

DAKEITE, A NEW URANIUM MINERAL FROM WYOMING

ESPER S. LARSEN, JR. AND F. A. GONYER, *Harvard University, Cambridge, Mass.*

The new mineral described in this paper was submitted to the writers by Mr. R. W. Rowlands of San Diego, California. It had already been examined and thought to be a new species by Dr. H. C. Dake of Portland, Oregon. The name dakeite is proposed for the mineral in recognition of Doctor Dake's outstanding service in creating popular interest in mineralogy and the other earth sciences.

Dakeite was found in an excavation on U. S. Highway No. 30, near Wamsutter, Wyoming, about thirty miles west of Rawlins. The workmen thought the yellow mineral to be sulphur and paid little attention to it, but a prospector sent a specimen to Dr. H. C. Dake for determination. Doctor Dake found the mineral to fluoresce in the colors characteristic of the uranium minerals and had specimens sent to the writers for identification.

The specimens are gypsite through which are disseminated in considerable abundance rounded to elongated pisolites of dakeite, some of which are as much as a centimeter in diameter. Several of the specimens contain as much as ten per cent of dakeite.

The gypsite is made up mostly of small crystals of gypsum with a little sand and the dakeite. It is no doubt a surface deposit in a semi-arid region and was probably formed by the rise of water solutions to the surface by capillarity, the evaporation of the water and deposition of the dissolved minerals. The amount of dakeite in the gypsite and the extent of the dakeite-bearing gypsite are, according to the description given the writers, both surprisingly large for a uranium mineral. The country rocks in that part of Wyoming are sedimentary according to the available data. It seems probable that the uranium comes from some disseminated uranium mineral in a sandstone, such as the carnotite-bearing LaPlate sandstone of Paradise Valley, Colorado, or the uranium-bearing sandstone near Lusk, Wyoming.

Like many of the secondary uranium minerals, dakeite is green-yellow (Ridgway 27 b) in color. It has a hardness of about $2\frac{1}{2}$ and a specific gravity of 2.51. It occurs in aggregates of micaceous plates that reach a diameter of two millimeters. It has a perfect basal cleavage. Heated in the closed tube it yields abundant neutral water, and on charcoal before the blowpipe it intumesces while giving off water, and leaves a brown infusible residue. Fused with soda it yields a mass that darkens silver.

Dakeite has the following optical properties:

	<i>n</i>	
X (very pale yellow), normal to cleavage	1.489 ± 0.002	Negative
Y (pale greenish yellow)	1.542 ± 0.001	2 <i>V</i> = 5°
Z (pale greenish yellow)	1.542 ± 0.001	Dispersion not perceptible

In ultraviolet light dakeite is strongly fluorescent in a bright yellowish green and in this respect it is much like willemite from Franklin, but its color is a little greener. It is not appreciably phosphorescent. Considering its high uranium content, dakeite is weakly radioactive, indicating a very young mineral, as would be expected from its occurrence in gypsite.

An analysis of dakeite by Gonyer, made on carefully picked material that was found by microscopic examination to be 99% pure, is given in Table 1 together with the molecular ratios and theoretical composition. The state of oxidation of the uranium was determined by dissolving the sample in H₂SO₄ in an atmosphere of CO₂ and titrating the resulting solution with K₂MnO₄.

TABLE 1. ANALYSIS, RATIOS, AND THEORETICAL COMPOSITION OF DAKEITE

	Molecular Ratios					Theoretical Composition
CaO	18.31	.326	3	×	.109	18.9
Na ₂ O	7.31	.118	1	×	.118	6.9
UO ₃	30.27	.105	1	×	.105	30.3
CO ₂	13.71	.312	3	×	.104	14.8
SO ₃	9.61	.120	1	×	.120	8.9
H ₂ O	19.95	1.108	10	×	.111	20.2
Insol.	1.06					100.0
	100.22					

The composition of dakeite can be written as 3CaO · Na₂O · UO₃ · 3CO₂ · SO₃ · 10H₂O or 3CaCO₃ · Na₂SO₄ · UO₃ · 10H₂O. In the preliminary description of the mineral (Larsen, 1937) the composition was incorrectly given, as the soda had not then been recognized.

Dakeite is easily and completely soluble in acid. It is also completely soluble in water at room temperature (about 20°C.). Considering the composition of dakeite, this is surprising and the constituents must be present in the solution as a double salt, probably with about the composition of dakeite (3CaCO₃ · Na₂SO₄ · UO₃). Treated with hot water for fifteen hours at 85°C., dakeite is decomposed and loses to the solution part of its CaO and nearly all of its Na₂O and SO₄. One sample lost:

CaO	3.48
SO ₃	9.98
Na ₂ O	n.d.
UO ₃	none

The insoluble part, after drying at 110°C. weighed 62.1 per cent of the original sample and was a very fine-grained mixture of calcite and a yellow uranium compound.

REFERENCE

LARSEN, E. S. (1937): *The Mineralogist*, 5 (2) 7.