The Crystalline Structure of Herderite, Datolite and Gadolinite   SOV/20-114-4-56/63

of isostructure-gadolinite. Its formula is obtained from the dato-linite-formula $CaBSiO_4OH$ by replacement of the 5-charge-pair CaB by YBe and introduction into the inversion-centers of the cell (cf. figure 3 in reference 5) of 2 additional $Fe^{..}$ with a simul-taneous replacement of 4 OH by 4 O. This leads to the formula FeY_2- $-Be_2Si_2O_{10}$ in the case of 2 such "molecules" in the cell. An ana-lysis similar to the above-mentioned ones was carried out for gadolinite. 30 of very strong inequalities in this case had determ-ined 40 signs of supporting group. The second projection of the electron-density is shown on figure 3, the coordinates following from it in the fourth column of table 1. The quality of the radio-gram was worse by the inclination to metamictic disintegration of gadolinite, and due to the indetermination of the atom-factor of Y (Z = 39) whose major part is on the one hand replaced by Er (Z = 68) and on the other hand by Ca (Z = 20). It is easy to rea-lize that the atom-coordinates of gadolinite are closer to those of herderite than to those of datolite, as a Be-atom with a radius much larger than that possessed by B in datolite is part of the two first minerals. There are 3 figures, 1 table, and 6 references, 4 of which are Slavic.

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The Crystalline Structure of Herderite, Datolite and Gadolinite   SOV/20-114-4-56/63

SUBMITTED: April 4, 1957

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SHUBNIKOV, Aleksey Vasileyevich, akademik; BELOV, N.V., akademik, otvetstven-
nyy red.

[Crystals in science and engineering] Kristally v nauke i tekhnike.
Izd.2., dop. Moskva, Izd-vo Akad. nauk SSSR, 1958. 53 p.
                    (Crystals)   (MIRA 11:7)

BELOV, N.V.

3(8)   PHASE I BOOK EXPLOITATION   SOV/1310

Soveshchaniye po eksperimental'noy i tekhnicheskoy mineralogii i
    petrografii, 5th Leningrad, 1956.

Trudy... (Transactions of the Fifth Conference on Experimental and
    Applied Mineralogy and Petrography) Moscow, Izd-vo AN SSSR, 1958.
    516 p. 1,800 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut geologii rudnykh
    mestorozhdeniy, petrografii, mineralogii i geokhimii, and Akademiya
    nauk SSSR.   Institut khimii silikatov.

Resp. Ed.: Tsvetkov, A.I.; Ed. of Publishing House: Ivanov, B.V.;
    Tech. Ed.: Kiseleva, A.A.

PURPOSE: This book is intended for scientists and students of minera-
    logy and petrography.

COVERAGE: The present collection of articles are reprints of reports
    presented at the Fifth Conference on Experimental and Applied Minera-
    logy and Petrography, held in Leningrad on March 26-31, 1956. The

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Transactions of the Fifth Conference (Cont.)   SOV/1310

purpose of the Conference was to exchange information and coordi-
nate the activities in the fields of experimental and applied
mineralogy and petrography, and to stress the increasing complexity
of practical problems. The Conference was sponsored by the
Academy of Sciences of the USSR and organized by its Institute of
Ore Deposits, Geology, Petrography, Mineralogy and Geochemistry
of the Division of Geological-Geographical Sciences, and the
Institute of Silicate Chemistry of the Division of Chemical
Sciences. During the Conference special tribute was paid to
Academician D.S. Belyankin,(died 1952), founder of applied
petrography in the USSR and organizer of the first four con-
ferences and Academician A.N. Zavaritskiy, (died 1953),out-
standing petrographer and mineralogist. Of the 76 reports pre-
sented, 53 are reprinted in the present volume. Each article is
accompanied by diagrams, tables, and bibliographic references.

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Transactions of the Fifth. Conference (Cont.)   SOV/1310

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                                        MM/lab
                                        3-19-59

BELOV, N.V., akademik.

Crystal structure of silicates. Khim.nauka i prom. 3 no.1:46-56
'58.

(Silicate crystals)   (MIRA 11:3)

AUTHOR: Belov, N. V., Member, AS USSR   30-58-3-12/45
Vaynshteyn, B. K., Doctor of Physical and
Mathematical Sciences

TITLE: The Congress of Crystallographers Held at Montreal
(Kongress kristallografov v Monreale)

PERIODICAL: Vestnik Akademii Nauk SSSR, 1958,   Nr 3,
pp. 64-67 (USSR)

ABSTRACT: The fourth congress took place in the summer of last year and
was attended by more than 700 scientists from 21 countries.
The Soviet delegation consisted of N. V. Belov, L. M. Belyayev,
G. B. Bokiy, Ye. G. Bronnikova, B. K. Vaynshteyn, G. S.
Zhdanov, V. I. Iveronova, A. I. Kitaygorodskiy, Z. G. Pinsker
and S. I. Shchetinin. They had a special number of the
periodical "Crystallography" taken with them, which contained
all reports delivered by the delegation on this congress, as
well as a collection of scientific investigations "The Growth
of Growth of Crystals". The work of this congress was carried
out by 18 sections. In the plenary sessions lectures were
Card 1/4   delivered on topical problems of modern crystallography.

The Congress of Crystallographers Held at Montreal   30-58-3-12/45

On the last two days special symposia on electronography and on the physical research methods of crystallography were held. Great importance was attached to consultations held outside the official sessions on various scientific problems. A large group of reports dealt with the theory, the method, and the new results obtained by investigations on the atomic structure of crystals. In the section "Progress in Structural Determination", A. I. Kitaygorodskiy among other things, dealt with the correlation theory among structural factors. Much attention was paid to electronic computors. Also new types of apparatus were on show in special exhibitions of this congress. N. V. Belov reported on new silicate structures. The authors regretted the fact that, in the field of structural determination, mainly only such structures were precisely dealt with as are already known. A report on general problems of crystal chemistry was delivered by G. Shdanov. The report by G. B. Bokiy and G. A. Kukina dealt upon the crystal chemistry of the complex compounds of bivalent platinums. A. I. Kitaygoroskiy spoke about several results achieved in the

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The Congress of Crystallographers Held at Montreal   30-58-3-12/45

investigation of organic structures at the Institute for
Organoelementary Compounds of the AS USSR. Z. G. Pinsker spoke
about the results obtained by electronographic investigations
of some carbides and nitrites. Radiographic investigations of
displacements were dealt with by V. I. Iveronova. L. M.
Belyayev delivered a report on the investigation of a
distribution of activators in halide-crystals of alkaline
metals. Ye. G. Bronnikovs gave a survey of the methods of
breeding piezo-electric crystals in the USSR. On a plenary
session the Soviet delegation showed the film. "The
crystallization of two-teased diphenylamine (dvulistnikov
difenilamine). In the section dealing with the symmetry
theory N. V. Belov, reported on the 1651 group of the spatial
black- and white, as well as on groups of colored symmetry. In
a symposium Z. G. Pinsker and B. K. Vaynshteyn delivered a
lecture on problems of structural electronography and its
development in the USSR. B. K. Vaynshteyn gave a report on
electron dispersion by means of crystalline polydispersion
preparations. Parallel to the congress a full session of the

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The Congress of Crystallographers Held at Montreal

30-58-3-12/45

Society of Crystallographers was held, on which occasion
new elections were finally carried out as the result of which
N. V. Belov was elected vice-president for 6 years and other
Soviet scientists were elected members of various commissions.
The Soviet delegation was able to visit scientific research
laboratories of the universities of Montreal and in the
vicinity of this town, as well as the National Research Center
in Ottawa. They were able to convince themselves of the high
level of these institutions. The congress showed that
crystallography is developing according to plan.

Card 4/4

AUTHOR: Belov, N. V.   SOV/70-3-1-16/26

TITLE: On the Law of the (X-ray) Extinctions in Quartz
          (O kvartsevom zakone pogasaniy)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 89-90 (USSR)

ABSTRACT: In B.Ya. Pines' book, "Lectures on X-ray Structure Analysis",
            second edition, Khar'kov, 1957, the law $h + k + l = 3n$
            is found for the reflections from the rhombohedral cell of
            quartz.   This is not found in the International Tables or
            other standard handbooks.   This is likely to cause con-
            fusion and is an archaism.   It arises from an old classical
            tradition of using a triply primitive rhombohedral unit
            cell (extra lattice points at 1/3, 1/3, 1/3   and
            2/3, 2/3, 2/3) which corresponds with the observed external
            forms.   It is the rhombohedral cell in terms of which a
            hexagonal primitive cell can be expressed.
            The error that four indices are desirable for the expression
            of co-ordinates and axes in the hexagonal system is also
            found.   Belov demonstrates that $h + k + i = 0$ and that
            the fourth index is redundant but desirable for faces but
Card1/2 · meaningless and confusing for axes and co-ordinates.

On the Law of the (X-ray) Extinctions in Quartz SOV/70-3-1-16/26
        There are 2 figures and 5 Soviet references
ASSOCIATION: Institut kristallografii AN SSSR (Institute
               of Crystallography of the Ac.Sc.USSR)
SUBMITTED: December 13, 1957

Card 2/2

AUTHORS: Borisov, S.V., Pavlov, P.V. and Belov, N.V.

