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PLAZOLITE, A NEW MINERAL[1]

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Included in some material collected by the writer near Riverside, California, were several specimens of vesuvianite associated with small colorless dodecahedrons. The latter proved to be distinct from any known species and the writer proposes the name plazolite from the greek *plazo*, to perplex, in allusion to the difficulty in interpreting its composition. The work detailed below was done in the mineralogical laboratory of the University of California and the writer is indebted to Prof. A. S. Eakle for his kindly interest and for his many valuable suggestions.

Occurrence and Genesis.—The mineral was found at the Commercial Quarry of the Riverside Portland Cement Co., at Crestmore, near Riverside, Calif., directly associated with green vesuvianite and an unknown, foliated white mineral, and in the same part of the quarry that has yielded riversideite, wilkeite, wollastonite, diopside, garnet, etc. The crystals of plazolite are imbedded in the foliated white mineral, and a massive form also occurs directly filling the space between the vesuvianite crystals.

The limestone composing the hill is intruded by a dike of fine-grained granodiorite. The genesis of the plazolite and associated minerals is directly connected with this intrusion. Small pegmatitic stringers leave the parent mass of the dike and cut across the garnet hornfels adjacent. The offshoots are mainly feldspar with some quartz, occasional tourmaline, and rare zircon. After the solidification of the pegmatite, hot magmatic waters penetrated the metamorphosed mass, altering such stable minerals as vesuvianite, kaolinizing the feldspar, and in many places leaching out the more soluble minerals leaving a skeletal residue of silica and iron oxides. It was at

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this stage that the wilkeite was altered, the zeolites developed in the pegmatites, and a large array of hydrous calcium silicates, most of them still unidentified, were formed. These include the riversideite and the plazolite.

Crystallography.—Plazolite crystallizes in small, clear rhombic dodecahedrons of the isometric system. No other forms were noted. The crystals reach a maximum size of 2 mm.

Physical Properties.—The mineral is brittle, has a conchoidal fracture, and shows no evidence of cleavage. Its density, determined with a pycnometer, is 3.129. Hardness, 6.5.

Optical Properties.—The mineral is colorless to light yellow. The luster is vitreous, almost adamantine. The refractive index as determined by the immersion method is 1.710. Some crystals show slight anomalous birefringence.

Chemical Composition.—The material selected for analysis was composed of clear, colorless, dodecahedrons free from adhering material. Analyses were made upon three different samples. Nos. I and II were made on the original lot collected; No. III upon some received later. In analysis I the presence of CO_2 was not suspected and the ignition loss only determined. In II and III the water was determined by Penfield's method and the CO_2 by difference between ignition loss and water content, since the amount of material was insufficient for a direct determination of CO_2. The other constituents were determined in the ordinary manner. The mineral is easily soluble in hydrochloric acid.

	I	II	Molecular Ratios		III	Molecular Ratios	
SiO_2........	24.13	23.85	.397	2.1	25.06	.417	1.8
Al_2O_3........	23.66	22.77	.223	1.0	24.63	.241	1.0
CaO........	40.22	40.13	.716	3.2	40.13	.716	2.9
MgO........	0.12	—	—	—	Trace	—	—
H_2O........	12.21	9.39	.521	2.4	9.04	.502	2.1
CO_2........		3.41	.077	—	1.13	.025	—
Totals.....	100.34	99.55	—	—	99.99	—	—

In the above ratios the CO_2 is calculated with the SiO_2 since the two apparently are contained in the mineral molecule. These ratios lead to the formula $3CaO.Al_2O_3.2(SiO_2,CO_2).2H_2O$.

Constitution and Relations.—A determination of the ignition loss at various temperatures gave:

	Percent.
110°...........................	0.18
150°...........................	0.21
Blast..........................	12.80

The powdered mineral was tested with phenolphthalein but gave only a faint coloration. The gently ignited material gave a decided red color and also upon leaching a slight precipitate with ammonium oxalate. As will be seen from the analyses the water content is constant. The CO_2 is apparently an integral part of the mineral molecule. That CO_3 can replace SiO_3 is shown by the experiments of Lemberg,[1] who synthesized both carbonate and silicate-cancrinite. The ratio of the bases to the silica is very large. The only formula which will satisfy all the bases is an orthosilicate one in which the bases are present in some complex grouping. The mineral appears to be most nearly related to sodalite.

THE GOLDSCHMIDT TWO-CIRCLE METHOD. INTRODUCTION TO THE TRICLINIC SYSTEM

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The Gnomonic Projection

Figures 38 and 39 show the gnomonic projections of the upper and lower ends respectively of the anorthite crystal discussed in the following paper by Professor Parsons, assuming that the same faces would be developed on the upper end as were found by measurement on the lower end. The two figures are similar, the differences being such as to be very puzzling unless the relations of the two are clearly in mind. The one may be obtained from the other by pricking the face-poles thru on to the back of the paper, and then turning the paper over in such a way that the right-and-left coördinate maintains its direction but with ends interchanged. Figure 38 is that which would be obtained by plotting the angles of the respective forms as given in the *Winkeltabellen.*[2] In figure 39 the forms have the same ρ values and the same φ values but measured in the opposite sense; the latter is also true of the angle ν; and the y and q

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[1] *Z. Deut. Geol. Ges.*, **1885**, 662.

[2] In the project thus made the direction-lines of faces in the prism zone would center at S, the projection center, and would not pass thru nodes of the network of face-poles of the terminal faces. By transferring the direction-lines by parallels thru O, the pole of the base, they become, as shown in the figure, diagonals of the network; and their zonal relations and symbols then become evident.