There is a striking difference in the appearance of the kaolinite fired in vacuum from that fired in air. The kaolinite heated in vacuum at 1063° C. and replicated hot (Fig. 2C) is completely transformed to irregularly shaped mullite needles. The edges are rounded rather than sharply defined straight lines. There are no structures that can be identified as partially degraded kaolinite plates as was the case with kaolinite heated in air at 1063° C.

The structure of the kaolinite heated in vacuum at 1260° C. for 20 hours (Figs. 2E and 2F) is very complex. The material is completely transformed into an agglomerate of well-formed crystals with lath-like outlines, distinct striations, and step-like structures. The conventional replica (Fig. 2E) and the high-temperature replica (Fig. 2F) are very similar. There is evidence, however, that platinum did not adhere to the hot surface as well as to the cold surface.

The high-temperature replication technique appears to be a relatively easy method for investigation of materials at elevated temperatures. If a pronounced change occurred on cooling, the replica would probably be somewhat disrupted. Careful study of the replica, however, should enable one to interpret the magnitude and nature of the change.

The observed differences in air-fired and vacuum-fired kaolinites lead to some interesting questions regarding the effects of atmosphere, pressure, relative volatilities of major constituents and impurities, and firing times on phase development in kaolinite. Further investigations of this type, coupled with *x*-ray diffraction studies, may provide considerable information as to the mechanisms and factors involved in thermal transformations.

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VALIDITY OF TINTICITE

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Hugo Strunz in his Mineralogische Tabellen, Akademische Verlagsgesellschaft, 3 Auflage, Leipzig 1957, on page 246 says, "Eleonorit ist mit Beraunit identisch, vielleicht auch Tinticit (Stringham 1946)," thus casting doubt on the validity of tinticite. In the original paper, the close compositional relationship of tinticite to beraunite was recognized, but *x*-rays by the Bureau of Mines, Salt Lake City and J. M. Axelrod of the U. S. Geological Survey showed them to be different.

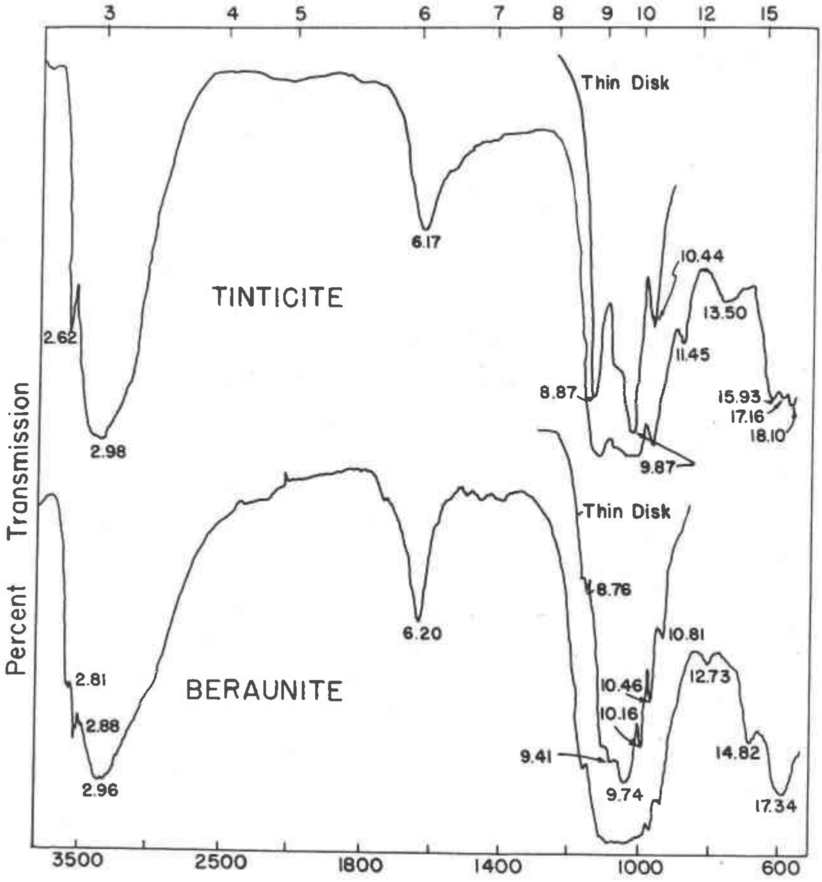

FIG. 1. Infra red curves for tinticite and beraunite showing positions of peaks in microns.

Since 1946 the Department of Mineralogy at the University of Utah has had access to two x-ray machines (Norelco and General Electric) and recently a Perkins-Elmer Infra-red spectrophotometer No. 421. A new specimen of authentic beraunite was recently secured from the U. S. National Museum and x-ray patterns and infra-red spectra run on both beraunite and tinticite. X-ray patterns show them to be different as expected. The infra-red spectra is presented here for the record and to show conclusively that there is a difference between the two minerals.

The graph (Fig. 1) was traced directly from the spectrograms of tinticite and beraunite. On the infra-red 421 machine wave numbers (reciprocal of the wave length) are read directly when a peak is reached thus eliminating most of the error in either interpolating a curve or a 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 tinticite. 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. Tinticite 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.