TITLE: A Graphical Method for Solving the Fundamental Harker-Kasper Inequalities (Graficheskiy metod resheniya osnovnykh neravenstv Kharkera-Kaspera)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 90-92 (USSR)

ABSTRACT: The most powerful inequality relating the absolute unitary structure amplitudes is:

$$(U_H \pm U_K)^2 \leqslant (1 \pm U_{H+K})(1 \pm U_{H-K}) \ .$$

This leads to a relationship between the signs of $S_{H+K} = S_H \cdot S_K$ and $S_{H-K} = S_H \cdot S_K$. The examination of all quartets of reflections is a long process and can be facilitated by suitable graphs. If $(U_H \pm U_K)$ is denoted by Σ and $(1 \pm U_{H+K})$ and $(1 \pm U_{H-K})$ by x and y, respectively, then the inequality is $\Sigma^2 \leqslant xy$ which takes the form of hyperbolae for the case of equivalence. Lines of constant Σ are drawn out on two graphs (each with U_{H-K} as abscissae and U_{H+K} as ordinates) one with values of Σ greater than 1 and

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A Graphical Method for Solving the Fundamental Harker-Kasper Inequalities

SOV/70-3-1-17/26

the other with values less than 1 . The graphs are then divided into four regions: a) where $S_{H-K} = S_H \cdot S_K$ obtains; b) where $S_{H+K} = S_H \cdot S_K$ obtains; c) where neither obtains and ab) where both are true. These can be overlaid with weighted reciprocal nets. It can be seen that the most effective inequalities will be obtained when three of the amplitudes selected are large and the fourth small. For values of Σ near to 1 the inequalities will also be effective, for a pair U_{H+K} and U_{H-K} of the order of 0.15 to 0.20. There are 3 figures and 7 references, 5 of which are Soviet and 2 English.

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A Graphical Method for Solving the Fundamental Harker-Kasper Inequalities

ASSOCIATION: Institut kristallografii AN SSSR
               (Institute of Crystallography of the Ac.Sc.USSR)

SUBMITTED: November 25, 1957

Card 3/3

AUTHOR: Belov, N.V.

70-3-2-15/26

TITLE: The Facial Morphology of Crystals in the Light of Their Fine
Structures (Grannaya morfologiya kristallov v svete ikh
tonkoy struktury)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 2, pp 225 - 227
(USSR)

ABSTRACT: Criticisms are made of statements in a new book
"Kristally mineralov" by I.I. Shafranovskiy (Leningrad, 1957).
Tables are given on pp 90 - 106 of the symmetries of the
general and special faces of crystals belonging to the 230
space groups. Satisfactory agreement is found with observations
on 8 cubic minerals but garnet appears to be an exception.
In this case, a cube and not a rhombic dodedahedron has the
most symmetrical faces but garnet (space group $O_h^{10} =$ Ia3d)
crystallises in the dodecahedral form 110. The whole argument
in this section is shown to be fallacious and certain
additional errors of fact are pointed out.
There are 2 figures and 6 references, 4 of which are Soviet and
2 French.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography, Ac.Sc. USSR)

SUBMITTED: February 7, 1958
Card 1/1

AUTHOR: Belov, N.V.   70-3-2-25/26

TITLE: On Ways of Founding a Correct Soviet Course in Crystallo-
          graphy (O putyakh k sozdaniyu polnotsennogo sovetskogo
          kursa kristallografii)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 2, pp 246 - 249
                                                        (USSR)

ABSTRACT: Errors in Soviet Textbooks, published since 1950, when
          dealing with questions of symmetry are quoted and examined.
          References to the books criticised are not given. Foreign
          books are not exempt from the failings castigated.

ASSOCIATION: Institut kristallografii AN SSSR
              (Institute of Crystallography, Ac.Sc. USSR)

SUBMITTED: February 7, 1958

Card 1/1

AUTHORS: Belov, N.V., Belyayev, L.M., Bokiy, G.B., Bronnikova, Ye.G.,
             Vaynshteyn, B.K., Zhdanov, G.S., Iveronova, V.I., Kitaygorod-
             skiy, A.I. and Pinsker, Z.G.

70-3-2-26/26

TITLE: The Fourth International Congress of Crystallography
             (IV mezhdunarodnyy kongress kristallografov) (Montreal,
             July 10-19, 1957)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 2, pp 250 - 260
             (USSR).

ABSTRACT: Outline of the scientific proceedings of the
             conference.

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USCOMM-DC-60577

AUTHORS: Borisov, S.V., Golovachev, V.P. and Belov, N.V.   70-3-3-2/36

TITLE: On the Arbitrary Allocation of Signs in Direct Methods of
Determining Crystal Structures (O proizvol'no zadavayemykh
znakakh pri pryamykh sposobakh rasshifrovki kristallich-
eskikh struktur)

ABSTRACT: The limiting conditions on the arbitrarily allocated
signs of three-structure amplitudes which are connected with
the use of the direct methods of analysis are worked out and
tabulated for all symmetries except inversion. The equivalent
groups of centres of symmetry are listed for the seven crystal
systems with lattices of the P, C, I and F types and
under the headings of the Bravais lattices, the equivalent
centres for the tabulated forms of the structure factors, the
groupings of the different classes of reflections, the number
of arbitrarily assignable signs and the types of reflections
for which it is not permissible to allocate signs arbitrarily
are tabulated. The same types of information are also given
for the plane groups. Such data is not available elsewhere in
organised form. There are 6 figures, 3 tables and 8 references,
Card1/2 1 of which is Soviet and 7 English.

On the Arbitrary Allocation of Signs in Direct Methods of Determining
Crystal Structures   70-3-3-2/36

ASSOCIATION: Institut kristallografii AN SSSR
                 (Institute of Crystallography, Ac.Sc. USSR)
SUBMITTED: March 14, 1958.

Card 2/2

AUTHORS: Simonov, V,I. and Belov, N.V.   SOV/70-3-4-5/26

TITLE: A Determination of the Structure of Ambligonite by the Method of Minimalisation (Opredeleniye struktury ambligonita metodom minimalizatsii)

ABSTRACT: A full determination of the structure of crystals of $LiAlPO_4F$ has been made by a superposition process. The resolving power of the function used has been estimated and the crystal-chemical properties of lithium have been elucidated. The triclinic cell of a natural specimen with small sodium content was found to have the dimensions $a = 5.06$, $b = 5.16$, $c = 7.08$ A; $\alpha = 109°52'$, $\beta = 107°30'$, $\gamma = 97°54'$. Previous authors have chosen different axes but their measurements agree with the above. Three Weissenberg photographs were taken of equatorial layer lines with Mo radiation and intensities were estimated visually, 218 0kl, 190 hol and 167 hk0 reflections were recorded. The statistics of the hol zone showed it to be centred and implied that the space group was $P\bar{1} = C_i^1$. $Z = 2$. The Patterson projections $p(x,z)$

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A Determination of the Structure of Ambligonite by the Method of Minimalisation

SOV/70-3-4-5/26

and $p(y,z)$ were calculated. If r_0 represents a Patterson peak with a radius vector $\underline{r}_0$, then several superposition functions are available, in particular:

$$\Sigma = P(\underline{r} - 1/2\ \underline{r}_0) + P(\underline{r} + 1/2\ \underline{r}_0)$$

$$\sqcap = P(\underline{r} - 1/2\ \underline{r}_0).P(\underline{r} + 1/2\underline{r}_0)$$

$$M = \min.\left\{P(\underline{r} - 1/2\ \underline{r}_0),\ \ P(\underline{r} + 1/2\ \underline{r}_0)\right\}$$

$$I = \Sigma - \left|P(\underline{r} - 1/2\ \underline{r}_0) - P(\underline{r} + 1/2\ \underline{r}_0)\right|$$

and $M = 1/2\ I$.

The P-Al and P-P peaks were identifiable in the Patterson projections and, as the M function was shown to be the most powerful, it was calculated for the x,z and y,z projections with the vectors P-P and Al-Al and enabled oxygen positions to be found. The corresponding

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A Determination of the Structure of Ambligonite by the Method of Minimalisation

SOV/70-3-4-5/26

structure factors were calculated and electron density projections constructed with very satisfactory agreement. It was concluded that the Li atoms were distributed statistically between two positions, final R values (incl. zero reflections) of about 15% being obtained. The final co-ordinates were: (x,y,z) Al_I (0,0,0); Al_{II} (0.50, 0.50, 0.50); P (0.565, 0.883, 0.238); O_I (0.646, 0.680, 0.3485); O_{II} (0.659, 0.194, 0.402); O_{III} (0.724, 0.836, 0.0805); O_{IV} (0.234, 0.795, 0.1115); (F,OH) (0.143, 0.319, 0.267); 1/2 Li_I (0.92, 0.575, 0.18); 1/2 Li_{II} (0.995, 0.65, 0.25). The accuracy is estimated at P ± 0.002 A, O ± 0.005 A, 1/2 Li ± 0.05 A . Diagrams are given of the ways in which the P tetrahedra and the Al octahedra link up and a calculation of the way in which

Card 3/4

AUTHORS: Belov, N.V., Belova, Ye.N. and Tarkhova, T.N.   SOV/70-3-5-15/24

TITLE: Further on the Colour Symmetry Groups (Yeshche o gruppakh tsvetnoy simmetrii)

ABSTRACT: Diagrams of the 15-colour symmetry groups which were given in Kristallografiya, 1957, Vol 2, p 21 can be improved slightly. The designation of the group $I\,4_1$ is altered to $I\,4_1(4_3)$ and its relationship to the packing of squares, each of symmetry $P\,4_1$, is illustrated. New diagrams are given showing the symmetries of the groups $I\,4_1md$ and $Fdd2$ better than those published previously. There are 18 figures and 5 Soviet references.

ASSOCIATION: Institut kristallografii AN SSSR
              (Institute of Crystallography of the Ac.Sc.USSR)

SUBMITTED: July 11, 1958

Card 1/1

AUTHORS: Donnay, G., Belov, N.V., Neronova, N.N. and Smirnova, T.S.

