

it. Sixteen chapters are devoted to the identification of important gems and gem materials. An appendix of thirteen pages includes a glossary, alphabetical summary of gem species, description of the crystal systems, a short bibliography, and tables of specific gravities and refractive indices. There is an excellent index.

The book should prove to be very serviceable to those for whom it is specifically designed, namely, jewelers and dealers in gem stones.

EDWARD H. KRAUS

X-RAY CRYSTALLOGRAPHY by R. W. James, Senior Lecturer in Physics in the University of Manchester. *London*, Methuen & Co., Ltd., 1930. vii+88 pages, 29 figures.  $4\frac{1}{2}'' \times 6\frac{3}{4}''$ . Cloth. Price 2s.6d. Second edition, 1941. Price 3s.

This excellent book, one of a series of small-sized monographs on physical subjects, gives a concise account of the principles involved in the analysis of crystal structures by means of  $x$ -rays.  $X$ -ray crystallography is treated as the descendant of geometrical crystallography, bringing proof of the pre-existing theory of the periodic structure of crystals and the underlying framework of space-lattices, point-groups (crystal classes), and space-groups, and giving the means of finding the absolute lengths of the lattice periods and the actual positions of the atoms in the unit cell. A short chapter on the relation of the crystal form to the crystal lattice shows why crystal faces have rational and preferably simple indices. The following chapter on the crystal lattice as a diffraction grating introduces Bragg's rule and gives an account of the earlier methods of observing  $x$ -ray diffraction. A chapter on crystal symmetry summarizes the classical geometrical theory, shows how lattice centering and the action of glide-planes and screw-axes give systematic spectral omissions, and explains the calculation of the structure amplitude. The following chapter on the measurement and calculation of the intensities of  $x$ -ray spectra considers theoretical reflection from perfect and mozaic crystals and the effects of primary and secondary extinction; the calculation of  $f$  from the distribution of electrons in the atom, and  $F$  from the distribution of atoms in the unit cell; the temperature factor; and the determination of atomic parameters by trial and error and with the help of the Fourier series. In conclusion, some simple structural types are described and a short bibliography and index are given.

In the section on external symmetry rotation-reflexion axes are used whereas rotation-inversion axes are now generally preferred. The groupings of the crystal classes into crystal systems avoids the difficulties that arise when the systems are defined by the typical axial relations, but the recognition of a separate trigonal system leads to formal difficulties. Dr. George Tunell has noted that the diagram representing the space-group  $D_2^5$  (Fig. 20) is incorrect.

By a considered choice and economy of words—recalling the style of the author's chief, Sir W. L. Bragg—Mr. James presents a very readable and illuminating introduction to a complex subject. The concise treatment will appeal particularly to research workers who are commencing a study of structural crystallography. The second edition appears to be an unchanged reprint of the first, on better paper.

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## NEW MINERAL NAMES

### Meta-alunogen

SAMUEL G. GORDON: Results of the Chilean mineralogical expedition of 1938. Part VII. The crystallography of alunogen, meta-alunogen and pickeringite. *Nectulae Naturae Acad. Nat. Sciences Philadelphia*, 101, 9 pp. (1942).

Alunogen occurs with pickeringite in veins in altered andesite near Francisco de Vergara, Chile. Where exposed, the alunogen dehydrates readily to a white, waxy or pearly monoclinic mineral, pseudomorphous after alunogen, and called meta-alunogen. Analysis by William Pitman and Paul Collins gave:  $\text{Al}_2\text{O}_3$  17.33,  $\text{SO}_3$  41.04,  $\text{H}_2\text{O}$  41.44; sum 99.81%, corresponding to  $\text{Al}_2(\text{SO}_4)_3 \cdot 13\frac{1}{2} \text{H}_2\text{O}$ . Optically positive,  $\alpha=1.469$ ,  $\beta=1.473$ ,  $\gamma=1.491$ , 2E large, obtuse bisectrix perpendicular to cleavage.

MICHAEL FLEISCHER

### Kalsilite

F. A. BANNISTER AND MAX H. HEY: Kalsilite, a polymorph of  $\text{KAlSiO}_4$ . *Mineral. Mag.*, **26**, 218-224 (1942).

NAME: From the chemical composition.

CHEMICAL PROPERTIES: Microchemical analysis by M. H. Hey gave for a fraction of sp. gr. 2.62-2.67;  $\text{SiO}_2$  39.6,  $\text{Al}_2\text{O}_3$  21.3,  $\text{Fe}_2\text{O}_3$  5.9,  $\text{MgO}$  3.7,  $\text{CaO}$  5.0,  $\text{K}_2\text{O}$  20.1,  $\text{Na}_2\text{O}$  1.6; sum 97.2%. Ignition loss at 800°C. less than 1%. The Fe, Ca and Mg may be due to inclusions of phlogopite or diopside, but the pure mineral contains some iron. Readily attacked by dilute HCl giving gelatinous silica.

