

droxyl ions in brucite. Weak bonds may then exist between neighboring hydroxyl ions, giving rise to a cooperative process orienting the dipoles. Neutron inelastic scattering and neutron diffraction studies have provided confirming evidence.

## REFERENCES

- BASSETT, W. A. (1960) Role of hydroxyl orientation in mica alteration. *Bull. Geol. Soc. Am.* **71**, 449-456.
- BERNAL, J. AND H. MEGAW (1935) The function of hydrogen in intermolecular forces. *Proc. Roy. Soc. London* **A151**, 384.
- BUCHANAN, R. A., E. L. KINSEY AND H. H. CASPER (1962) Infrared-absorption spectra of LiOH and LiOD. *Jour. Chem. Phys.* **36**, 2665-2675.
- BUSING, W. R. AND H. A. LEVY (1957) Neutron diffraction study of calcium hydroxide. *Jour. Chem. Phys.* **26**, 563-568.
- HEXTER, R. M. (1958) On the infrared absorption spectra of crystalline brucite  $[Mg(OH)_2]$  and portlandite  $[Ca(OH)_2]$ . *Jour. Opt. Soc. Am.* **48**, 770-774.
- (1960) Infrared spectrum of single crystals of LiOH, LiOD and LiOH LiOD. *Jour. Chem. Phys.* **34**, 941-947.
- AND D. A. DOWS (1956) Low-frequency vibrations and the vibrational spectra of molecular crystals. *Jour. Chem. Phys.* **25**, 504-509.
- MARA, R. T. AND G. B. B. M. SUTHERLAND (1953) The infrared spectrum of brucite  $[Mg(OH)_2]$ . *Jour. Opt. Soc. Am.* **43**, 1100-1102.
- SAFFORD, G. J., V. BRAJOVIC AND H. BOUTIN (1962) An investigation of the energy levels in alkaline-earth hydroxides by inelastic scattering of slow neutrons. *Jour. Phys. Chem. Solids* (to be published).
- PETSCH, H. (1957) A determination of the hydrogen positions in  $Ca(OH)_2$  by x-ray diffraction. *Canad. Jour. Phys.* **35**, 983.
- PETSCH, H. (1961) The hydrogen positions in portlandite  $Ca(OH)_2$  as indicated by the electron distribution. *Acta Cryst.* **14**, 950.
- SERRATOSA, J. M. AND W. F. BRADLEY (1958) Determination of the orientation of OH bond axes in layer silicates by infrared absorption. *Jour. Phys. Chem.* **62**, 1164-1167.
- TSUBOI, MASAMICHI (1950) On the positions of the hydrogen atoms in the crystal structure of muscovite as revealed by the infrared absorption study. *Chem. Soc. Japan Bull.* **23**, 83-88.
- WICKERSHEIM, K. A. (1959) Infrared absorption spectrum of lithium hydroxide. *Jour. Chem. Phys.* **31**, 863-869.

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MANGANBERZELIITE FROM FRANKLIN, NEW JERSEY<sup>1</sup>

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Manganberzeliite has been identified in a few specimens from Franklin, New Jersey, as granular veinlets up to  $\frac{3}{4}$  inch thick cutting franklinite-willemitite ore. No other minerals are associated in the veinlets. A chemical

<sup>1</sup> Mineralogical Contribution No. 409, Harvard University.

analysis, cited below, is in very close agreement with the established formula  $\text{Mn}_2(\text{Ca}, \text{Na})_3(\text{AsO}_4)_3$ , with  $\text{Na}:\text{Ca}=1:2.18$ ; small amounts of Fe, Mg and Zn substitute for Mn.

MnO	MgO	FeO	ZnO	CaO	Na <sub>2</sub> O	As <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	H <sub>2</sub> O—	Total
19.64	1.01	0.41	0.61	18.43	4.68	54.52	0.35	0.27	99.92

Contains traces of Pb,Cu,Ni,Co,Al. No Sb or P. Analyst, J. Ito, 1958.

The mineral has a honey yellow to orange yellow color, with specific gravity  $4.21 \pm .02$  and an index of refraction of  $1.770 \pm .002$  in white light. The unit cell dimension calculated from a sharp x-ray powder diffractometer pattern is  $a 12.500 \pm .005 \text{ \AA}$ . This value is in close agreement with that indicated by the graph relating MnO content and  $a$  obtained for the berzeliite-manganberzeliite series by Blix and Wickman (1959). The mineral is not fluorescent in either long or short-wave ultraviolet radiation. The specimens closely resemble the veinlets of granular, yellow to brown willemite sometimes found cutting the ore bodies at Franklin and Sterling Hill.

This species and its magnesium analogue berzeliite are known chiefly from their occurrences at Langban and at the Sjö mine, Sweden. The present occurrence is the first in the United States. The recognition of the mineral at Franklin is owing to the interest of two private mineral collectors, Roy W. Epting of Warwick, N. Y., and Stanley J. Schaub of Westfield, N. J., who noted an isotropic mineral that contained arsenic and manganese in specimens acquired from an old collection.

#### REFERENCE

BLIX, R. AND F. E. WICKMAN (1959) A contribution to the knowledge of the mineral berzeliite. *Arkiv Mineral. Geol.* 2, 417-424.

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THE CRYSTAL STRUCTURE DETERMINATION OF THE  
ZEOLITE GISMONDITE.  $\text{CaAl}_2\text{Si}_2\text{O}_8 \cdot 4\text{H}_2\text{O}$ .

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#### EXPERIMENTAL PROCEDURE AND CRYSTALLOGRAPHIC DATA

A single-crystal fragment of gismondite was taken from a sample from Hohenberg near Buehne/Westfalia. A slightly modified Bond apparatus (Bond, 1951) was used to grind a sphere. Its average diameter was meas-

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