

NOTES AND NEWS

DICKITE FROM PENNSYLVANIA

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It is the purpose of this paper to record two new localities for the rather rare mineral dickite, and to summarize its optical, chemical, and x -ray data.

The material, first examined, came from the coal workings at the Pine Knot Colliery in Schuylkill County, Pennsylvania, and was supplied to the writers by Mr. Charles K. Graeber of the Pennsylvania State Geological Survey. Sometime later Mr. J. R. Jones visited the locality at the request of the senior author and obtained several pounds of well crystallized material which proved to be very suitable for study. The data assembled from an investigation of this material indicate that the mineral is, without doubt, dickite. Some months after the occurrence of dickite was known at Pine Knot Colliery, a small pocket of white glistening material was discovered in a coal mine at the Colonial Colliery of the Maderia Hill Coal Company at Natalie, Pennsylvania. Mr. Edward G. Fox, in charge of mine operations there, very kindly supplied the writers with some of this material for investigation. Strangely enough, this proved to be dickite also. It is, however, unfortunate, that the occurrence at Pine Knot Colliery became flooded before the geology of the deposit could be studied, and equally regrettable that the deposit at Natalie, Pennsylvania, being only a small pocket, was completely mined out shortly after its discovery.

The dickite from Pine Knot Colliery occurs, for the most part, as a white glistening powder or small lumps composed of transparent tabular monoclinic crystals, often of exceptional beauty, varying in size from .1 to .5 mm. along the major axis. The crystals occur as individuals and in book-like groups, some of the latter often showing a radial arrangement. Parallel growths are apparently common, other groupings suggest a small angle of rotation with respect to adjacent plates; the angle, however, is not constant and probably represents mechanical displacement of lamellae in many of the complex groupings. In habit the crystals are well developed as pseudo-hexagonal plates flattened parallel to the base

along which plane the mineral appears to break with ease. Some of the larger crystals, however, reveal very clearly the development of pyramidal faces. Although the material is generally white, some portions of the powder are light yellow to amber in color, and occasional lumps are distinctly orange, but since there is no appreciable change in refractive index with change of color it is believed that the coloration is due to iron stain and not to iron in solid solution. Of the associated species clear transparent quartz is most common, although a very small amount of pyrite and magnetic material are present. The quartz crystals are everywhere completely coated with dickite which impregnates the crystal surfaces in a manner suggestive of replacement. This, in itself may suggest a hydrothermal genesis for this mineral, but when considered in the absence of other evidence does not seem convincing. The physical properties of the dickite from Pine Knot Colliery as given above apply also to the dickite from Natalie, Pennsylvania, except that the mineral from the latter locality is finer grained.

The optical properties, determined from the larger crystals, agree with published data.¹ The book-like groups show the B_{x_a} interference figure with a fairly large 2V. The optical sign is positive. The extinction angle measured on the B_{x_a} section (010) is about 16° and may be considered one of its most diagnostic properties. The indices of refraction, determined by the oil immersion method, are as follows: $\alpha = 1.560$, $\beta = 1.562$, $\gamma = 1.566$.^{*} The double refraction is therefore weak, yielding gray to yellow interference tints when the larger individual crystals are properly mounted and examined with a microscope. Some of the book-like groupings,

ANALYSIS² OF DICKITE FROM PINE KNOT COLLIERY, SCHUYLKILL, CO., PA.

	COMPOSITION	THEORETICAL COMPOSITION	MOL. RATIOS	
SiO ₂	46.14%	46.55%	1.98	2
Al ₂ O ₃	39.61	39.49	1.00	1
Fe ₂ O ₃	—	—		
MgO	N.D.	—		
CaO	N.D.	—		
H ₂ O+	13.91	13.96	1.99	2
Total	99.66%	100.00%		

¹ Ross and Kerr, *U. S. Geol. Survey, Prof. Paper 165-E*, pp. 158-161.

^{*} The values for the indices of refraction were obtained with the oil of immersion method, using white light, and therefore probably not more accurate than ± 0.003 .

² Brady, G. A., Analyst, Min. Ind. Exper. Sta., The Pennsylvania State College.

however, show an anomalous blue interference color and are positive in elongation.

The specimen used for chemical analysis was taken from a coal mine in Schuylkill County, Pennsylvania, and was prepared by sieving through 65 mesh on to 100 mesh screen in order to bring together the larger crystals. This material was then sorted carefully beneath the binocular microscope and a superior sample obtained. The chemical analysis is given on the preceding page.

This analysis may be reduced to a formula which compares favorably with the accepted one, $2\text{H}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$. Since the silica is so slightly below the 200:100 ratio of silica to alumina accepted for this mineral, and the fact that only superior crystals were employed for the chemical analysis, it is believed the material from this locality occurs in unusual purity.

X-RAY IDENTIFICATION

For the purpose of the *x*-ray study a fine powder spectrogram of the specimen was taken using copper radiation, no attempt being made to separate the K_β radiations. The specimen was mounted on a copper wire, the resultant copper lines serving as a method for the calibration of the film. The camera radius was 57.65 mm.

Table 1 shows the results of the *x*-ray analysis compared with reported data for dickite, kaolinite, and nacrite. The agreement with Gruner's values for dickite is good, with the possible exception of the lines adjacent to the primary beam. This may be accounted for in the correction of the film as there are no lines for copper in this region, and the correction curve must be extrapolated to include this area. A slight change in *l* when *l* is small makes a very noticeable change in *d*. The *x*-ray and optical data are, therefore, in agreement concerning the identity of the mineral dickite.