SOV/70-3-5-22/24

TITLE: On the Shubnikov Groups (O Shubnikovskikh gruppakh) (Letters to the Editor)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 5, pp 635-636 (USSR)

ABSTRACT: Letter from the first author. Baltimore, USA, April 12, 1958:

It is suggested that in the deduction of the 36 P_a groups of the Shubnikov (black and white) groups 12 groups are not distinct but are only repetitions in different orientations of others. 12 other groups are thought to have been omitted. Derivations of the groups 387 ($P_a ccm$) and 388 ($P_a bmb$) are taken as examples. It is found that $P_a bmb$ must be replaced by $P_a maa$. The co-ordinates of the black and white equivalent points in the 3 groups are listed. All co-ordinates of $P_a bmb$ can be transformed into those of $P_a ccm$ by the following matrix: the co-ordinates of the

Card 1/3   black and white points are exchanged. No matrix will

On the Shubnikov Groups   SOV/70-3-5-22/24

transform co-ordinates in $P_a$maa into those in $P_a$ccm.
The simple rule is that if the x- co-ordinates are
identical for two settings connected by a transformation
matrix, then the two P_a-symbols will correspond to
different settings (aspects) of the same Shubnikov group.
The groups following are therefore doublets (numbers as
in Trudy Inst. Kristallog., 1955, Vol 11, p 33):
372, 371; 374, 373; 377, 375; 380,378; 385, 384;
388, 387; 390, 389; 392, 391; 394, 393; 395, 396;
400, 399; 402, 403 .
The following groups should be added $P_a$maa, $P_a$ncb,
$P_a$bmm, $P_a$baa, $P_a$mcb, $P_a$naa, $P_a$bcm, $P_a$bmn, $P_a$mcn,
$P_a$nca, $P_a$nmm, $P_a$mnn .
Reply from the other authors, Moscow, July 4, 1958:
These mistakes have already been acknowledged and
corrected in Kristallografiya, 1957, Vol 2, Nr 3, pp 315-25.

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On the Shubnikov Groups

SOV/70-3-5-22/24

Canonical forms of the 12 additional groups listed above are given, together with the group numbers and equivalent groups. All are preferred in the setting P_a as above. There are 2 Soviet references.

SUBMITTED: July 11, 1958

Card 3/3

AUTHOR: Belov, N.V.   SOV/70-3-6-25/25

TITLE: Plan for a University Course in Space Groups (Proyekt
            vuzovskogo kursa fedorovskikh grupp)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 6, pp 765-772 (USSR)

ABSTRACT: Outline of a system of teaching symmetry and, in
            particular, the 230 space groups in logical way.
            There are 5 references, 4 of which are Soviet and
            1 German.

ASSOCIATION: Institut kristallografii AN SSSR
               (Institute of Crystallography of the Ac.Sc.USSR)

SUBMITTED: September 8, 1958

Card 1/1

2o-119-2-46/6o

AUTHORS: Simonov, V. I., Belov, N. V., Member, Academy of Sciences,
             USSR

TITLE: The Crystalline Structure of Amblygonite (Kristallicheskaya
             struktura ambligonita)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 2,
             pp. 354 - 356 (USSR)

ABSTRACT: Initially the amblygonite $LiAlPO_4(F,OH)$ is charcterized in
             detail (Reference 2). The amplitude statistics F_{hol} have con-
             firmed the presence of a center of symmetry in the amblygo-
             nite. Paterson's projections $p(x, z)$ and $p(y,z)$ made the
             regularities of the centrosymmetric crystals be seen (Reference
             4) which made possible the elimination of the vector-branches,
             which correspond to the distances between the atoms; the latter
             are connected to the center of symmetry. Moreover the mini-
             mizing (References 5,6) could be carried out according to the
             projections. The approximated values of the coordinates of all

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The Crystalline Structure of Amblygonite

atoms apart from Li could be determined from $M_4(x,z)$ and $M_2(y,z)$ (Reference 7). The precision of the structure was carried out according to the projections of the electron density $\sigma(x,y)$, $\sigma(z,z)$, $\sigma(y,z)$ without taking Li into consideration. The precision process was continued according to the latter with the same signs according to which the latter projections were built up, until the converted signs of all amplitudes F_{hol} and F_{okl} (for $F_{exp} \neq 0$) harmonized. In order to determine the position of Li, the difference synthesis $\sigma_\Delta(x,z)$ (figure 1) was calculated under elimination of the contribution (vklad) of all atoms apart from Li. The geometrical analysis of the structure has shown the peaks 1 and 2 (figure 1) are corresponding to the "centers" of 1 irregular polyhedra with common facet (figure 2). It can be assumed that Li with a weight of 1/2 has statistically positions in the amblygonite which are 0,5 Å apart from each other. This

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The Crystalline Structure of Amblygonite

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conclusion has been confirmed by the calculated coefficients
of the authencity R for different possible positions of Li.
The assumed coordinates of the base atoms of the amblygonite
– 2 kinds of Al without parameter (in centers of symmetry)
and 7 other atoms in common positions with 24 parameters
(li has statistically 2 positions) – are collated in table 1.
The common anions (F, OH) unite the Al-octahedra in chains
which extend   parallel to the line b_1. The bands of the al-
ternating P- tetrahedra and Li-polyhedra extend in the same
direction. The tetrahedron-octahedron-bands are combined in
lattices which are at right angles to the direction c_1.
Figure 3 shows the projection of a lattice with Al and P, but
instead of Li-polyhedra positions are given which are taken
by Li with a probability of 1/2. Moreover interatomic distances
in the amblygonite are given. The assumption of a structural
relationship between amblygonite and herderite (Reference 9)
is not confirmed, as in the structure of the amblygonite, lattices
exclusively consisting of tetrahedra or octahedra are lacking.
There is, however, a similarity of the chains in the amblygo-
nite with those in sphene $CaTiSiO_5$. There are 3 figures,

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The Crystalline Structure of Amblygonite

2o-119-2-46/6o

1 table and 11 references, 5 of which are Soviet.

SUBMITTED: December 30, 1957

Card 4/4

AUTHORS: Mamedov, Kh. S., Belov, N. V., Member,   SOV/20-121-4-40/54
Academy of Sciences, USSR

TITLE: The Crystalline Structure of Micaceous Calcium Hydrosilicates:
Okenite, Nekoite, Truscottite, Gyrolite (Kristallicheskaya
struktura slyudopodobnykh Ca-gidrosilikatov: okenita, nekoita,
truskottita, girolita) A New Silicon-Oxygen Radical $(Si_6O_{15})_\infty$

(Novyy kremnekislorodnyy radikal $(Si_6O_{15})_\infty$)

ABSTRACT: It is well known that from silicon-oxygen chains of pyroxene
$(SiO_3)_\infty$ amphibole bands are formed as a consequence of
their duplication (with respect to the plane of symmetry).
They are composed of members of 6 subdivisions each and may be
polymerized to 2-dimensional lattices $(Si_2O_5)_\infty$. These
lattices have only 6-membered loops which are a characteristic
feature of the very comprehensive class of pseudo-hexagonal
strata of minerals: Mica, loams, chlorites. The pyroxenoid
chains $(SiO_3)_\infty$ with a different geometry which the author

Card 1/4

The Crystalline Structure of Micaceous Calcium Hydro-   SOV/2o-121-4-4o/54
silicates:Okenite, Nekoite, Truscottite, Gyrolite. A New Silicon-Oxygen
Radical $(Si_6O_{15})\infty$

discovered in wollastonite (Ref 1) (3 Si-tetrahedrons in
the member compared with only two in pyroxenes) yield in
bands with a different formula $(Si_6O_{17})\infty$ as a result of
duplication, and with 8-membered chains (xonolite bands
(Ref 2)) which polymerize to lattices with a very much
changed geometry $(Si_2O_5)\infty$. All these misunderstandings may
be eliminated if it is taken into account that the main
feature of wollastonite xonolite and of related Ca-minerals
are infinite columns of Ca-octahedrons which are added in
such a way that the O — O-edge of each of them is directly
continued by the edge of the next (Fig 1 b). Such an edge
is much longer than that of a Si-tetrahedron but is less than
its double height. Thanks to the inclination of the tetra-
hedrons on one edge of a Ca-octahedron a pair of Si-tetra-
hedrons is attached whereas to a following Ca-tetrahedron
corresponds an edge of a Si-tetrahedron + "saved component"
which was formed by the previous Si-tetrahedron pair thanks
to the inclination. Since the edges of both Ca-tetrahedrons

Card 2/4

The Crystalline Structure of Micaceous Calcium Hydro-
silicates: Okenite, Nekoite, Truscottite, Gyrolite. A New Silicon-Oxygen   SOV/2o-121-4-4o/54
Radical $(Si_6O_{15})_\infty$

are equal this holds also true for the two modifications
of the conjugate chain of Si-tetrahedrons. Thus such a
combination of the near xonolyte bands is possible as it is
shown on figure 1 v. The conjugating element of symmetry
is the slip plane which is most natural in microcrystallo-
graphy. In the chain an exchange takes place between 8-membered
rings with the double number of 5-membered rings. When heated
up to 800° okenite decomposes to wollastonite and a non-
orientated crystobalite which process is accompanied by a
loss of H_2O. The formation of an oriented wollastonite due
to dehydration obviously points to the fact that the de-
composing radical is a condensate of the wollastonite chain
(Ref 6). The final crystallochemical okenite formula is the
following: $3/Ca_3Si_6O_{15} \cdot 2H_2O \cdot 4H_2O/$. Also the thermogram with
2 clear endothermal maxima corresponds to the separation of
water into constitution- and zeolite water. There are 4
figures, 1 table, and 10 references, 5 of which are Soviet.