CRYSTALLOGRAPHIC PROPERTIES: Occurs in irregular grains showing no crystal faces. No cleavage observed. Laue and oscillation photographs show kalsilite to be hexagonal, space group  $D_6^h=C6_2$ . It differs from kaliophilite and synthetic orthorhombic  $\text{KAlSiO}_4$  and is not isomorphous with nepheline. The unit cell constants are:  $a=5.17$ ,  $c=8.67 \text{ \AA}$ ., and the unit cell contains 2  $\text{KAlSiO}_4$ . X-ray powder diffraction data are given.

PHYSICAL AND OPTICAL PROPERTIES: Colorless. Sp. gr.=2.59±.03. Uniaxial, negative,  $\omega=1.542$ ,  $\epsilon=1.537 \pm .002$ .

OCCURRENCE: Occurs as "pegmatitoid segregations" in the rocks from southwest Uganda named mafurite, kalsilite-ugandite and kalsilite-katungite by Holmes. (*Mineral. Mag.* **26**, 197-217 (1942)). These are potash-rich ultrabasic lavas containing varying proportions of olivine, melilite, diopsidic augite and leucite. Other minerals associated with kalsilite are phlogopite and a zeolite related to harmotome. Also occurs in mafurite-venanzite rock from Pian di Celle, San Venanzo, Italy (Holmes, *Geological Mag.*, **79**, 225-232 (1942)).

M. F.

### Shilkinite

G. W. MERKULOVA: A new mineral—shilkinite. *Mem. Soc. Russe Mineral.*, **68**, No. 4, 559-561 (561 in English) (1939).

NAME: For the locality, Shilka River (?).

CHEMICAL PROPERTIES: Analyses are given of grayish-green (I) and greenish-white varieties.

	$\text{SiO}_2$	$\text{TiO}_2$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{FeO}$	$\text{MnO}$	$\text{CaO}$
I	45.17	tr.	37.03	1.30	tr.	0.04	0.47
II	46.59	tr.	34.50	2.20	0.15	0.05	0.53
	$\text{Na}_2\text{O}$	$\text{MgO}$	$\text{K}_2\text{O}$	$\text{H}_2\text{O}+$	$\text{H}_2\text{O}-$	Sum	
I	0.47	0.60	8.09	6.31	0.65	100.13	
II	0.44	0.88	8.11	5.80	0.71	99.96	

These give the formula  $\text{K}_2\text{O} \cdot 4\text{Al}_2\text{O}_3 \cdot 8\text{SiO}_2 \cdot 4\text{H}_2\text{O}$ . Insoluble in acid.

PHYSICAL AND OPTICAL PROPERTIES: Color grayish-green, bluish-green, yellowish-green, sometimes white. Luster silky to dull. Hardness=3-4. Sp. gr.=2.795-2.804. Forms fibrous and fan-shaped aggregates. In thin section shows distinct prismatic cleavage and

parting normal to it. Optically negative,  $\alpha=1.55$ ,  $\beta=1.570$ ,  $\gamma=1.585$ ,  $2V(-) 67^\circ$ . Dispersion  $r < v$ , distinct. Pleochroism weak,  $\alpha$ =brownish-yellow,  $\beta$ =light yellow,  $\gamma$ =colorless. Elongation positive. Elongated section has parallel extinction.

**OCCURRENCE:** Occurs in pegmatite dikes of the Bortshovotshny range on the right shore of the Shilka river, eastern Transbaikalia. Associated minerals are orthoclase, albite and smoky quartz. It replaces orthoclase and occurs sometimes as veinlets cutting orthoclase. Sometimes replaces prismatic crystals of some primary mineral which is not preserved.

**DISCUSSION:** The analyses suggest a relationship to the hydrous mica group (bravaisite, illite).

M. F.

#### NEW DATA

#### Skutterudite, Smaltite, Chloanthite, Safflorite

RALPH J. HOLMES: Relationships of the higher arsenides of cobalt, nickel and iron occurring in nature. *Science*, **96**, 90-93 (1942).

