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## AN UNUSUAL OCCURRENCE OF ALBITE

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On a visit made several months ago to the trap-rock quarries in the western part of Paterson, New Jersey, two specimens were found, carrying a mineral of different appearance from the zeolites and associated minerals of usual occurrence there.

The quarry from which the specimens were obtained is the western one of the two openings near the Delaware, Lackawanna, and Western Railroad. The site is well known to mineralogists; many beautiful specimens of zeolites, pectolite, prehnite, datolite, apophyllite, thaumasite and other species have been obtained there, and are found in mineral collections throughout the country.

The specimens suggested albite, and further investigation has confirmed this, but certain features of the occurrence are unusual, not only as regards the mineral associations in the Watchung basalt, but with respect to the occurrence of albite in general.

The relations appear in the accompanying photograph. The crystals occupy a vug or cavity in slightly altered basalt. The cavity probably represents a pocket left between portions of adjacent "pillows" of the lava flow, later somewhat modified by solution and mineral deposition. Such spaces are favorite sites of deposition of secondary minerals in the Watchung basalt, probably due partly to their having offered channels of relatively easy circulation for solutions, and also because the tachylitic crusts of the "pillows" were more easily attacked and worked over than was the densely crystalline phase of the basalt.

In the figure, the portion designated 1 is nearly pure albite, forming a continuous crust or lining of the cavity, and with small terminated crystals projecting into the free space; 2 is calcite, 3 is chabazite, and 4 is prehnite. Albite is evidently the oldest of these minerals.

The second specimen, which was broken up to obtain material for analysis, was very similar, but in one part a mass of prehnite showed one of the well-known cavities or molds formerly occupied

by a mineral which has now disappeared. Probably such cavities represent more than one species of mineral; in this case the shape suggests anhydrite, of which occasional specimens have been found here in good preservation. Imbedded in the prehnite, and also resting upon it, were minute clusters of dark-green amphibole. There were also a few small crystals of the rare mineral babingtonite, which is known to occur in this locality and is easily diag-

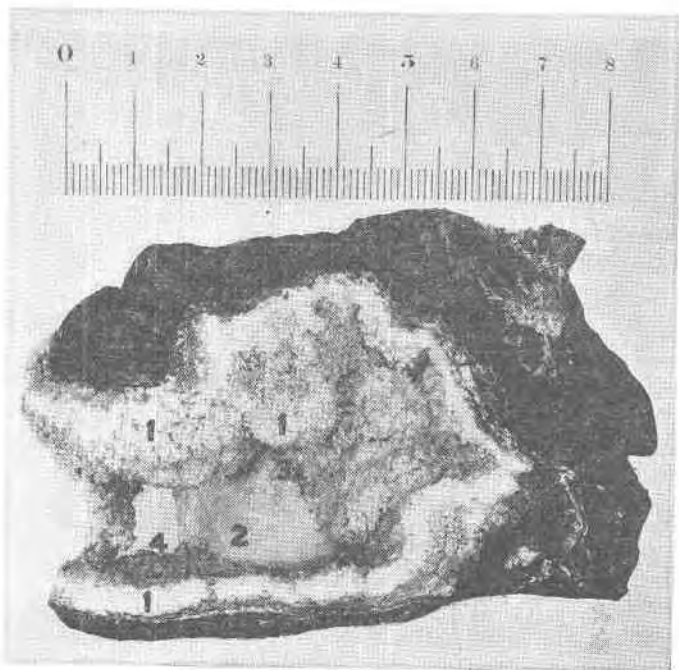


Figure 1

Albite lining cavity in Watchung basalt. 1=albite, 2=calcite, 3=chabazite, 4=prehnite. Scale in centimeters.

nosed by the intense and highly characteristic pleochroism of its powder in polarized light. Scattered small spots of ashy-green, earthy material seen here and there may be a decomposition product of babingtonite. These minerals all appear to be younger than the albite.

The free ends of the albite crystals attain an ordinary maximum length of 1 to  $1\frac{1}{2}$ mm. They were examined with the idea of select-

ing some for goniometric measurement, but the faces hardly appeared well enough developed for the purpose, and some were curved. With a binocular magnifier, however, it was possible to recognize a number of the forms. The habit of the crystals is rather unusual. They are elongated in the direction of the  $\alpha$  axis, and tabular parallel to the side pinacoid  $b(010)$ . The orientation was determined by the plane of perfect cleavage parallel to the base, and confirmed by the position of the plane of albite twinning.

The side pinacoid,  $(010)$ , is vertically striated, and in most cases is slightly curved. Other recognizable faces are the base  $c(001)$  and the prisms  $m(110)$  and  $M(\bar{1}\bar{1}0)$ . Less certain are a brachydome, perhaps  $n(0\bar{2}1)$ , and a second prism, perhaps  $f(130)$ . There is also a macrodome, probably  $x(\bar{1}01)$ . The intersection of this dome and of the base with the side pinacoid gives the crystals an elongated rhombic outline, with the tips of the acute angles cut off by the prism faces.

Preliminary tests upon the mineral gave a hardness of about 6, and showed that its powder was not acted upon by warm 1 : 1 HCl.

Under the microscope, it was found to be biaxial, positive, with a large axial angle;  $\alpha = 1.530$ ,  $\gamma > 1.535 < 1.540$ .