Card 3/4

The Crystalline Structure of Micaceous Calcium Hydro-   SOV/2o-121-4-4o/54
silicates: Okenite, Nekoite, Truscottite, Gyrolite. A New Silicon-Oxygen
Radical $(Si_6O_{15})_\infty$

ASSOCIATION: Institut khimii Akademii nauk AzerbSSR (Chemical Institute,
                AS Azerbaydzhan SSSR) Institut kristallografii Akademii nauk
                SSSR (Institute of Crystallography, AS USSR)

SUBMITTED: April 29, 1958

Card 4/4

AUTHORS: Mamedov, Kh. S., Belov, N. V.,   SOV/20-121-5-37/50
             Member, Academy of Sciences, USSR

TITLE: Crystalline Structure of Foshagite $Ca_8[Si_6O_{17}](OH)_6$

             (Kristallicheskaya struktura foshagita $Ca_8[Si_6O_{17}](ON)_6$)

ABSTRACT: The authors introductorily discuss the previous versions of
             the formulae of this mineral belonging to the fibrous hydrat-
             ed wollastonites (Refs 1 - 5). It is a typical fibrillar
             mineral. Besides powder diagrams, also X-ray diagrams of the
             rotation about the fiber-axis can be obtained from it. The

             corresponding lattice period amounts to 7,35 $\overset{o}{A}$, the pseudo-

             semiperiod 3,68 $\overset{o}{A}$, however, is distinctly marked which is
             characteristic of several Ca-silicates (Refs 1,2). Foshagite
             is similar to xonontlite with respect to the temperature at
             which the main quantity of water is removed (650 to 750° accor-
             ding to reference 5). Similar to the Ca-minerals mentioned

Card 1/3

Crystalline Structure of Foshagite   SOV/20-121-5-37/50
$Ca_8[Si_6O_{17}](OH)_6$
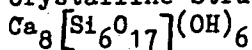
above, foshagite, heated up to 800°, after dehydration transforms into β-wollastonite, the fibers of which are orientated parallel to those of the initial foshagite. The above mentioned period and semiperiod are equal to the two latter and to the previously mentioned minerals. The parameters of the monoclinic cell of foshagite (Ref 5) are given. The basic cleavage - at (001) - and a less marked one - at (100) were determined by means of an electron microscope (Ref 5). The authors discuss the views developed by Gard and Taylor (Ref 5). Contrary to this reference, the authors have given a practically more convenient description of β-wollastonite (Ref 7); there are two superfluous $Ca(OH)_2$ in it,

compared with wollastonite. The authors subsequently denote foshagite as a xonontlite enriched with lime:
$Ca_6[Si_6O_{17}](OH)_2 + 2Ca(OH)_2 = Ca_8[Si_6O_{17}](OH)_6$.
Figures 1 and 2 show a structural scheme of foshagite and a frontal projection; figure 3 shows a plan in "Pauling's"
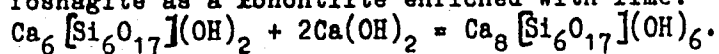
Card 2/3   (paulingovskiye) cylinders. It is easy to build a model of

Crystalline Structure of Foshagite   30V/20-121-5-37/50
$Ca_8[Si_5O_{17}](OH)_6$
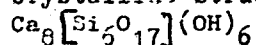
cf foshagite entirely of wollastonite chains (Fig 4), i.e.
strictly according to formula
$2\{4CaO.3SiO_2.H_2O\} = Ca_8[Si_3O_9]_2(OH)_4$.
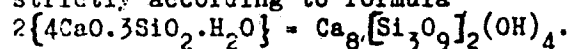
Then the reaction taking place at 750° remains quite unin-
telligible, so far as a simple separation of water from the
Ca-minerals (Ref 5) does not require any temperatures above
500°.
There are 4 figures and 11 references, 6 of which are Soviet.

ASSOCIATION: Institut khimii Akademii nauk AzerbSSR (Institute of Chemi-
                stry, AS Azerbaydzhan-SSR)
                Institut kristallografii Akademii nauk SSSR (Institute of
                Crystallography, AS USSR)

SUBMITTED: May 7, 1958

Card 3/3

AUTHORS: Simonov, V. I., Belov, N. V., Member, Academy of Sciences, USSR

TITLE: The Crystal Structure of Seidhozerite (Kristallicheskaya struktura seydozerita)

ABSTRACT: On the basis of an analysis M. Ye. Kazakova gave the formula $Na_2(Mn_{0,50}, Ti_{0,75}, Zr_{0,75})Si_2O_8(F,OH)$ for zirconium titanium silicate (23% ZrO_2, 13% TiO_2) found by Ye. I. Semenov called seidhozerite. According to optical and roentgen goniometry the mineral is monoclinic and has the cell parameters $a = 5,53$, $b = 7,10$, $c = 18,30$ Å, and $\beta - 102°43'$. The allegation that seidhozerite is holohedral was confirmed by the amplitude statistics $/F_{h01}/$; by means of this statistics a clear (according to Ref 2) centrosymmetric distribution could be observed. According to the specific weight $d = 3,47$ the problem arose as to the realization of the structure with 3 Ti- and 3 Zr-atoms per cell in the P2/c group in which only 2- and 4-fold positions

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are possible. It was not possible to draw reliable conclusions on the structure by means of the superposition method. The main results were obtained from the projection $p(x,z)$. A regularity in the position of the peaks could be observed from this projection which was recently found by the authors for amblygonite (Ref 4). It once played an important part in the determination of the epidote structure (Ref 5). In seidhozerite 2 atoms with approximately equal atomic numbers must be placed in centers of symmetry translationally not identical which are at a distance of $a/2$ from each other. A further analysis of projection under consideration of the regularities of the syntheses of Paterson (given in Ref 6) made possible the observation of two other heavy atoms. The relative position of the 4 atoms observed was used for the superposition of the Paterson projection and for the construction of $M_6(x,z)$. The latter furnished the first surface model of the structure. This was lateron determined more precisely by the computation of the signs and by the computation of the projections $\sigma(x,z)$. After having returned to projection (y,z) the authors determined the sign of F_{0k1} by means of the

Card 2/3   direct (statistic) method (Refs 7,8). Then $\sigma(y,z)$ was construct-

The Crystal Structure of Seidhozerite   SOV/20-122-3-42/57

ed. A precise projection $\sigma(x,z)$ made possible the determination of the grain ratio from $\sigma(y,z)$, and the determination of the latter by means of the normal method. The assumed coordinates of the 17 base atoms (43 parameters) are given on table 1. Seidhozerite proved to be a diorthosilicate inspite of its orthosilicate empirical molecular formula. The 8th O-atom contained in the chemical formula is not a component of the silicon oxygen radical. The crystallochemical formula of seidhozerite must be set up as follows: $Na_4MnTi(Zr_{1,5}, Ti_{0,5})O_2(F,OH)[Si_2O_7]_2$.

There are 2 figures, 1 table, and 11 references, 9 of which are Soviet.

SUBMITTED: July 31, 1958

Card 3/3

3(8)

AUTHORS: Mamedov, Kh. S., Belov, N. V.,   SOV/20-123-1-44/56
            Member, Academy of Sciences, USSR

TITLE: The Crystal Structure of Tobermorite (Tobermorites)
            (O kristallicheskoy strukture tobermorita (tobermoritov))

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 1, pp 163 -
            165 (USSR)

ABSTRACT: Tobermorites are fibrous and at the same time platy, mica-
            like Ca-hydrosilicates. They take on considerable amounts of
            water in the same manner as montmorillonite and vermiculite,
            remaining monocrystalline. There is only a corresponding
            enlargement of the parameter of the elementary cell. The
            water content in tobermorites increases in sharp, jump-like
            increments, a characteristic which distinguishes them from
            the above-mentioned clay minerals. Each increment has been
            given a different name. All tobermorites are characterized
            by rhombic symmetry (Ref 1). Their constants and properties
            are described. If the various amounts of inter-layer water
            are left out of consideration, the composition of all tober-
            morites is the same. One "tobermorite from Lokh-Eynort"
            (Ref 2) differs from all others. Its parameter corresponds

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The Crystal Structure of Tobermorite (Tobermorites)   SOV/20-123-1-44/56

form-wise to an 11 $\overset{o}{A}$ hydrate: it changes into oriented fibers of wollastonite, but its basic cleavage is not (001) but (100)-like and it cannot be changed to a 14 $\overset{o}{A}$ hydrate even after being ground to a fine powder and treated with water for many hours. Megaw and Kelsey (Ref 3) presented a structure scheme which agrees satisfactorily with the diffraction picture of an 11 $\overset{o}{A}$ hydrate. They work from the assumption that of most importance are the wollastonite chains, $(SiO_3)_\infty$, which are characteristic of the product of their

thermal reactions. The chains are responsible for the fiber-like form of the tobermorite: the sheet-like structure is a result of condensation of the amphibole chains to talc nets. The silicon-oxygen nets are (according to Ref 3) similar to corregated cardboard. The authors develop the concrete structure of tobermorite sheets from these schemes. The authors' recent deciphering of the experiment which yielded okenite (Ref 6) among other things (Ref 7) shows that if the disintegration products of Ca-hydrosilicates at $\sim$750° are wollastonite fibers with simple chains, $(Si_3O_9)_\infty$ -

Card 2/4

The Crystal Structure of Tobermorite (Tobermorites)   SOV/20-123-1-44/56

$=3(SiO_3)$ then the double silicon-oxygen chains from xonotlite, $(Si_6O_{17})_\infty$ (Ref 8) serve to generate in the hydrothermal syntheses of Ca-silicates. These chains are discrete in xonotlite itself. In okenite the double chains are no longer discrete and intertwine in a parallel manner, but about a half period b displaced, that is, displaced along the chain axis. Okenite nets are entirely flat in talc and also in mica. In tobermorite the okenite bonds are shoved over each other on swelling (Fig 1). Figure 1 shows an approximate localization of the Si-tetrahedra, 12 of which occur in every sheet (4 overlapping and 4 single pairs) and of the 20 cations of Ca (10 overlapping pairs); all 12 hydroxle groups, OH, (per whole cell) occur under non-covering O atoms in the horizontal bonds of the xonotlite rings. The position of the 16 (per cell) inter-layer H_2O is more difficult to determine.

The paradox of the Lokh-Eynort tobermorite is satisfactorily eliminated if the electronogram (of Ref 2) is studied. The period here clearly shown is not $2 \cdot 5.5 = 11$ Å, as in normal tobermorites, but $3 \cdot 5.5 = 16.5$ Å. Thus the parameters a and

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The Crystal Structure of Tobermorite (Tobermorites)   SOV/20-123-1-44/56

    b of the Lokh-Eynort tobermorite are proven to be a repetition
    of the xonotlite parameter with a c parameter which amounts
    to three-fold. There are 2 figures and 9 references, 3 of
    which are Soviet.

