

that an approximate estimate of the amount of soda present can perhaps be obtained from the use of the optic angle curve coupled with the curves for the refractive indices. The sample from Paris, Me., (No. 6), shows indices which are too high according to the diagram; the reason is unknown. The sample from Cáceres, Spain, shows indices which are too low; this may be due to the presence of more soda than implied by the lines of the diagram.⁶

In conclusion the writer would emphasize the fact that no claim of high accuracy is made for the diagram, but the existence on it of all available data permits any one to judge its limitations, and also shows the need of further carefully correlated physical and chemical work.

ZEOPHYLLITE FROM IDAHO WITH NOTE ON THE DETERMINATION OF MALLARD'S CONSTANT

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Zeophyllite, $3\text{CaO} \cdot \text{CaF}_2 \cdot 3\text{SiO}_2 \cdot 2\text{H}_2\text{O}$, was identified in material submitted by Mr. F. A. Hamilton, Rainbow End Mining Co., Salmon River District, Idaho. The mineral was found by him in the Salmon River district near Riggins, Idaho.

Zeophyllite was first found associated with natrolite in Bohemian basalt by Pelikan.¹ No reference could be found for an American occurrence of this mineral; therefore it is desirable to place this new occurrence on record.

OCCURRENCE AND ORIGIN

The Idaho zeophyllite occurs in spherical forms consisting of radiated crystal aggregates in dolomite. The largest spherical form observed measured $3/8$ of an inch in diameter. The mineral appears to be limited to the more altered sections of the dolomite. A thin section was prepared from a chip known to contain the zeophyllite upon one surface at least. This surface was mounted

⁶ Optic data recently published by Landes (*Am. Mineral.*, X, 382 (1925)) are accompanied by no analyses; from the diagram his "Class I amblygonite" may be inferred to have about 40% montebasite and to be rich in soda (perhaps 3%), while his "Class III amblygonite" must be nearly pure montebasite with remarkably little soda. His value for N_m is too high to check his value for $2V$, assuming N_g and N_p to be correct.

¹ *Sitz. Aka. Wiss. Wien*, 111, (1), 334 (1902).

and a few small aggregates were caught in the resulting section. The ingress of material along numerous minute fissures in the formation of the mineral was indicated by the fact that every crystal observed occurred near a fissure. Unaltered dolomite occurring near such fissures has been replaced by zeophyllite crystals. While the connection with fissures is apparent, practically all of the space occupied by the crystals was obtained by replacement of dolomite. Pyrite, epidote and chlorite have also been introduced.

The occurrence of the dolomite appears to be as follows, according to information and a suite of specimens furnished by Mr. Hamilton. Dolomite and a chlorite schist have been intruded by a granite pegmatite. Fluorine and water, and no doubt other substances, have traveled from the pegmatite into the dolomite and the schist. The origin of the zeophyllite is indicated by its association with the minerals of the pegmatite. Manganotantalite,² $(\text{Mn,Fe})\text{O} \cdot (\text{Ta,Cb})_2\text{O}_2$, was identified in fairly large specimens in the pegmatite and contains disseminated zeophyllite.

IDENTIFICATION

The following properties agree very closely with those of the Bohemian mineral and do not resemble any other listed species; colorless, hardness about 3, cleavage (0001) perfect, fibrous parallel to a , uniaxial (-) to biaxial (-) with $2E\ 33^\circ 14'$ and $2V = 20^\circ 56'$, dispersion $2V_r < 2V_v$ strong, $\gamma(\omega)$ elong. (a), $\omega = 1.575$, $\epsilon = 1.565$; $\omega - \epsilon = .010$. These values of the refractive indices apply to an undetermined wave-length between $182\mu\mu$ and $480\mu\mu$. The dielectric constant, highest value, determined at 31°C amounted to 25 ± 1 , for $\lambda = \text{infinite}$.³

NOTE ON 2V DETERMINATION

Ammonium sulphate was used to obtain Mallard's constant in the determination of 2V for the zeophyllite.

The Mallard constant of the microscope is often determined by using a mineral section of aragonite, muscovite or some other common mineral. Unless the optical axial angle of the mineral has been accurately determined, it is not advisable to employ

² The writer is indebted to his colleague, Mr. C. W. Davis, for a partial analysis of this mineral. Manganese is present in considerable excess over the iron.

³ For a brief discussion of the dielectric constants of the zeolites see page 251 of this article.

minerals for this purpose. 2E of muscovite, for example, varies from about 56° to 75° and the tendency of aragonite to form an isomorphous series is likely to be accompanied by a change in the optical axial angle. Chemically pure, clear, ammonium sulphate, (NH₄)₂SO₄, appears to possess a very constant 2V of 52°10'. The use of this substance can, therefore, be recommended for the determination of Mallard's constant. Fragments oriented perfectly normal to the positive acute bisectrix were found without difficulty. The following optical data on this reagent are necessary; $\beta - \alpha = .0021$; $\beta_{Na} = 1.5230$; $2E = 84^{\circ}6'$.

