

is sufficiently reduced by evaporation to permit washing the sample from the tubing into a small jar for drying and storage. After drying the sample is pulverized and mixed in the jars by use of a rubber policeman and is then ready to be packed in holders for *x*-ray fluorescence analysis.

X-ray Fluorescence Analysis

For this work an XRD-5 General Electric *x*-ray unit with counting apparatus is used with a LiF analyzer crystal and a .005 collimator. With the tube operating at 50 KV and 50 MA, a 40 second background count is taken at about $29^{\circ}2\theta$ and subtracted from the average of two 40 second sample counts which are taken at a previously determined maximum intensity position for the $\text{Sr}^{+2}\text{K}\alpha$ wave length (about $25^{\circ}2\theta$). A plot of counts versus per cent montmorillonite indicates the relationship to be essentially linear as shown in Fig. 1. For the construction of this regression line ten standards ranging from 0.00% to 8.00% montmorillonite were taken in duplicate and separately dialyzed as previously described. After dialysis two packings were made from each for the *x*-ray analysis.

A statistical analysis of the results shows that the differences in machine and dialysis error not significant at the .90 probability level. A combined regression line, $y = 168.6 + 241.8x$, is constructed from which unknowns can be determined with a precision of approximately $\pm 0.5\%$ in the 0.5–8.0% range.

THE AMERICAN MINERALOGIST, VOL. 45, JANUARY-FEBRUARY, 1960

THE CELL CONSTANTS OF ARTIFICIAL SIDERITE*

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The artificial siderite used to measure the cell constants was prepared in the following way. Equal molar quantities of solid NaHCO_3 and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ were placed in a 120 ml. capacity stainless steel bomb which was half filled with water. The sealed bomb was then heated to 200°C . After reaching 200°C ., CO_2 was pumped into the bomb until a total pressure of 500 bars had been reached. The bomb was maintained at 200°C . and 500 bars for 3 days. This procedure served to stabilize the precipitated FeCO_3 . The white precipitate was then removed, filtered, and dried in an oven at 100°C . It partly oxidized to a yellow-brown

* Contribution No. 165, Institute of Geophysics.

color while drying. The dried material was placed in a "simple squeezer" high pressure apparatus, Kennedy and Griggs (1956), and heated to 600° C. at a pressure of 15 kb. The final product used in the *x*-ray work consisted of siderite together with a small amount of magnetite.

Earlier attempts to prepare siderite were less successful. Mixtures of $\text{FeCl}_2 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ and $\text{FeSO}_4 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ with total $\text{CO}_2 + \text{H}_2\text{O}$ pressures of 50–200 bars in a bomb resulted only in forming magnetite. A small amount of siderite was, however, prepared by precipitating amorphous FeCO_3 and $\text{Fe}(\text{OH})_2$ from solutions of FeSO_4 and Na_2CO_3 at atmospheric pressure. The solutions were kept covered with

TABLE 1. X-RAY POWDER DATA FOR ARTIFICIAL SIDERITE

Indices	$d_{\text{obs.}}$	$d_{\text{calc.}}$	100 I/I ₀
01.2	3.591	3.591	25
10.4	2.789	2.791	100
11.0	2.341	2.345	20
11.3	2.131	2.132	27
20.2	1.962	1.964	30
02.4	1.794	1.796	15
01.8	1.735	1.737	35
11.6	1.730	1.730	44
12.2	1.505	1.506	19
21.4	1.425	1.426	16
20.8	1.395	1.396	7
03.0	1.353	1.354	20
12.8	1.199	1.199	17
21.10	1.086	1.086	17
13.4	1.081	1.081	26
22.6	1.066	1.066	17

kerosene to prevent oxidation from the air. The precipitate was allowed to settle and the excess solution decanted off. The remaining water was removed by adding acetone and filtering. The material was dried in a vacuum oven at 110° C. However, most of the material still oxidized. This material was subsequently run as above in the "simple squeezer" at 500° C. and 15 kb. The resulting product was a mixture of hematite and siderite.