ASSOCIATION: Institut khimii Akademii nauk AzerbSSR (Institute of Chemistry,
                Academy of Sciences, Azerbaydzhanskaya SSR)
                Institut kristallografii Akademii nauk SSSR (Crystallography
                Institute, AS USSR)

SUBMITTED: August 1, 1958

Card 4/4

3(8)
AUTHORS: Mamedov, Kh.S., Belov, N. V.,   SOV/20-123-4-47/53
             Academician

TITLE: The Crystal Structure of Hillebrandite (O kristallicheskoy
             strukture gillebrandita)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 4, pp 741-743
             (USSR)

ABSTRACT: A considerable number of calcium silicates invert to fibrous
             β-wollastonite ($CaSiO_3$) at 700-800°. These fibers are
             oriented parallel to the b axis (b=2· 3.65 Å) which is
             common to the wollastonite and original silicate. From the
             authors' works (Refs 1-3) it is seen that wollastonite chains
             ($3/SiO_3/_\infty$ = $/Si_3O_9/_\infty^{6-}$) are not the primary structural blocks
             in hydrothermal synthesis (either natural or artificial) of
             calcium (hydro)-silicates. These blocks are much more complex
             chains which originate by doubling of the wollastonite chains
             ($/Si_6O_{17}/_\infty^{10-}$). These latter have been designated xonotlite
             chains (Ref 1). In the calcium (hydro)-silicate minerals
             they are present either unchanged (Refs 2,3) or condense to
             lattices (Refs 2,4). Hillebrandite is a characteristic and

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The Crystal Structure of Hillebrandite

SOV/20-123-4-47/53

predominant product produced by hydrothermal synthesis through temperature decrease (pot sediment) (Ref 6). It precipitates easily with a surplus of $Ca(OH)_2$ and even builds an oriented intergrowth with the latter. It is an arcicular and at the same time platy mineral. However, hillebrandite distinguishes itself markedly from okenite and tobermorite, primarily because it cannot be changed to oriented wollaston- ite through thermal treatment (Ref 5). Two of the 3 cell parameters agree exactly with those of xonotlite (Ref 5). This paradox - that is the undoubted role of xonotlite in the wollastonite reaction and the non-inversion of hillebrand- ite to wollastonite by thermal treatment - can easily be explained if 2 subtractions are made. If (a) the basic molecule of xonotlite is removed from the formula of hille- brandite and (b) the 2 unequal parameters, c, are subtracted, the results show that the hillebrandite cell is made of alternating layers of xonotlite and portlandite (Fig 1). This cannot be taken literally, however, for hillebrandite when compared with xonotlite has the following characteristics: the central sheet with 2 chains, $/Si_6O_{17}/$, contains its "own"

Card 2/3

The Crystal Structure of Hillebrandite

SOV/20-123-4-47/53

calcium-cation layer both above and below, while in xonotlite the calcium-cation layer always belongs to both central layers of $/Si_6O_{17}/\infty$ chains. From this scheme it can be seen that the perfect cleavage (001) runs through the middle of the portlandite layer which has become a constituent part of the hillebrandite. There are 1 figure and 6 references, 5 of which are Soviet.

ASSOCIATION: Institut khimii Akademii nauk AzerbSSR (Chemistry Institute of the Academy of Sciences of the Azerbaydzhanskaya SSR) Institut kristallografii Akademii nauk SSSR (Crystallography Institute, Academy of Sciences, USSR)

SUBMITTED: August 1, 1958

Card 3/3

BELOV, N.V.

Studies on structural mineralogy. Part 9. Min.sbor. no.12:
15-42 '58.   (MIRA 13:2)

1. Institut kristallografii AN SSSR.
        (Crystallography)

BELOV, IV V

PHASE I BOOK EXPLOITATION   507/5055

Vsesoyuznoye soveshchaniye po stekloobraznomu sostoyaniyu. 3d, Leningrad, 1959.

Stekloobraznoye sostoyaniye; trudy Tret'yego vsesoyuznogo soveshchaniya Leningrad, 16-20 noyabrya 1959 (Vitreous State; Transactions of the Third All-Union Conference on the Vitreous State, held in Leningrad on November 16-20, 1959) Moscow, Izd-vo AN SSSR, 1960. 534 p. Errata slip inserted. 3,200 copies printed. (Series: Its: Trudy)

Sponsoring Agencies: Institut khimii silikatov Akademii nauk SSSR. Vsesoyuznoye khimicheskoye obshchestvo imeni D.I. Mendeleyeva and Gosudarstvennyy ordena Lenina opticheskiy institut imeni S.I. Vavilova.

Editorial Board: A.I. Avgustinik, V.P. Barzakovskiy, M.A. Bezborodov, O.K. Botvinkin, V.V.Vargin, A.G. Vlasov, K.S. Yevstrop'yev, A.A. Lebedev, M.A. Matveyev, V.S. Molchanov, R.L. Myuller, Ye.A. Porey-Koshits, Chairman, N.A. Toropov, V.A. Florinskaya, A.K. Yakhkind; Ed. of Publishing House: I.V. Suvorov; Tech. Ed.: V.T. Bocharev.

PURPOSE: This book is intended for researchers in the science and technology of glasses.

COVERAGE: The book contains the reports and discussions of the Third All-Union Conference on the Vitreous State, held in Leningrad on November 16-19, 1959. They deal with the methods and results of studying the structure of glasses, the relation between the structure and properties of glasses, the nature of the chemical bond and glass structure, and the crystallochemistry of glass. Fused silica, mechanism of vitrification, optical properties and glass structure, and the electrical properties of glasses are also discussed. A number of the reports deal with the dependence of glass properties on composition, the tinting of glasses and radiation effects, and mechanical, technical, and chemical properties of glasses. Other papers treat glass semiconductors and soda borosilicate glasses. The Conference was attended by more than 300 delegates from Soviet and East German scientific organizations. Among the participants in the discussions were K.V. Solntn, Ye. V. Kurshinskiy, Yu.A. Gustev, V.P. Pryanishnikov, Yu. Ya. Gotlib, O.P. Mzedlov-Petrosyan, G.P. Mikhaylov, S.N. Petrov, A.N. Lazarev, D.I. Levin, A.V. Danilov, N.T. Pichchinskiy, A.Ya. Kuznetsov, E.V. Degtyarev, G.V. Byrgunovskiy, A.A. Lebedev, M.M. Skornyakov, P.Ya. Bokin, E.K. Keller, N.A. Kuznetsov, V.P. Pozdnev, R.S. Shevelevich, Z.G. Pinkev, and O.S. Molchanova. The final session of the Conference was addressed by Professor I.I. Kitaygorodskiy, Honored Scientist and Engineer, Doctor of Technical Sciences. The following institutes were cited for their contribution to the development of glass science and technology: Gosudarstvennyy opticheskiy institut (State Optical Institute), Institut khimii silikatov AN SSSR (Institute of Silicate Chemistry, AS USSR), Fizicheskiy institut AN SSSR (Physics Institute AS USSR), Fiziko-tekhnicheskiy institut AN SSSR (Physicotechnical Institute AS USSR), Institut fiziki AN BSSR, Minsk (Institute of Physics, Academy of Sciences, Belorusskaya SSR, Minsk), Laboratory of Physical Chemistry of Silicates of the Institut obshchey i neorganicheskoy khimii AS SSSR, Minsk (Institute of General and Inorganic Chemistry, Academy of Sciences, Belorusskaya SSR, Minsk), Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High Molecular Compounds, AS USSR), Gosudarstvennyy institut stekla (State Institute for Glass), Gosudarstvennyy institut elektrotekhnicheskogo stekla (State Institute for Electrical Glass), Sibirskiy fiziko-tekhnicheskiy institut, Tomsk (Siberian Physicotechnical Institute, Tomsk),Leningradskiy gosudarstvennyy universitet (Leningrad State University), Moskovskiy khimiko-tekhnologicheskiy institut (Moscow Institute of Chemical Technology),Leningradskiy tekhnologicheskiy institut im. Lensoveta (Leningrad Technological Institut imeni Lensovet), Belorusskiy politekhnicheskiy institut Minsk (Belorussian Polytechnic Institute, Minsk), Novocherkasskiy politekhnicheskiy institut (Novocherkassk Polytechnic Institute), and Sverdlovskiy politekhnicheskiy institut (Sverdlovsk Polytechnic Institute). The Conference was sponsored by the Institute of Silicate Chemistry AS USSR (Acting Director - A.S. Gotlib), the Vsesoyuznoye khimicheskoye obshchestvo im. D.I. Mendeleyeva (All-Union Chemical Society imeni D.I. Mendeleyev), and the Gosudarstvennyy ordena Lenina opticheskiy institut imeni S.I. Vavilov (State "Order of Lenin" Optical Institute imeni S.I. Vavilov). The 15 resolutions of the Conference include recommendations to organize a Center for the purpose of coordinating the research on glass, to publish a new periodical under the title "Fizika i khimiya stekla" (Physics and Chemistry of Glass), and to join the International Committee on Glass. The Conference thanks A.A. Lebedev, Academician, Professor, and Chairman of the Organization of Committee; Ye.A. Porey-Koshits, Doctor of Physics and Mathematics, Member of the Organizational Committee; and R.L. Myuller, Doctor of Chemical Sciences, Member of the Organizational Committee. The editorial board thanks G.M. Bartenev, N.V. Vol'kenshteyn, L.I. Demkina, D.P. Dobychin, B.K. Dubrovo, V.A. Ioffe, and B.T. Kolmiyets. References accompany individual reports.

Belov, N.V.

"The Second Chapter of the Crystall Chemistry of Silicates"

Areport presented at Symposium of the International Union of Crystallography
Lenningrad   21-27   May   1959

SO: B 3,135, 471   28 July 1959

NIKOLAY VASILYEVICH BELOV; GEORGIY BORISOVICH BOKIY; ILLARION
ILLARIONOVICH SHAFRANOVSKIY   .

"IN MEMORIUM OF E.S. FEDOROV"

A Report presented at Symposium of the International Union of Crystallography
Lenningrad, 21-27 May 1959

SO; B,3135,471   28 July 1959

2

BELOV, N. V.

"Das Zweite Kapitel der Kristallchemie der Silicate," a paper presented at the meeting of the German Mineralogical Society, Section for Crystal Science, held in Berlin, 17-18 April 1959.