TABLE 1

A		B		C		D		E	
<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>
5	7.14 ^β	5	7.14 ^β			5	7.06 ^β	10	7.078
8	6.88	10	7.12			10	7.06		
								1	4.895
1	4.29 ^β								
3	4.33	4	4.43	8	4.471	6	4.32	8	4.404
		3	4.15	5	4.201	3	4.14	3	4.126
1	3.79 ^β					4	3.96		
8	3.77	5	3.95	5	3.846			2	3.928
		0.5	3.79			4	3.71		

TABLE 1—(Continued)

A		B		C		D		E	
<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>	<i>I</i>	<i>d</i>
10	3.52	10	3.578	9	3.631	10	3.54	9	3.579
				2	3.491				
		0.5	3.439					1	3.442
				0.5	3.336	0.5	3.33		
				0.5	3.161				
		0.5	3.011			0.5	3.07	1	3.042
				2	2.981	1	2.817		
				2	2.741	1	2.755	2	2.690
0.5	2.66	1-2	2.634						
		1	2.567 ^B						
0.5	2.59	3-4	2.566	5	2.591	5	2.556	1	2.537
		1	2.524 ^B			several lines			
2	2.48	4	2.514	8	2.526	5	2.491		
				1	2.408			10	2.418
								1-2	2.393
1	2.37	5	2.384			2	2.373		
2	2.28 ^B					8	2.341		
6	2.31	5	2.328	10	2.346			1	2.319
								0.5-1	2.263
0.5	2.19	0.5	2.180	2	2.225	5	2.272		
		0.5	2.099			0.5	2.200	1	2.069
1	1.97	4	1.976	8	1.995	4	1.983		
						1	1.930		
		0.5	1.895	1	1.910	1	1.893	2-3	1.902
				2	1.870	2	1.839		
		1	1.819	1	1.800				
0.5	1.78	3	1.792			1	1.785	1	1.795
		0.5	1.718					0.5	1.744
								2	1.675
6	1.64	4	1.649	9	1.659	7	1.658	2	1.649
						several lines			
						4	1.610	2	1.616
1	1.55	3	1.555	5	1.564	1	1.585	1	1.583
						3	1.536		
3	1.48	5	1.490	8	1.494	8	1.486	8	1.486
1	1.45	2	1.455	2	1.469	2	1.452	4	1.455
		2	1.431	0.5	1.434	1	1.430	0.5-1	1.434
0.5	1.39	1	1.391	1	1.409	0.5	1.389		
		1	1.374	1	1.383	0.5	1.371		
						3	1.340	1-2	1.358
5	1.31	4	1.317	8	1.323	4	1.306	0.5	1.314

- A. Dickite from Pine Knot Colliery, Schuylkill Co., Pa.
 B. Dickite from National Bell Mine, Red Mountain, Colorado, after J. W. Gruner "The Crystal Structure of Dickite" *Zeit. Kryst.*, (A), Bd. **83**, Heft 5/6, 1932.
 C. Dickite from National Bell Mine, Ouray, Colorado, after C. S. Ross and P. F. Kerr "The Kaolin Minerals" **165-E**, *U.S.G.S.*, Prof. Paper, 1932.
 D. Kaolinite from subway tunnel at Brooklyn, N. Y. After J. W. Gruner, "The Crystal Structure of Kaolinite," *Zeit. Kryst.*, (A) Bd. **83**, Heft 1/2, 1932.
 E. Nacrite from Brand, Saxony, after J. W. Gruner, *Zeit. Kryst.*, (A) **85**, 345-354, 1933.

A PETROGRAPHIC USE OF FLUORESCENCE

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The use of fluorescence in determining the relative abundance, distribution, and textural relationships of minerals which are not readily distinguished in ordinary light is not new. So far as the writer is aware, this has been applied mainly to mineralogy rather than to petrography. The purpose of this short paper is to call attention to one rather specialized use of this method in petrography and to describe briefly how photographs of fluorescent minerals may be taken to show petrographic relationships that would hardly be possible in ordinary light.

The writer is engaged in a study of the rocks of Red Hill, N. H., among which is the interesting nephelite syenite, or foyaite, described by Pirsson.¹ Because of the great variation shown by different thin-sections of this rock from the same or nearby localities an attempt has been made to study the relationships of the minerals in large specimens. To accomplish this purpose satisfactorily it is desirable to be able to distinguish at a glance as many of the main constituents as possible. Macroscopically, the rock is composed of potash feldspar, nephelite, sodalite, and hornblende. The hornblende, of course, is easily distinguished from the rest of the minerals. The feldspathoids are different from the feldspar by possessing a more greasy luster, but that distinction is not sufficiently marked so that one can see readily the existing relationships. On certain exposed surfaces the feldspathoids have weathered in such a manner as to leave pits which make the relationships rather apparent. The distinction between the nephelite and the sodalite is hardly possible to the unaided eye, however. Progress

¹ Pirsson, L. V., and Washington, H. S., Contributions to the Geology of New Hampshire, no. III, On Red Hill, Moultonboro: *Am. Jour. Sci.*, vol. **23** (4th series), pp. 266-274, 1907.