An *x*-ray powder diffraction pattern of the siderite-magnetite mixture, finely ground and mixed with vaseline, was obtained at 25° C. in a Norelco high angle recording diffractometer using $\text{FeK}\alpha$ radiation ($\lambda = 1.9373 \text{ \AA}$) and a Mn filter, with a scanning speed of $\frac{1}{8}^\circ (2\theta)$ per minute. High purity pre-calibrated NaCl was used as an internal standard.

The hexagonal unit-cell belonging to the space group $R\bar{3}c$ was obtained by a least squares treatment. The hexagonal cell constants are:

$$a_0 = 4.690 \pm 0.002 \text{ \AA}, \quad c_0 = 15.370 \pm 0.003 \text{ \AA}, \quad Z = 6, \quad \text{axial ratio } c/a = 3.277.$$

This compares closely with the values for natural material given in Dana's System of Mineralogy (1951) p. 167.

$$\begin{aligned} a_0 &= 4.71 \text{ kX}, & c_0 &= 15.43 \text{ kX}; \\ a_0 &= 4.677 \text{ kX}, & c_0 &= 15.267 \text{ kX}. \end{aligned}$$

The calculated rhombohedral dimensions are: $a_{rh} = 5.795 \text{ \AA}$, $\alpha = 47^\circ 45'$. The d-spacings and the corresponding indices are given in Table 1.

The calculated density is 3.941 which compares with the measured density of $3.96 \pm .01$, Dana's System of Mineralogy (1951) p. 168.

ACKNOWLEDGMENTS

I wish to thank Drs. Carl Pistorius and Julian Goldsmith for their help and encouragement during the preparation of this manuscript.

REFERENCES

- PALACHE, C., BERMAN, H., AND FRONDEL, C. (1951), Dana's System of Mineralogy, Vol. II: John Wiley & Sons, Inc., New York.
 GRIGGS, D. T., AND KENNEDY, G. C. (1956), A simple apparatus for high pressures and temperatures: *Am. Jour. Sci.*, **254**, 722-735.
 SMITH, HERBERT J. (1918), On equilibrium in the system ferrous carbonate, carbon dioxide and water: *J. Am. Chem. Soc.*, **40**, 879-883.

Note added in proof—

The lattice constants of artificial siderite have also recently been determined by D. L. Graf (personal communication) using the same method. His results, found by extrapolation on back reflection measurements are:

$$a_0 = 4.6887 \text{ \AA}, \quad c_0 = 15.373 \text{ \AA}; \quad a_{rh} = 5.7954 \text{ \AA}, \quad \alpha = 47^\circ 43.3'$$

THE CANADIAN MINERALOGIST

The Canadian Mineralogist is published by the Mineralogical Association of Canada. It continues the publication known previously as *Contributions to Canadian Mineralogy*, which first appeared as parts of the *Geological Series of The University of Toronto Studies* until 1948. It was then sponsored by the Walker Mineralogical Club, and appeared as parts of *The American Mineralogist* from 1949 to 1955, the last issue being Vol. 5, No. 7.

The first number of *The Canadian Mineralogist*, Vol. 6, Part 1, appeared in 1957 under the editorship of Professor L. G. Berry, Queen's University, Kingston, Ontario. The current number for 1959, Vol. 6, part 3, has now appeared. The Journal publishes papers in the fields of crystallography, geochemistry, mineralogy, petrology and allied sciences in either English or French. It is issued once a year, and is sent to all members of the Mineralogical Association of Canada. The annual fee for ordinary and associate members is \$2.00; for

corporate members, including libraries, \$5.00; for student members, \$1.00. Membership in the Association is subject to the approval of the executive committee.

Inquiries regarding membership, and remittances should be sent to Mr. S. Kaiman, Secretary, Mineralogical Association, c/o Mines Branch, 555 Booth Street, Ottawa, Canada.

