Although exceedingly common as embedded rock-forming minerals, the intermediate members of the isomorphous albite-anorthite series, unlike albite, are seldom found as attached euhedral crystals in veins. Further, among all the plagioclase crystals found attached to the walls of veins, those of pericline habit are confined to relatively few localities, and in these localities a disproportionately large ratio of them are albite in composition. Of the 324 albite crystals figured by Goldschmidt in his ATLAS DER KRYSTALLFORMEN, about ten per cent have the typical pericline development, while of 117 figures illustrating the entire transition series from oligoclase to bytownite there are only three figures which show this habit. These three were described from Sweden by Flink[12] in 1914. So far as the writer is aware no American occurrence of euhedral oligoclase of pericline habit has previously been described.

From the foregoing it is evident that at Gold Hill an extremely common mineral occurs in an unusually rare form. To the collector, such specimens are always fascinating.

RELATIONS BETWEEN PROPERTIES AND COMPOSITION IN THE AMBLYGONITE-MONTEBRASITE SERIES

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Amblygonite is a lithium aluminum fluophosphate whose formula is commonly written as $LiAlFPO_4$. Penfield[1] demonstrated that hydroxyl can proxy for any part or all of the fluorine in this substance, thus forming a series from amblygonite proper, $LiAlFPO_4$, to montebrasite, $LiAlOHPO_4$. Furthermore, sodium can proxy for lithium up to about twenty (molecular) percent, as shown by many analyses; according to Schaller[2] sodium can displace lithium (almost) entirely, as in "fremontite," but there is no evidence that $NaAl(OH,F)PO_4$ is miscible in more than limited amounts with $LiAl(F,OH)PO_4$.

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[12] *Arkiv Kemi Min. Geol.* (1914), cited by Goldschmidt, "Atlas der Krystallformen," Band III, Heidelberg (1916). The three figures referred to (Figs. 113, 114 and 115, Tafel 206, Goldschmidt) would serve equally well to illustrate the variations in the habit of the Gold Hill material, except for the minor forms.

[1] *Am. Jour. Sci.*, **CLXVIII,** 297 (1879).

[2] *U. S. Geol. Surv. Bull.*, **610,** 141 (1916); see also: *Am. Jour. Sci.*, **CLXXXI,** 48 (1911).

In the preceding paragraph it is assumed that the usual formulas for the amblygonite group are correct; as a matter of fact all modern analyses of the group show an excess of water beyond the tenor required by the formula. Since this excess is found in *all* recent analyses and is far greater than the probable error in the determination of water (and fluorine), averaging about one and a half percent by weight, it seems reasonable to modify the formula so as to include this water. The writer would therefore suggest the following formulas for the members of the amblygonite group:

Amblygonite proper	$LiAlFPO_4.1/4\,H_2O$ or $4LiAlFPO_4.H_2O$
Montebrasite	$LiAlOHPO_4.1/4\,H_2O$ or $4LiAlOHPO_4.H_2O$
Fremontite	$NaAl(OH,F)PO_4.1/4\,H_2O$ or $4NaAl(OH,F)PO_4.H_2O$

Nearly ten years ago Backlund[3] made an elaborate attempt to show the relations between physical properties and chemical composition in the amblygonite-montebrasite series, but found it impossible to prepare an exact graphic representation of these relations.[4] It is still impossible to prepare an accurate graph, but with the aid of the new interpretation of the composition, just given, a graph (Fig. 1) has been made which seems to be a reasonably good interpretation of the available data. Accurately correlated physical and chemical data are urgently needed in this series as in many others. In the amblygonite-montebrasite series practically no such data are available and it is necessary to assume in some cases that samples from a given locality are alike. In other cases it was shown by Pisani[5] over fifty years ago that a single locality may furnish samples varying widely in composition; the only available guide to show which analysis of samples from one locality corresponds chemically with a sample optically measured is a comparison of the specific gravities of the analyzed samples with that of the optically measured sample. In view of the small range in specific gravities and the difficulties encountered in measuring the densities, it is surprising that this method is quite useful.

In the diagram the optic data for only three samples fall exactly on the lines which are drawn for N_g, N_m and N_p. No explanation of the discrepancy has been found in the case of the sample from

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[3] *Geol. För. Förh. Stockholm*, **XL,** 757 (1918).

[4] "Doch lässt das Materiel keine exakte graphische Darstellung dieser Abhängigkeit zu." *Op. cit.*, p. 769.

[5] *Comp. Rend.*, **LXXV,** 79 (1872).

Utö (No. 3), but it is of interest to note that the measured indices are about correct for a sample of the recorded specific gravity, according to the diagram. This suggests that the sample analyzed was not the same as the sample whose density and refractive indices were measured. The sample from Montebras (No. 2) is unusually rich in soda which doubtless lowers the indices of refraction; in this connection it may be remarked that the refractive index lines of the figure should be higher (by about 0.01) at the fluorine side of the diagram to show properly the properties of soda-free amblygonite. From other data it seems probable that the optic angle is affected less than the indices by soda, so

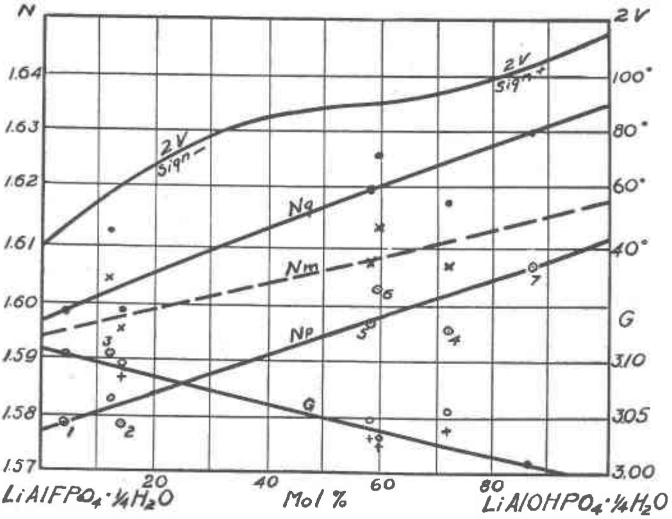

Fig. 1. Relations between Properties and Composition in the Amblygonite-Montebrasite Series. Specific gravity of analyzed sample indicated by a cross, and that of optically measured sample by an open circle. Optic angle curve of less value because derived from the graph of N_g, N_m and N_p rather than from direct measures on analyzed samples.

All optic data are from H. Backlund: *Geol. För. Förh.*, **XL**, 757 (1918).

Analyses of 1, 2, 5, 6, 7, by S. L. Penfield: *Am. Jour. Sci.*, **CLXVIII**, 296 (1879).

Analysis of 3 by N. Sahlbom in H. Backlund; *loc. cit.*

Analysis of 4 by W. Dörpinghaus: *Arch. Lagerst*, **XVI**, 1914; *Zeit. Kryst.*, **LXII**, 587 (1925).

Sample No. 1 from Chursdorf near Penig, Saxony; 2 from Montebras, France (Backlund's No. 2, Table IV, in which N_m should be corrected to read 1.5953); 3 from Utö, Sweden; 4 from Cãceres, Spain, 5 from Hebron, Me.; 6 from Paris, Me.; 7 from Montebras, France (Backlund's No. 9, Table IV).

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 Căceres, 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, $3CaO.CaF_2.3SiO_2.2H_2O$, 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

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[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% montebrasite and to be rich in soda (perhaps 3%), while his "Class III amblygonite" must be nearly pure montebrasite 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).