

the sample is subjected to the electron beam for not longer than about 30 seconds at a magnification of approximately 5700 times and very low electron beam intensity.

These results indicate that the stability of chrysotile is relatively low in comparison to that of antigorite and other hydrous silicate minerals. Surface area measurements using the B.E.T. gas adsorption method yielded a value of 7.24 m²/gm for the chrysotile sample used in the experiments and 11.40 m²/gm for the antigorite sample. The similarity in magnitude of these values indicates that the difference in the stability cannot be attributed to different surface areas. A possible explanation of the lower stability of chrysotile may be related to the strain that is believed to exist in the tubes. Bates, Hildebrand and Swineford (1950) pointed out that theoretically the unstrained portion of the endellite tubes is only one unit cell thick in the *c* direction and that with increase or decrease in radius of curvature the strain in the other layers also increases. Noll and Kircher (1951) used the same line of reasoning in discussing the morphology and structure of chrysotile.

REFERENCES

1. BATES, T. F., HILDEBRAND, F. A., AND SWINEFORD, ADA (1950), Morphology and structure of endellite and halloysite: *Am. Mineral.*, **35**, 463-484.
2. BATES, T. F., AND MINK, J. F. (1950), Morphology and structure of the serpentine minerals antigorite and chrysotile: (abstract), *Geol. Soc. Am. Bull.*, **61**, (12), 1442.
3. BATES, T. F., SAND, L. B., AND MINK, J. F. (1950), Tubular crystals of chrysotile asbestos: *Science*, **111**, 512-513.
4. NOLL, W., AND KIRCHER, H. (1950), Zur Morphologie des Chrysotilasbestes: *Naturw.*, **37**, 540-541.
5. NOLL, W., AND KIRCHER, H. (1951), Über die Morphologie von Asbesten und ihren Zusammenhang mit der Kristallstruktur: *Neues Jb. Mineral., Mh.* **10**, 219-240.
6. NOLL, W., AND KIRCHER, H. (1952), Veränderungen von Chrysotilasbest im Electronenmikroskop: *Naturw.*, **39**, 188.
7. PAULING, L. (1930), The structure of the chlorites: *Proc. Nat. Acad. Sci.*, **16**, 578-582.
8. WARREN, B. E., AND HERING, K. W. (1941), The random structure of chrysotile asbestos: *Phys. Rev.*, **59**, 925.

SECOND OCCURRENCE OF BAYLEYITE IN THE UNITED STATES

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Bayleyite, Mg₂UO₂(CO₃)₃·18H₂O, is one of three new uranium minerals first described from the Hillside mine, Yavapai County, Arizona, by Axelrod, Grimaldi, Milton, and Murata (1951). The minerals occurred at the 300-ft level of the mine and the authors state (1951, p. 2) that "In the mine, bayleyite crystals are sharp and well faceted. In the drier atmosphere of Washington, [D. C.] they soon become dull, losing

their luster and finally disintegrate to a yellow powder." Branche, Chervet, and Guillemin (1951) who described bayleyite from Morocco, the only foreign locality for this mineral, also noted that the crystals disintegrated rapidly, but they ascribed this property to the humidity of their laboratory.

In July 1951 T. W. Stern collected a yellow efflorescent crust of a highly radioactive mineral from Hideout No. 1 mine on Deer Flats, along the north side of White Canyon, San Juan County, Utah, when the authors visited the mine with L. B. Riley and W. E. Benson also of the U. S. Geological Survey. Fortunately this material did not dehydrate as the Arizona and Morocco samples had, for when it was studied nine months later it was found to be fully hydrated bayleyite. The Hideout mine is thus the second bayleyite locality in the United States.

The Hideout No. 1 mine, not much more than a prospect in July 1951, is in a copper-uranium deposit in the Shinarump conglomerate (Triassic). The chief minerals observed were chalcocite, bornite, chalcopyrite, brochantite, malachite, and azurite, which replace fossil wood and impregnate coarse arkosic sandstone. Bayleyite and schroekingerite are the only uranium minerals so far identified from this mine. They occur in the adit less than 100 feet from the cliff face, in contrast to the Arizona specimens which were collected from the 300-ft level. The massive pieces of copper sulfide replacing wood show some radioactivity with the Geiger counter, but no uranium mineral can be seen under a binocular microscope.

