

possibly shifted graph paper. Wave lengths in Fig. 1 are posted at each peak and should aid the immediate evaluation by the reader. Direct tracing leaves little chance for errors in amplitude. Note that there are two small peaks at 2.81 and 2.88 microns in beraunite whereas only one occurs at 2.62 in tinctite. It is to be expected that the prominent O-H stretching absorption of both minerals would be near the same (2.96–2.98). Also the O-H bonding adsorption at 6.17 and 6.20 should be similar. Examination of the region of absorption of the P-O bonding, from about 8.25 to 18.00, shows marked differences in the two minerals. Tinctite is therefore reestablished as a valid mineral. It seems logical that Strunz in casting doubts on the validity of any mineral should do so only if he has performed more determinative work to support his conclusion.

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SAND-BARITE, AN ANALOG OF SAND-CALCITE, BLACK HILLS,  
SOUTH DAKOTA

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Concretions of sand grains with barite cement forming definite shapes have long been known (Nichols, 1906; Pogue, 1911). However, these have been in the shape of rosettes or similar forms where the barite crystals enclosing the sand grains are compound tabular crystals not sufficiently definite in form to describe the crystal habit. No occurrence has been published where the barite crystals have formed crystal aggregates and single crystals of the type formed by sand-calcite. Sand-calcite crystals have been described by Rodgers and Reed (1926), Wanless (1922), Connolly (1930) and others.

Sand-barite analogs of sand-calcite single crystals were discovered recently by Mr. Everett Hill on land adjoining his ranch which is located about 12 miles south of Hot Springs, South Dakota. The crystals weather out of a sandstone in the Lower Cretaceous Inyan Kara Group in sec. 36, T. 8 S., R. 4 E., Fall River County, South Dakota.

Angular quartz sand grains in the range from 0.1–0.5 mm have been cemented by barite which has formed optically continuous single crystals ranging from less than one-half an inch to over five inches in length.

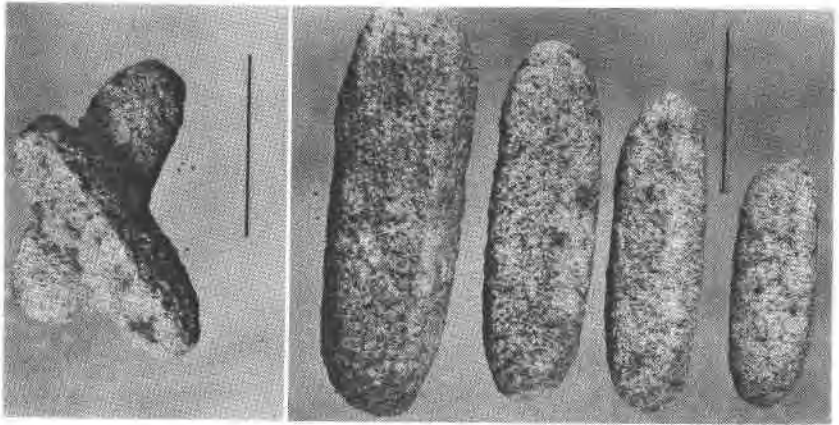


FIG. 1. Sand-barite crystals from South Dakota. The scale marker in the photographs represents 1 inch.

The crystals weather out as discrete single crystals or crystal aggregates showing typical barite habit and a well defined cleavage (Fig. 1). The average density of the crystals is about 3.32, which is close to the figure of 3.348 reported by Nichols (1906) for sand-barite concretions from Oklahoma.

The crystalline barite itself is essentially pure  $\text{BaSO}_4$ . An  $x$ -ray diffraction pattern of the barite cement showed no second compound and no evidence for ionic substitution in the barium position. Spectrographic analysis (by Dr. Amos Lingard, Experiment Station, South Dakota School of Mines and Technology) of a crystal aggregate gave by weight:

$\text{SiO}_2$	(ca.) 65 %
$\text{BaSO}_4$	36 %
$\text{Al}_2\text{O}_3$	1 %
$\text{Fe}_2\text{O}_3$	0.5%
Ni, Mo, Ti, Cr, Mg, Ca, Sr	tr.

A number of thin-sections were made and a point-count of 1800 points showed less than 1% material other than quartz or barite. Modal analyses of three single-crystal sections showed a range from 28 to 36 per cent by volume barite. A density separation of a disaggregated crystal gave barite 36 per cent, quartz 64 per cent by weight, which is in close agreement with the spectrographic analysis. This corresponds to 25 per cent barite by volume.

Crystal habit shows little variation. All crystals are elongated along the crystallographic  $b$  axis and typical forms are  $\{101\}$  well developed,  $\{001\}$  moderately well developed,  $\{hk0\}$  poorly developed and  $\{0k1\}$  poorly developed (see accompanying plate).

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A NEW YTTRIAN APATITE ENCLOSED IN QUARTZ FROM NAEGI, GIFU  
PREFECTURE, JAPAN

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During an investigation of the minor elements contained in quartz of a pegmatite from Naegi, Gifu Prefecture, Japan (Omori and Konno, 1961), the writers found an apatite which contained a remarkable amount of yttrium, an element not heretofore reported as prominent in apatite. The present mineral differs its color, specific gravity, refractive indices, x-ray powder diffraction and chemical composition from abukumalite studied by Omori and Hasegawa (1953).

The mineral was discovered in quartz by observations on an artificially etched crystal (Fig. 1). This occurrence differs from the ordinary occurrence of pegmatitic apatite. The mineral measures 10-32 mm long and 2-5 mm wide. The larger crystals usually have a slender druse in their center (Fig. 2). The crystal form is hexagonal prismatic.

The mineral is pale greenish-white with a vitreous luster. Careful measurement of the specific gravity was made using a pycnometer, with the result recalculated to 4° C.; G 3.188.

Under the microscope a thin section of this mineral is colorless, transparent and uniaxial negative. The indices of refraction measured with a total refractometer;  $\epsilon = 1.6389$ ,  $\omega = 1.6452$ ,  $\epsilon - \omega = (-)0.0063$ .

X-ray powder diffraction data were obtained by the Geigerflex dif-