swanson and Fuyat, 1953)	
I	*d* (*kX*)	*I*	*d* (Å)	*I*	*d* (*kX*)	*I*	*d* (Å)
10	2.74	100	2.715	<1	1.149	5	1.1493
2	2.50	21	2.471	<1	1.092	12	1.0904
3	2.30	36	2.298	<1	1.059	4	1.0587
<1	(2.05)	—	—	<1	1.043	5	1.0425
2	1.69	24	1.683	<1	1.029	8	1.0282
1	1.63	12	1.625	<1	0.986	1	0.9845
1	1.474	16	1.470	<1	0.949	3	0.9495
2	1.398	23	1.395	<1	0.911	2	0.9056
1	1.361	11	1.358	<1	0.888	4	0.8874
		3	(1.2368)	<1		3	0.8180

Photographs taken with Cu-Ni-radiation; D = 57.3 mm.

Habit. Occurs in grains of various forms measuring up to 1 mm.

Physical properties. Gray with yellowish tinge. Luster metallic. Micro-indentation hardness between 130 and 159 kg/mm^2 (142 kg/mm^2 on the average). Hardness of synthetic metallic indium ranges from 137 to 165 kg/mm^2 (150 kg/mm^2 on the average).

Microscopy. Pinkish-white in polished sections. Very weakly anisotropic. No double reflection. Reflectivity very high, almost equal to that of native silver. R in yellow light 92.3% (in air) and 85.7% (on immersion).

Occurrence and genesis. Discovered in greisenized and albitized granites of Eastern Transbaikalia, in close association with native silver Apparently formed during albitization of indium-bearing biotite granites, owing to accumulation of indium lost by biotites on decomposition during alkali metasomatism.

Roquesite $CuInS_2$

Discovered in the Charier deposit, France (Picot and Pierrot, 1963). Named after Prof. M. Roque.

Chemical composition. A sulfide of copper and indium. Theoretical composition (in %): Cu 26.2; In 47.4; S 26.4; total 100; synthetic $CuInS_2$: Cu 26.6 ± 0.5; In 48.0 ± 1; S 27.0 ± 1; total 101.6; roquesite: Cu 26.8 ± ± 0.5; In 47.8 ± 1; S 27.3 ± 1; total 101.9.

Structure. Tetragonal. a_0 = 5.51, c_0 = 11.05 Å. Isostructural with chalcopyrite.

X-ray powder patterns of roquesite and synthetic $CuInS_2$ are very similar (Picot and Pierrot, 1963) (Table 381).

Habit. Observed only in thin sections in the form of lamellar and irregular inclusions (0.3 × 0.2 mm) in bornite. Maximum size of inclusions 1 mm^2.

Microscopy. Gray in polished sections, faintly bluish in comparison with bornite. Very weakly anisotropic. Reflectivity in yellow light (λ = 554 mμ) 22.4%. Micro-indentation hardness 241 kg/mm^2. Relative relief high in comparison with that of bornite. Structure brought out by etching with concentrated HNO_3.

Occurrence and genesis. Discovered in thin sections of ores from the Charier deposit, Allier Department, Central France. The ore mainly consists of copper sulfides, cassiterite, martitized magnetite and hertzinite spinel, which form veins in highly metamorphosed rocks. The vein minerals are mainly represented by iron-rich green mica of the lepidomelane type and iron chlorite. Moreover, quartz, carbonates, apatite, zircon, garnet, rutile, andalusite, fluorite, epidote, beryl, ilmenite, scheelite, native bismuth, bismuthinite, molybdenite, emplectite, pyrite, tetrahedrite and other minerals are present in veins.

Roquesite occurs in association with copper sulfides and forms inclusions in bornite. Not observed in chalcopyrite. Bornite, wittichenite, chalcocite and covellite replace chalcopyrite. Bornite with roquesite inclusions contains 0.3% In. Sphalerite with disseminated chalcopyrite emulsion occurs in association with roquesite-bearing bornite. The content of indium in this sphalerite is as high as 0.8%. The Charier ores formed