The bayleyite specimen from Hideout No. 1 mine is translucent, light yellow, and occurs in thin crusts that break away easily from the underlying rock. The bayleyite consists of microscopic, bladed or prismatic crystals (Fig. 1) with terminal faces on the upper surface of the crust. The optical properties determined in white light are similar to the type and Moroccan materials, with $\alpha = 1.454 \pm 0.003$, $\beta = 1.492 \pm 0.003$, and $\gamma = 1.502 \pm 0.003$, the extinction angle between X and the c axis is 14° , and Z is parallel to the b axis. It is not possible to obtain an acute bisectrix interference figure because the cross section of the blades is too small. The mineral is faintly pleochroic with pale pink in the X direction and light yellow to greenish yellow in the Y and Z directions.

Bayleyite is water-soluble and it effervesces vigorously and quickly dissolves in cold dilute hydrochloric acid. A semiquantitative spectrographic analysis, made by C. S. Ansell of the Geological Survey, shows:

U	> 10 per cent
Mg, Ca (low)	1.0 to 10 per cent
Al	0.1 to 1.0 per cent
Si, Sr	0.01 to 0.1 per cent

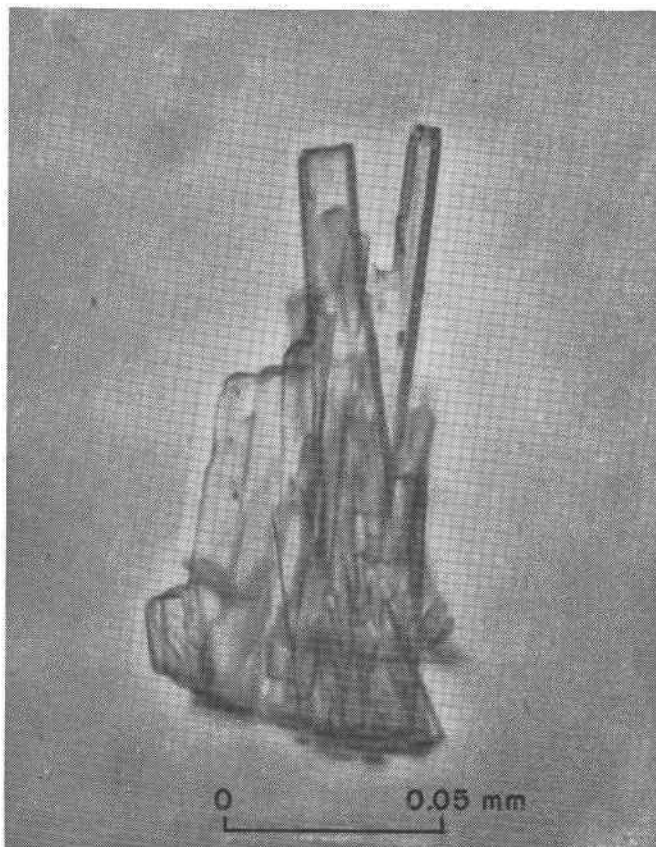


FIG. 1. Prismatic bayleyite crystals from Hideout No. 1 mine, San Juan County, Utah.

The calcium is probably due to a little gypsum and schroeckingerite that occur with the bayleyite. The schroeckingerite is in fine-grained greenish-yellow flakes on the under side of the bayleyite. When activated with long wavelength fluorescent light (3663 \AA) the schroeckingerite fluoresces vivid yellow green and the bayleyite fluoresces faintly whitish green. The schroeckingerite gives the superficial appearance of the dehydrated bayleyite described by Axelrod, Grimaldi, Milton, and Murata (1951, p. 2), but an x -ray diffraction powder pattern shows only schroeckingerite lines and no metabayleyite lines. The bayleyite gives an x -ray pattern identical to that of the Arizona material.

REFERENCES

- AXELROD, J. M., GRIMALDI, F. S., MILTON, C., AND MURATA, K. J. (1951), The uranium minerals from the Hillside mine, Yavapai County, Arizona: *Am. Mineral.*, **36**, 1-22.
- BRANCHE, C., CHERVET, J., AND GUILLEMIN, C. (1951), Nouvelles espèces uranifères françaises: *Soc. franç. mineralogie et cristallographie Bull.*, **74**, 458-461.