This is a preliminary report of x-ray studies of natural and synthetic arsenides of cobalt, nickel and iron. The orthorhombic diarsenides rammelsbergite ( $\text{NiAs}_2$ ), pararammelsbergite ( $\text{NiAs}_2$ ), and loellingite were synthesized. The synthesis of pure  $\text{CoAs}_2$  was unsuccessful, but natural safflorite and synthetic (Co, Fe)  $\text{As}_2$  (Co:Fe ratio not stated) gave patterns similar to that of loellingite. It is suggested that as all analyses of safflorite are high in iron, safflorite should be redefined as a cobaltiferous loellingite (better, cobaltian loellingite—M. F.) and has doubtful merit as an independent species.

The isometric arsenides were previously classified as the diarsenides smaltite ( $\text{CoAs}_2$ ), chloanthite ( $\text{NiAs}_2$ ) and arsenoferrite ( $\text{FeAs}_2$ ), and as the triarsenide skutterudite (Co, Ni, Fe)  $\text{As}_3$ . The published analyses deviate widely from these formulas. Microscopic examination of many specimens demonstrates that the low and variable arsenic content of the so-called diarsenides can be accounted for in many cases by admixed lower arsenides, such as niccolite and rammelsbergite. X-ray patterns of "diarsenides" and triarsenides are identical and have been shown by Oftedal to be compatible only with the formula  $\text{RAs}_3$ .  $\text{CoAs}_3$  has been synthesized and gives the skutterudite pattern as does  $\text{CoAs}_3$  containing variable amounts of Fe and Ni (amounts not stated).  $\text{FeAs}_3$  and  $\text{NiAs}_3$  could not be synthesized. It is suggested that the names smaltite, chloanthite and arsenoferrite be dropped, and that the name skutterudite be used to designate  $\text{CoAs}_3$  and all the other possible minerals of the isomorphous series  $\text{CoAs}_3$ - $\text{NiAs}_3$ - $\text{FeAs}_3$ . The terms nickel-skutterudite and iron-skutterudite are suggested for the members of the series rich in nickel and iron, respectively, not for the end members  $\text{NiAs}_3$  and  $\text{FeAs}_3$ , whose existence is yet to be demonstrated, though the precise limits of substitution of the three metals in the series are yet to be determined.

**DISCUSSION:** The nomenclature suggested is objectionable for several reasons, and differs from that recently suggested by Peacock (*Univ. Toronto Studies, Geol. Ser. No. 44*, p. 65, 1940). Study of these minerals is being continued at both laboratories. It seems best, therefore, to postpone any attempt to systematize their nomenclature.

M. F.

#### Dussertite

DUNCAN McCONNELL: X-ray data on several phosphate minerals: *Am. Jour. Sci.*, **240**, 649-657 (1942).

X-ray study showed that dussertite is a member of the jarosite group. A new analysis of purified type material by F. A. Gonyer gave:  $\text{As}_2\text{O}_5$  31.23,  $\text{Fe}_2\text{O}_3$  34.57,  $\text{BaO}$  20.93,  $\text{CaO}$  0.08,  $\text{H}_2\text{O}$  9.30, Insol. 4.10; Sum 100.21%. This gives the formula  $\text{BaFe}_3(\text{AsO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$ .

M. F.

**Pseudowavellite**

DUNCAN MCCONNELL, *op. cit.* X-ray study shows that pseudowavellite is a member of the alunite group. This requires revision of the formula heretofore given. The new formula  $\text{CaAl}_3(\text{PO}_4)_2(\text{OH})_6 \cdot \text{H}_2\text{O}$  agrees well with the analysis by Shannon and meets the structural requirements.

M. F.

**DISCREDITED MINERALS****Zepharovichite = Wavellite**

DUNCAN MCCONNELL, *op. cit.* Zepharovichite from the type locality, Třenic near Cerhovic, Bohemia, gave the x-ray diffraction pattern of wavellite. The name zepharovichite should be dropped.

M. F.

**Callainite, Coeruleolactite (?)**

DUNCAN MCCONNELL, *op. cit.* Callainite from Montebrias, Creuze, France, was found to be a mixture of wavellite and turquoise. Coeruleolactite from East Whiteland Township, Chester Co., Pa., was found to be turquoise. These results throw doubt on the validity of these two mineral species, but the type material of neither mineral has been re-examined and the minerals cannot be considered discredited.

M. F.

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Arthur P. Honess professor of mineralogy and petrology at Pennsylvania State College and a member of the faculty of that institution for twenty-five years, died December 17, at the age of fifty-five years. From 1937-1940 Professor Honess served on the Council of the Mineralogical Society of America.

A notice has been received of the death of Sir Henry Miers at the age of eighty-four years. He was Waynflete professor of mineralogy at the University of Oxford from 1895 to 1908; principal of the University of London from 1908 to 1915; and vice-chancellor of the University of Manchester and professor of crystallography from 1915 to 1926.