Angewandte Chemie, 7 July 1959

3(8)
AUTHOR: Belov, N. V.   SOV/7-59-3-11/13

TITLE: Concerning   the   Paper by A. A. Beus "On the Position of
              Alkali Metals in the Structure of Beryl" (Po povodu raboty
              A. A. Beusa "O polozhenii shchelochnykh metallov v strukture
              berilla")

PERIODICAL: Geokhimiya, 1959, Nr 3, pp 282-283 (USSR)

ABSTRACT: The author considers it to be unjustified to tear the aluminum
              portion of beryl apart, especially because the five analyses
              mentioned by A. A. Beus give nearly exactly two atoms Al per
              formula unit of beryl. It is much more probable that here
              lithium replaces beryllium. This is indicated by the nuclear-
              chemical affinity between lithium and beryllium. Besides, the
              ion radius of lithium, according to Pauling, amounts to only
              0.60 Å as against the value of 0.78 Å according to Goldschmidt,
              and that value increases still more in the case of a covalent
              bond in fourth coordination. In any case, it is not permis-
              sible to declare that any isomorphism exists between beryl
              and milarite and herefrom to draw conclusions concerning beryl
              structure. There is 1 Soviet reference.

Card 1/2

AUTHORS: Simonov, V.I. and Belov, N.V.   SOV/70-4-2-4/36

TITLE: The Determination of the Crystal Structure of seydozerite
            (Opredeleniye struktury seydozerita)

ABSTRACT: Seydozerite from the Seydozero area has the formula
            $Na_2(Mn_{0.5}Ti_{0.75}Zr_{0.75})Si_2O_8(F,OH)$ as described in the
            work of Semenov, Kazakova and the author (Ref 1). It is
            monoclinic with the space group
            $C_s^2 = Pc$ or $C_{2h}^4 = P2/c$ and the cell dimensions
            $a = 5.53 \pm 0.2$ Å [sic] $b = 7.10 \pm 0.03$ Å,
            $c = 18.30 \pm 0.10$ Å and $\beta = 102°43' \pm 1'$. β was
            found by optical goniometry. Possible centro-symmetry
            is indicated by the morphology, by the absence of piezo-
            electricity and by the statistics of the $ho\ell$ intensities.
            The Patterson functions (projections) confirmed this and
            the holohedric group P2/c was assumed.
            $d_{obs} = 3.47$ gives $Z = 3.87 \simeq 4$ formulae units per cell.

Card1/5

SOV/70-4-2-4/36
The Determination of the Crystal Structure of Seydozerite

378 non-zero reflexions in the $ho\ell$ zone and 331 in the $ok\ell$ zone were used in the analysis. The absorption for $\lambda = 0.71$ Å was 35 cm^{-1} and the cross-sections of the crystals used were 0.15×0.20 mm ($ho\ell$) and 0.3×0.5 mm $ok\ell$. This leads to errors in $|F|$ of up to 10% and 15%, respectively. $P(y,z)$ and $P(x,z)$ were calculated and are reproduced. The heavy Zr-Zr peaks could be identified and used for superposition methods in the (x,z) projection. Statistical sign-determination methods were found very suitable for the $F(ok\ell)$ reflexions as the space group $P2/c$ is appropriate. For these reflexions those with $\ell = 2n$ have:

$F(ok\ell) = F(o\bar{k}\ell) = F(ok\bar{\ell}) = F(o\bar{k}\bar{\ell})$ and those with $\ell = 2n + 1$ have $F(ok\ell) = -F(o\bar{k}\ell) = -F(ok\bar{\ell}) = F(o\bar{k}\bar{\ell})$. 70 reflexions with the greatest unitary structure amplitudes were taken as "bankers". The signs were considered found if $\geqslant 3$ pairs gave the same sign. 264 out of 331 signs were thus allotted. The Fourier projection was then calculated. It showed a systematic,

Card2/5

SOV/70-4-2-4/36

The Determination of the Crystal Structure of Seydozerite

over-regular atomic arrangement which made superposition methods invalid and caused the statistical method to give ~ 25% of incorrect signs. Crystallochemical and mineralogical considerations concerning the isomorpous replacement had to be used in assigning the atomic positions (see Table 1, p 168). The accuracy of the atomic positions estimated by Vaynshteyn's method was $Zr \pm 0.001$, $Mn \pm 0.002$; $Ti \pm 0.003$; $Si \pm 0.004$; $Na \pm 0.005$; 0 ± 0.009 Å. All x-coordinates come from $\rho(x,z)$ where there are no non-overlapping maxima. $F_{ho\ell}$ and $F_{ok\ell}$ were calculated from the coordinates and compared with the experimental values, giving reliability factors of 17.2 and 22.5% for $ho\ell$ and $ok\ell$ reflexions ($F_{exp} \neq 0$ up to $\sin \vartheta/\lambda \leqslant 1.30$ and $F_{exp} \neq 0$ up to $\sin \vartheta/\lambda \leqslant 0.66$), respectively. Without counting $F_{exp} = 0$ reflexions, the values were 16.6 and 20.7%. Counting up the bond strength balance according to Pauling's second rule, there are some deviations of 25%.

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The Determination of the Crystal Structure of Seydozerite   SOV/70-4-2-4/36

The formula can be written structurally as $Na_4MnTi(Zr_{1.5}Ti_{0.5})O_2(F,OH)_2[Si_2O_7]_2$ with $Z = 2$.
There are endless sheets of octahedra threaded on the twofold azis. Atoms of Mn(Mg), Ti and Na alternate in these octahedra. Zr and Na octahedra alternate in double bands along the b-axis. The silicate groups are Si_2O_7 double tetrahedra parallel to b. Cuspidine and tilleyite have similar bonds between diorthogroups and Ca-octahedra. The bond distances are tabulated and analysed. The 001 cleavage is parallel to the sheets of octahedra. Optical measurements gave $2V = +68°$. $n_g = 1.830$, $n_m = 1.758$ and $n_p = 1.725$. n_g coincides with a and n_p with b and this is consistent with the structure, the Mn octahedra accounting for most of the refractivity.

Card4/5

SOV/70-4-2-4/36
The Determination of the Crystal Structure of Seydozerite

          There are 6 figures, 3 tables and 21 references, 15 of which
          are Soviet, 2 international, 3 English and 1 German

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
          Crystallography of the Ac.Sc.USSR)

SUBMITTED: January 21, 1959

Card 5/5

AUTHOR: ___Belov,___N.V.___   SOV/70-4-2-36/36

TITLE: The Hexagonal Space Groups (Geksagonal'nyye
            fedorovskiye gruppy)

ABSTRACT: Didactic article on the properties of the space groups.

            There are 12 figures and 3 references, 2 of which are
            Soviet and 1 German.

ASSOCIATION: Institut kristallografii AN SSSR
            (Institute of Crystallography of the Ac.Sc.USSR)

Card 1/1

SOV/70-4-3-3/32

AUTHORS: Belov, N.V. and Klevtsova, R.F.

TITLE: The Simplest Method of Deducing the Fedorov (Space) Groups

ABSTRACT: For pedagogic purposes it is most convenient to start with the classes mm2 and mmm and primitive lattices. The symmetry elements m, n, c, g(= a or b) are selected three at a time with the limitation that they do not change from one to another by the simple inter-change of axes. The method rests on the principle that, if all the symmetry elements of a space group are moved so that they intersect in a point and glide and screw translations are suppressed, the appropriate point group is obtained. In expanding from a point group centres of symmetry (i) are generated from i_{ooo} by, for example,

$$i_{1/2\ 00} = i \times a \ , \quad i_{0\ 1/2\ 1/2} = i_{ooo} \times (b + c),$$

$$i_{1/2\ 1/2\ 1/2} = i_{ooo} \times (a + b + c).$$ The displacements of m planes can be found by the operational equation

Card1/4

The Simplest Method of Deducing the Fedorov (Space) Groups

SOV/70-4-3-3/32

$$_{o}m_x \times a/2 = \ _{1/4}m_x \ .$$

There are 16 primitive groups corresponding to Pmmm .
These are given by adding translations to the m planes
as:

$$Pm + 0, \ m + 0, \ m + 0 \ = Pmmm \ ;$$

$$Pm + 0, \ m + a/2, \ m + a/2 = Pmaa \ ;$$

$$Pm + a/2, \ m + 0, \ m + a/2 = Pm^{x}ma$$

where the asterisk denotes a displacement of the plane
from the origin (from the original centre of symmetry).
The other groups are given, for example:

$$Pm + b + c, \ m + c + a, \ m + a + b = Pnnn$$

$$Pm + a + b, \ m + b + c, \ m + c + a = Pb^{x}c^{x}a^{x} \ \ .$$

Similarly, 10 primitive groups can be derived from the

Card 2/4

SOV/70-4-3-3/32

The Simplest Method of Deducing the Fedorov (Space) Groups

class mm2 , for example:

$$D_2^1 = P\ 222; \quad D_2^2 = P\ 2,\ 2 + c,\ 2 + c = P22^*2_1 \ ;$$

$$D_2^3 = P\ 2 + a + b,\ 2 + b + a,\ 2 + 0 = P2_1^*2_1^*2 \ ;$$

$$D_2^4 = P2 + a + b,\ 2 + b + c,\ 2 + c + a = P2_1^*2_1^*2_1^* \quad .$$

This method of deducing the space groups is closer to Fedorov's original method than to Schoenflies' (Ref 5). There are 6 references, of which 3 are Soviet, 2 German and 1 international.

Card3/4

The Simplest Method of Deducing the Fedorov (Space) Groups   SOV/70-4-3-3/32

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
        Crystallography of the Ac.Sc., USSR)

SUBMITTED: April 13, 1959

Card 4/4

AUTHORS: Pavlov, P.V. and Belov, N.V.