Polysynthetic twinning, resembling closely that of albite, was evident, and maximum extinction angles on symmetrically extinguishing twins gave, in three cases,  $15\frac{1}{2}^\circ$ ,  $15\frac{1}{2}^\circ$ , and  $17^\circ$ .

These results agreed satisfactorily with albite, but in order to settle all doubts an analysis was made. One of the specimens was broken up, and the pieces were immersed for several hours in cold dilute (1 : 3) HCl to remove calcite. Small pieces of the crusts were then examined individually under a binocular magnifier, and the albite was picked out. Prehnite was the only mineral in close enough association with the albite to give trouble. All pieces showing recognizable prehnite were rejected; this necessitated the rejection of much material, as some of the crusts which were nearly pure albite contained a little closely adhering prehnite. The finally selected material appeared, under the binocular, to be pure albite except for a minute quantity of the earthy green substance previously mentioned. When the powder was examined microscopically there was an occasional grain of prehnite to be seen. As a rough guess, the amount was set down as 1 to 2 percent. Otherwise the albite showed no contamination, but in liquid of index 1.530 it appeared slightly turbid.

The color, both in the hand specimen and in the powder, was a pale salmon-pink, almost white; luster dull on compact surfaces, vitreous or shining on crystal faces and basal cleavages.

The analysis was performed according to standard methods. The usual precautions of evaporating twice for  $\text{SiO}_2$ , and making two precipitations of  $\text{Al}_2\text{O}_3$ ,  $\text{CaO}$ , and  $\text{MgO}$  were observed. The results follow:

$\text{SiO}_2$	67.99
$\text{Al}_2\text{O}_3$	19.45
$\text{Fe}_2\text{O}_3$	0.22
$\text{MgO}$	0.20
$\text{CaO}$	0.37
$\text{Na}_2\text{O}$	11.01
$\text{K}_2\text{O}$	0.39
$\text{H}_2\text{O}$	0.40

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100.03

As a little prehnite was visibly present, the  $\text{CaO}$  was calculated to prehnite, and found to correspond to 1.36 per cent. The corresponding amounts of  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$  were deducted from the analysis, and also  $\text{Fe}_2\text{O}_3$ ,  $\text{MgO}$ , and  $\text{H}_2\text{O}$ ;  $\text{K}_2\text{O}$  was calculated to its equivalent in  $\text{Na}_2\text{O}$ , and added to the  $\text{Na}_2\text{O}$  found;  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , and  $\text{Na}_2\text{O}$  were then recalculated to 100 per cent. The results, compared with the theoretical composition of albite, are:

	FOUND BY ANALYSIS	THEORETICAL COMPOSITION OF ALBITE
$\text{SiO}_2$	68.87	68.75
$\text{Al}_2\text{O}_3$	19.53	19.44
$\text{Na}_2\text{O}$	11.60	11.81

The agreement is so close that there can hardly be doubt that the mineral is albite containing little or no anorthite and only a very small amount of the orthoclase molecule. The feldspars of the unaltered basalt are commonly labradorite, and recorded analyses show one-half to one-sixth as much potash as soda in the basalt, but in the formation of the secondary feldspar both lime and potash have been nearly eliminated.

In a study of the zeolites and associated minerals of the Watchung basalt, made by the writer several years ago,<sup>1</sup> scattered occurrences of small amounts of albite were discovered by micro-

<sup>1</sup> C. N. Fenner: The Watchung basalt and the paragenesis of its zeolites and other secondary minerals, *Am. N. Y. Acad. Sci.*, 20, No. 2, part 2. pp. 93-187, Aug., 1910.

scopic examination of specimens. Its relations indicated that in the long series of paragenetic transformations of these minerals it was one of the first to be formed, but was later replaced by others. It was thought not improbable that a large amount of albite might have appeared among the first products, but that little of it survived. In more recent years the finding of occasional specimens of albite has been reported by collectors, but no description appears to have been given in the literature. The discovery of such specimens seems to support the view expressed in the earlier article.

## SOME FACTORS INFLUENCING CRYSTAL HABIT

(Concluded)

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### B. CRYSTALS FORMED IN AQUEOUS SOLUTIONS CONTAINING ONE FOREIGN SUBSTANCE

(Continued from page 239)

To determine the effect of foreign substances, or impurities, on crystal habit a series of experiments was carried out testing the influence of a number of inorganic salts which differ somewhat in solubility. Also, some organic substances were used as impurities. Some insoluble substances reduced to a very fine powder were likewise used as suspensions. The experiments in which inorganic salts were used as impurities will be described first.

Experiments were conducted with the same three salts listed under A, viz: lead nitrate, barium nitrate, and strontium nitrate. Four different conditions for crystal growth were employed:

1. Evaporation "medium"; temperature 20°C to 24°C.
2. Evaporation "medium"; temperature 25°C to 30°C.
3. Evaporation "slow"; temperature 20°C to 24°C.
4. Evaporation "slow"; temperature 25°C to 30°C.

Observations for record were made after 12 hours, 36 hours, and 60 hours of crystal growth. Experiments were conducted in the same manner as under A. The results obtained from a few experiments will be briefly described in the following pages. Other results from a number of these experiments using inorganic salts as impurities will be tabulated in table No. III.

It was found that within certain limits, the result obtained was influenced by the amount of impurity added. In order, therefore,