DISCUSSION AT THE COPENHAGEN MEETING

Under New Mineral Names in this issue (on page 257) is a reference to a paper by Dr. R. C. Mackenzie on the classification and nomenclature of the clay minerals. This paper is to serve as the basis for a discussion at Copenhagen in 1960. It is urged that all interested read this paper and send their comments to Dr. Mackenzie, at Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen, Scotland, *with copies to* Dr. M. Fleischer, U. S. Geological Survey, Washington 25, D. C., representing the Nomenclature Committee of the M.S.A., *and to* Dr. Duncan McConnell, Ohio State University, Columbus 10, Ohio, the M.S.A. representative on the International Mineralogical Association Commission on New Minerals and Nomenclature.

NOTICES OF MEETINGS

INTERNATIONAL MINERALOGICAL ASSOCIATION

The *Second* General Meeting of the *International Mineralogical Association* will be held in the Mineralogical Museum of the University of Copenhagen in Denmark between August 18 and 25, 1960. Besides the business meetings of the delegates and the meetings of the existing commissions, there will be two symposia: 1) Mineral synthesis (including high-pressure work), and 2) Feldspars (in all their aspects). Those planning to attend should write Dr. J. L. Amoros, Museo de Ciencias Naturales, Paseo de la Castellana 84, Madrid, Spain at once; if giving a paper in either symposium, submit a title. Those not registered with the International Geological Congress should send \$10 to Dr. Hans Clausen, Mineralogisk Museum, Øster Volgade 7, Copenhagen K, Denmark, *at once* and give dates, kind of room (A best, B, C, or private lodging), one or two beds, etc.

NINTH NATIONAL CLAY CONFERENCE

On October 6, 7, and 8, 1960, the Ninth National Clay Conference will be held at Purdue University, Lafayette, Indiana, under the auspices of the Clay Minerals Committee of the National Academy of Sciences-National Research Council.

Two symposia of invited papers will be held on the topics of "Engineering Aspects of Physico-Chemical Properties of Clays" and "Clay-Organic Complexes." In addition to these special symposia there will be general sessions of contributed papers. All those having contributions should contact Dr. J. L. White, Chairman, Ninth National Clay Conference, Agronomy Department, Purdue University, Lafayette, Indiana. The title and an abstract of approximately 250 words should be sent in by June 1.

Further information and a preliminary announcement of the Conference may be obtained by writing to Dr. White.

FREQUENCY CONTROL SYMPOSIUM

The 14th annual Frequency Control Symposium, sponsored by the U. S. Army Signal Research and Development Laboratory, will be held May 31–June 2 at the Shelburne Hotel, Atlantic City, N. J. The symposium has been held previously at the Berkeley-Carteret Hotel, Asbury Park, N. J.

Approximately 40 technical papers will be presented during the three-day sessions at which an attendance of 800 or more is expected, including representatives of most of the Free World nations.

Technical papers will deal with piezoelectric resonators, fundamental properties and synthesis of quartz, crystal oscillators and filters, Masers, gas cells, atomic beam devices, and applications of atomic frequency standards, including World Wide Clock Synchronization.

Dr. E. A. Gerber, director of the Frequency Control Division, of the Signal Laboratory, is general symposium chairman.

INTERNATIONAL MINERALOGICAL ASSOCIATION

The time table for the Second General Meeting of this Association at the University of Copenhagen in Denmark in August 1960 is as follows:

Friday Aug. 19 } to Sunday Aug. 21 }	Meetings of the various Commissions
Monday Aug. 22—Morning:	Council Meeting
Afternoon:	First Business Meeting of Delegates
Tuesday Aug. 23—Morning } Afternoon }	Symposium on Mineral Synthesis (Chairman: Prof. J. R. Goldsmith)
Wednesday Aug. 24—Morning:	Second Business Meeting
Afternoon:	Symposium on Feldspars, Pt. 1 (Chairman: Prof. F. Laves)
Thursday Aug. 25—Morning:	Symposium on Feldspars, Pt. 2
Early Afternoon:	First meeting of the newly-elected Council
Afternoon:	1) Continuation of symposia (if any speakers remain) 2) Round table discussion on Nomenclature of Polymorphic Forms and Transitions