DIELECTRIC CONSTANTS OF ZEOLITES

A great deal has been written upon the constitution of the zeolites and a discussion will not be attempted here. One method of study, however, appears to have been neglected.⁴ That is the study of the dielectric constants. A few determinations of the constant, *k*, of a number of zeolites, all of which had been subjected to identical conditions of humidity and temperature, were made and are recorded below. The following values were determined under uniform conditions at 31°C.

| MINERALS | COMPOSITIONS | CONSTANT <i>k</i> |
|-------------|--|-------------------|
| Natrolite | Na ₂ O.Al ₂ O ₃ .3SiO ₂ .2H ₂ O | 11 |
| Analcite | Na ₂ O.Al ₂ O ₃ .4SiO ₂ .2H ₂ O | 13 |
| Crestmorite | 4CaO.4SiO ₂ .7H ₂ O | 17 |
| Chabazite | (CaNa ₂)O.Al ₂ O ₃ .4SiO ₂ .6H ₂ O | 19 |
| Stilbite | (CaNa ₂)O.Al ₂ O ₃ .6SiO ₂ .5H ₂ O | 22 |
| Zeophyllite | 3CaO.CaF ₂ .3SiO ₂ .2H ₂ O | 25 |
| Gmelinite | (CaNa ₂)O.Al ₂ O ₃ .4SiO ₂ .6H ₂ O | > 36 |
| | $\lambda = \text{infinite}$; Error ± 1 . | |

Stilbite was heated to 100°C for three hours and *k* was found to have increased from 22 to above 36. The optical properties were found to have remained the same and it is probable that they do not change until the inversion to the orthorhombic form takes place at about 250°C.⁵

The suggestion is offered that the loss of water unattended by a change in optical properties and without exhibiting a point of discontinuity (cusp) in a curve of *k*, may indicate that the water

⁴ Dielectric constant and molecular structure: K. T. Compton, *Science*, Jan. 15, 1926, pp. 53-58.

⁵ This inversion was determined by Rinne according to Winchell, *Am. Mineral.* 10, p. 152 (1925).

is held by secondary valence. This secondary valence is considered "a term that is used in a vague way to indicate the nature of the forces which bind together molecules in which the primary valences are satisfied, particularly in the cases when an ordinary valence cannot still be assigned to each atom through a rearranging of the bonds."⁶ This field is an interesting one for research and one into which our mineralogists might venture with profit.

NOTES AND NEWS

TOURMALINE CRYSTALS FROM SOUTHWEST AFRICA

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Selected crystals from a shipment of tourmalines recently received by Ward's Natural Science Establishment (see cover 4, *Am. Mineral.*, May, 1926) were submitted to the writer for examination. All of the crystals are loose and no evidence as to the nature of the matrix which carried them is available. In size they vary up to 2×4.5 cm. They are prismatic in habit and many are slender. Though black by reflected light, transmitted light shows their color to be clear transparent bottle green. They possess numerous flaws. The locality from which they came is given as Swakopmund, South West Africa.

Most of the crystals are remarkably well terminated and the principal and largest terminal faces show K : of Goldschmidt (see below). This is modified on the edges and summit by the smaller faces of two trigonal pyramids. The terminal faces of the crystals are etched, especially $p.x$. Prism faces are generally comparatively smooth and bright, with vertical striations. A study of a number of crystals by means of the two-circle reflecting and contact goniometer shows the following forms to be present: m ($10\bar{1}0$) prominent, striated; a ($11\bar{2}0$) prominent, striated; σ ($21\bar{3}0$) narrow, inconspicuous; r ($10\bar{1}1$) at summit of crystal; $p.x$. ($11\bar{2}1$) Gdt., modifying edges of K ; K : ($41\bar{5}1$) Gdt., steep, prominent form adjacent to prism zone.

The writer wishes to express his thanks to Ward's Nat. Sci. Est. for the use of these crystals.

PYRITE FROM CORNWALL, PENNSYLVANIA

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The pyrite crystals herein briefly described belong to two lots, which were measured independently by the above authors. The results of the measurements are combined in the present article.

Those measured by the senior writer were five in number and were kindly submitted by Professor J. F. Kemp of Columbia University, who stated that they

⁶ The constitution of nickel carbonyl and the nature of secondary valence: A. A. Blanchard and W. L. Gilliland, *Jour. Am. Chem. Soc.*, **48**, 4, p. 881 (1926).