TITLE: The Determination of the Structures of Herderite, Datolite and Gadolinite by Direct Methods

ABSTRACT: The structures of these three compounds were determined in parallel by direct methods, particularly by those elaborated in the Institute of Crystallography and in Gor'kiy University, which proved to be exceptionally powerful. A full account is given for pedagogic purposes. The cell dimensions and space group, found by Strunz, for herderite (a = 9.80, b = 7.68, c = 4.80 Å, $\beta = 90°06'$, $C_{2h}^5 = P2_1/a$) were confirmed. $d_{obs.} = 3.00$ and Z = 4 , the formula unit being $CaBePO_4F$. The use of Harker-Kasper inequalities followed by Zachariasen's statistical analysis has been successful several times before and was applied here. Weissenberg photographs with Mo radiation provided abundant data. There were 167 independent hk0 reflexions. Amplitudes were put on an absolute scale by Wilson and Vaynshteyn's methods.

Card1/5

The Determination of the Structures of Herderite, Datolite and Gadolinite by Direct Methods

SOV/70-4-3-8/32

There were 15 with $\left|U_{hk0}\right| > 0.5$. In all, 45 confirmed sign relationships of the form $S_{H+K} = S_H \cdot S_K$ were found. 18 signs were found uniquely by:

$$\left|U_{hkl}\right|^2 \leqslant 1/2 + 1/2\, U_{2h,\, 2k,\, 2l}$$

and other inequalities and less directly others giving a total of 56 "banker" reflexions. Two signs were given arbitrarily. Zachariasen's method was then applied and gave another 84 signs, i.e. a total of 140 out of 167, > 70% . About 20-24 pairs determined each sign. The resulting Fourier projection showed all atoms and calculated F values gave $R = 24\%$ only two having signs opposite to those assumed. A second synthesis with the remaining 27 reflexions and recalculation with the new positions gave $R = 14.9\%$ without zeros and 20.4% with zeros up to $\sin\theta/\lambda = 1.1$. Normalisation by $\sum F_o = \sum F_c$ showed that the

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The. Determination of the Structures SOV/70-4-3-8/32
Gadolinite by Direct Methods of Herderite, Datolite and

original setting of the amplitudes on an absolute scale
was accurate to within 5%. The hol projection was
treated similarly. There were 116 non-zero reflexions,
21 with $|U_{hol}| \geq 0.5$. Without zeros $R = 14.3\%$ and
with 60 zeros up to 1.1 $R = 19.7\%$. Vaynshteyn's
method gave the probable errors in atomic positions as
follows: for Ca 0.004 Å; P_o- 0.006 Å; Be - 0.033 Å;
0 - 0.015 Å and F - 0.013 Å. Table 1 gives the
atomic co-ordinates in the structures of herderite, datolite
and gadolinite (in hundredths of a, b and c). Datolite I
represents Japanese data and datolite II Pavlov and
Belov's.

The structure consists of infinite pseudotetragonal nets
of PO_4 and BeO_3F tetrahedra. In the net the fourfold
centrosymmetrical rings of tetrahedra of two sorts
alternate with locked centrosymmetrical pulled-out
octagons of the same tetrahedra. This is characteristic
of felspars and other related aluminosilicates. The

Card3/5

SOV/70-4-3-8/32

The Determination of the Structures of Herderite, Datolite and Gadolinite by Direct Methods

structure has two storeys, the lower consisting of 4 antiprisms (with 8 corners) around the Ca atoms and the upper of linked PO_4 tetrahedra in one orientation and BeO_3F tetrahedra in another. Interatomic distances are tabulated. Pauling's valency balance does not fit very accurately for some O atoms.

$CaBSiO_4(OH)$, datolite (a = 9.62, b = 7.60, c = 4.84 Å, $\beta = 90^\circ$, $P2_1/a$) was solved by Ito and Mori by a semi-heavy atom technique. The analysis reported for herderite was repeated. It was also partially repeated for gadolinite, $Fe^{++}Y_2Be_2O_2Si_2O_8$ (Z = 2, a = 9.89, b = 7.52, c = 4.71, $\beta = 90^\circ33'$) with results given in the table. Fe atoms are found at the origins octahedrally co-ordinated but otherwise the structure is very similar to that of the other minerals.

Card4/5

The Determination of the Structures of Herderite, Datolite and
Gadolinite by Direct Methods

SOV/70-4-3-8/32

There are 8 figures, 7 tables and 19 references, 13 of
which are Soviet, 2 German and 4 international.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography of the Ac.Sc., USSR)
Gor'kovskiy universitet im. N.I. Lobachevskogo
(Gor'kiy University imeni N.I. Lobachevskiy)

SUBMITTED: February 23, 1959

Card 5/5

AUTHORS: Belov, N.V. and Klevtsova, R.F.   SOV/70-4-4-3/34

TITLE: More on the Simplest Way of Developing the Fedorov
             (Space) Groups

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 4, pp 473-476 (USSR)

ABSTRACT: The development of the 230 space groups by the methods
             outlined in Kristallografiya, 1959, Vol 4, Nr 3, still
             presents some difficulties in dividing the translations
             introduced by various symmetrical and semi-symmetrical
             means. Even without a diagram it is possible to allocate
             a star, denoting displacement from the origin, to the
             planes in the space group symbol (in the first instance
             for the orthorhombic system). This is best done by
             writing down each halving. For example, Pbcn is
             expanded as Pm+b, m+c, m+a+b and should be written
             Pb^{x}cn^{x} . All 16 primitive orthrohombic groups based
             on Pmmm are listed. The method is particularly suitable
             also for obtaining the tetragonal groups in the standard
             form. The remainder of the paper is devoted to showing

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More on the Simplest Way of Developing the Fedorov (Space) Groups SOV/70-4-4-3/34

how these can be obtained. Various modifications of the usual notation are introduced, in particular, $\bar{4}$ is used for the special point on the inversion axis $\bar{4}$. There are 4 figures and 4 references, 3 of which are Soviet and 1 English.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography of the Ac.Sc., USSR)

SUBMITTED: May 15, 1959

Card 2/2

AUTHOR: Belov, N. V.

TITLE: On Covariant and Contravariant Relationships Between
           Derivative and Generating Structures   SOV/70-4-4-26/34

ABSTRACT: Transformations of covariant coordinates (indices) and
           contravariant coordinates (axial indices, points) are
           always given in textbooks but it is not always clear
           whether this relates to transformations of coordinates
           for a change of axes in the same structure and in the
           same lattice. This is not so: the corresponding
           formulae and tables are most convenient when the structure
           has some simple motive which does not describe all details
           of the structure but where the crystal cell is larger and
           more complicated than the cell of the pure motive.
           This is illustrated with clinohumite $MgF_2 \cdot 4Mg_2SiO_4$ where
           the unit cell contains 9 of the Si-O sheet motive units
           and:

Card1/3

On Covariant and Contravariant Relationships Between Derivative and Generating Structures

SOV/70-4-4-26/34

$$A = \frac{9}{2} a - c , \qquad a = \frac{2}{9} A + \frac{2}{9} C,$$

$$c = C ,$$

where large letters apply to the full cell and small letters to the motive unit. The coordinates transform:

$$X = \frac{2}{9} x \qquad Z = z + \frac{2}{9} x .$$

Hence, for Mg at the centres of octahedra, we get, from 1.0, 2/9, 2/9; from 2.0, 4/9, 4/9; from +1/2, -1/2 1/9, - 7/18. For Si at the centre of the triangle between octahedra with coordinates 3/2, 1/6, we get 1/3, 1/2, etc.

Card 2/3

On Covariant and Contravariant Relationships Between Derivative and Generating Structures   SCV/70-4-4-26/34

    There are 1 figure and 3 Soviet references.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography of the Ac.Sc., USSR)

SUBMITTED: May 15, 1959

Card 3/3

24.710

76003
SOV/70-4-5-25/36

AUTHOR: Belov, N. V.

TITLE: On the Nomenclature of the 80 Plane Groups in Three Dimen-
               sions

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 5, pp 775-778 (USSR)

ABSTRACT: Reviewing the historical aspects of symbolizing these
               groups, the author rejects W. T. Holser's inaccurate
               statements (Z. Kristallogr., 110, 266, 1958) and criti-
               cizes W. Cochran's application of international symbols
               to two-sided plane groups. Advancing his own earlier
               views, he tabulates the same 46 of the 80 plane groups
               in 5 different symbols, some of which he bases upon
               A. V. Shubnikov's principle of colored symmetry. The
               remaining 34 groups are termed degenerated groups and
               described by three different symbols. There is 1
               table; and 11 references, 4 Soviet, 4 German, 2 Danish,
               1 French.

Card 1/2

On the Nomenclature of the 80 Plane Groups
in Three Dimensions

76003
SOV/70-4-5-25/36

ASSOCIATION: Crystallographical Institute of the Academy of Sciences
of the USSR (Institut kristallografii AN SSSR)

SUBMITTED: August 13, 1959

Card 2/2

0.0000

76012
SOV/70-4-5-34/36

AUTHORS: Belov, N. V., Vaynshteyn, B. K., Kitaygorodskiy, A. I.,
Poray-Koshits, M. A., Semiletov, S. A., Sheftal', N. N.

TITLE: International Fedorov Session on Crystallography Held in
Leningrad

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 5, pp 796-800 (USSR)

ABSTRACT: The International Union of Crystallography (IUC) and the
Academy of Sciences of the USSR convened an International
Session (interim) on Crystallography commemorating the 40th
anniversary of the death of the great Russian crystallo-
grapher Ye. S. Fedorov. The session, attended by 600
scientists from the USSR, U.K., France, U.S., Japan,
Germany, Czechoslovakia, Netherlands, Canada, Australia,
and other countries, was held in Leningrad from May 21
to 27, 1959. The major reports were presented to the
plenary sessions and some 100 reports to 2 panels. The
subject of the 1st panel was crystal-chemical analysis
and that of the 2nd panel electron was diffraction studies.

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International Fedorov Session on
Crystallography Held in Leningrad

76012
SOV/70-4-5-34/36

The reports to the plenary sessions were presented by the
following Soviet scientists: N. V. Belov (VP of IUC),
V. I. Simonov, V. A. Frank-Kamenetskiy, G. B. Bokiy,
M. A. Poray-Koshits, L. O. Atovmyan, G. N. Tishchenko,
A. B. Ablov, T. I. Malinovskiy, Ye. A. Shugam, V. M.
Levina, Yu. S. Terminasov, Sh. Kh. Yar-Mukhamedov, Ya.
S. Umanskiy, V.I. Iveronova, L. S. Palatnik, V.A. Finkel',
Ye. I Gladyshevskiy, Z. G. Pinsker, G. S. Zhdanov, A. S.
Sonin, I. S. Zheludev, I. G. Ismailzade, I. S. Rez,
A. V. Stepanov, I. B. Borovskiy, A. S. Povarennykh,
Z. V. Zvonkova, A. I. Kitaygorodskiy, O. V. Stavrovskiy,
N. N. Sandakova, N. M. Bashkirov, B. K. Vaynshteyn, I. M.
Rumanova, V. L. Indenbom, I. I. Shafranovskiy, N. P.
Trifonov, B. M. Shchedrin, D. M. Kheyker, M. M. Uman-
skiy, A. V. Shubnikov, V. F. Parvov, and V. V. Semenov.
The reports of the U.S. crystallographers were presented
by R. Pepinsky, D. Harker, W. H. Zachariasen, R. Randle,
J. Donohue, G. Donnay, J. H. D. Donnay, and W. Parrish.
Six reports were presented by British crystallographers,
2 by German, 2 by Czech, 2 by Dutch and 1 each by

Card 2/3

International Fedorov Session on
Crystallography Held in Leningrad

76012
SOV/70-4-5-34/36

French, Canadian, and Japanese crystallographers. The
session admitted five new member nations into IUC, con-
firmed its newly appointed officers, including the
editor of "Acta Crystallographica," A. J. C. Wilson,
appointed G. B. Bokiy as head of the subcommittee for
abstracting the Soviet publications in crystallography,
planned Japan to be the site of the next interim, and
Italy or Israel of the next congress, and solved some
other business matters.

SUBMITTED: July 1, 1959

Card 3/3

24.7100

77100
SOV/70-4-6-1/31

AUTHORS: Neronova, N. N., Belov, N. V.

TITLE: Ferromagnetic and Ferroelectric Space Groups

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 6, pp 807-812 (USSR)

ABSTRACT: The authors selected 31 ferroelectric point groups
              out of 90 point groups of the Shubnikov classification
              (plus-minus groups, groups of antisymmetry, black
              and white groups) in a similar way as they previously
              had selected 31 ferromagnetic point groups out of
              the same 90 point groups. The principal differences
              between the ferromagnetic and ferroelectric groups
              are: (1) the former's symmetries are subdivisions
              of the limiting axial vector symmetry described by

              $\infty \frac{2'}{m} \frac{2'}{m'} \frac{}{m'}$, and of the latter's by $\frac{\infty}{m'} \frac{2'}{m} \frac{2'}{m}$; superscripts

              denote antisymmetry elements, (2) ferroelectrics
              require absence of a center of symmetry, 1, while
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Ferromagnetic and Ferroelectric   77100
Space Groups   SOV/70-4-6-1/31

ferromagnetics require a center of antisymmetry,
1', (3) equator planes are mirrors in ferromagnetic
groups and colored (black and white) planes in
ferroelectrics, (4) longitudinal planes, on the
contrary, are mirrors in ferroelectric groups and
colored planes in ferromagnetic groups. The symbolic
descriptions of 10 axial groups out of 31 are outwardly
identical in both cases but ferromagnetism and
ferroelectricity never occur in the same group be-
cause of internal "micro" discrepancy. The same is
true in the case of 2'mm' point group of which

ferroelectric and ferromagnetic space groups differ
from one another because of relocation of two dif-
ferent planes. On the basis of these distinctions,
275 ferromagnetic and 275 ferroelectric space groups
are selected out of the 1651 space groups of the
Shubnikov classification and compiled in a four page
table that describes the included point and space
groups in international symbols. There is 1 table;
Card 2/3   and 6 references, 5 Soviet, 1 Danish.

Ferromagnetic and Ferroelectric
Space Groups

77100
SOV/70-4-6-1/31

ASSOCIATION: Crystallographical Institute of the Academy of Sciences
of the USSR (Institut kristallografii AN SSSR)

SUBMITTED: September 1, 1959

Card 3/3

24.7100

17118
SOV/70-4-6-19/31

AUTHOR: Belov, N. V.

TITLE: Concerning the Basic Theorem of Close-Packed Arrangement
                 of Globuli. Brief Communication

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 6, pp 918-919 (USSR)

ABSTRACT: Having stated that no textbook on crystal chemistry
                 and crystal structures known to him, including the one
                 written by himself, convincingly illustrates the fact
                 that close-packed three-layer arrangement produces close-
                 packed face-centered cubic structure, the author seeks
                 to illustrate this by using ABC layers. Of these the A
                 layer contains 1 globule or 7 globules, as in usual
                 illustrations, but the B and C layers contain 6 globuli,
                 instead of 3, forming triangles turned 180° relative to
                 each other. Placing 7-globule A-layer between 6-globule
                 B and C layers produces an octahedron with two hori-
                 zontal faces. Placing 1-globule A layer between B and
Card 1/2   C, and the next A on C, produces a face-centered cube.

Concerning the Basic Theorem of Close-Packed   77118
Arrangement of Globuli. Brief Communication   SOV/70-4-6-19/31

    No octahedron in close-packed structure can have a common
    face with an adjacent octahedron, but only with a tetra-
    hedron. The latter is produced by placing a C layer on
    an octahedron face, a 1-globule A on C, and a B on A.
    There are 5 figures; and 1 Soviet reference.

ASSOCIATION: Crystallographical Institute of the Academy of Sciences
    of the USSR (Institut kristallografii AN SSSR)

SUBMITTED: September 1, 1959

Card 2/2

BELOV, N.V.

D.P. Serdiuchenko's calciotalc. Zap.Vses.min.ob-va 88 no.3:305-308
'59.
(MIRA 12:11)

1. Deystvitel'nyy chlen Vsesoyuznogo mineralogicheskogo obshchestva.
(Talc)

3(8)

AUTHORS: Bakakin, V. V., Belov, N. V., Academician

TITLE: On the Crystalline Structure of Hurlbutite (O kristallicheskoy strukture kherlbutita)

ABSTRACT: The mineral mentioned in the title $CaBe_2P_2O_8$ is known since 1952 (Ref 1). On the basis of crystallographic and radiographic investigations carried out by the discoverer the mineral was ascribed to rhombic syngony, especially to the older holohedral class D_{2h} = mmm. Its further constants are recalled.

In the following year a structural similarity between hurlbutite and dunburite (Ref 2) was found. It may be seen from the mentioned data that the lattice constants of both minerals and their physical characteristics are very closely related in general; in the case of hurlbutite, however, the parameter a is somewhat larger. According to this fact (less solid packing) all refraction indices are lower. Both minerals mostly differ by the Fedorov groups. The authors could not solve this problem by a comparison of the indicated lines of

Card 1/3

On the Crystalline Structure of Hurlbutite   SOV/20-125-2-41/64

the Debyegrams. For the purpose of determining the crystalline structure of hurlbutite the authors investigated this mineral in detail by means of X-ray analysis. For this purpose they used samples from South Rhodesia (Harvard Collection of Professor K. Frondel' and Hurlbut - Kherlbut). The completely transparent splinters of a structure as isometric as possible of about 0.3 - 0.5 mm were adjusted according to the Laue- diagrams on the basis of the Umanskiy-Kvitko method. The Laue- class of hurlbutite was not defined to be D_{2h} = mmm, as had been expected, but to be C_{2h} = 2/m. This mineral therefore does not belong to the rhombic syngony but to the monoclinic one with an angle $\beta \approx 90°$. The identity periods in the direc- tions of the 3 double axes which were determined from the radio- grams agree (within the experimental error limits) with the data given in reference 1. The mineral clearly belongs to the Fedorov group. C_{2h}^5 = $P2_1/a$ with a center of symmetry which is beyond any doubt. Two further beryllium phosphates: beryllonite (Ref 5) and herderite (Refs 5, 7) belong to the same group. The fact that hurlbutite belongs to the aforesaid group seems quite natural if one considers the circumstance that all 3 minerals are found closely intergrown which is due to their

Card 2/3

On the Crystalline Structure of Hurlbutite   SOV/20-125-2-41/64

metasomatic development (Ref 8). In conclusion it is referred
to the luminescence of hurlbutite under the action of X-ray
and cathode ray which is not mentioned in publications. It
is light-bluish-green and remains so for 5-10 minutes after
the cease of the irradiation. Its reason has not yet been
explained. This may be an important diagnostic criterion.
There are 8 references, 1 of which is Soviet.

ASSOCIATION: Institut neorganicheskoy khimii Sibirskogo otdeleniya Akademii
nauk SSSR
(Institute of Inorganic Chemistry of the Siberian Branch of
the Academy of Sciences, USSR).
Institut kristallografii Akademii nauk SSSR
(Institute of Crystallography of the Academy of Sciences, USSR)

SUBMITTED: December 26, 1958

Card 3/3

3(5), 5(2)

AUTHORS: Belov, N. V., Academician, Simonov, V. I.   SOV/20-125-4-56/74

TITLE: Isomorphous Interactions Between Zirconium and Titanium (Ob izomorfnykh sootnosheniyakh mezhdu tsirkoniyem i titanom)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 4, pp 888 - 889 (USSR)

ABSTRACT: The present paper gives the correction by the authors who were not careful (Ref 1) in the case of several sentences: "Ti was lacking in the Fersman-isomorphism "star" for Zr, can, however, constantly be found in all papers concerning the Lovozero massif. So the latter is in Lovenite with a content of more than 20% ZrO_2 substituted up to 50% by TiO_2." There are, however, important reasons for the absence of Ti in the Zr-star. The present material from the Lovozero-massif shows that this isomorphism of Zr and Ti occurs in fact only in the case of three minerals: Seydoserite (Seydozerit), Lovenite (Ti-Lovenites), and Astrophyllite-Kupletskite. These minerals have a high manganese content (10% and more % MnO). The role of Mn in Seydoserite is quite clear (Refs 1,2) though this is not the case in the two last mentioned minerals (their structure is unknown).

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