although some octahedra and a few cubes have been found; and dodecahedron faces noted. Twinning according to the spinel law is very common. Although the adamantine luster and typical habit of diamond aided in the initial identification, positive evidence was obtained from single crystal x-ray diffraction analysis. A rotation pattern about [001] gave $a_0 = 3.57$ Å, in good agreement with the literature value.

ACKNOWLEDGMENTS

The authors would like to express deep gratitude to Dr. J. A. Kohn for many helpful discussions and x-ray diffraction studies during the course of this work, and to Pfc. Wm. McGraw, Gene Hagaman and Frank Becker for their many contributions.

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THE AMERICAN MINERALOGIST, VOL. 45, JANUARY–FEBRUARY, 1960

IDENTITY OF CALCIUM RINKITE AND GÖTZENITE

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From a lava of the extinct volcano Mt. Shaheru in the Belgian Congo, a triclinic F-bearing Na-Ca-Ti-silicate was described by Sahama and Hytönen (1957 *a*) and named götzenite. It was realized that the mineral was related to calcium rinkite that occurs in the lovchorrite-bearing veins of Mt. Yukspor in Kola Peninsula and which has been briefly reviewed by P. Chirvinsky and I. Borneman-Starynkevich (in Fersman, 1937). The data presented for calcium rinkite were, however, not sufficient for an accurate comparison of the two minerals with each other. For that reason and, further, because of the entire absence of the rare earths, niobium and strontium in the Shaheru mineral, this mineral was distinguished from calcium rinkite.

The unit cell dimensions of götzenite as originally published by Sahama and Hytönen are as follows: $a = 10.93$, $b = 7.32$, $c = 5.74$, $\alpha = 90°$,

$\beta = 100°$, $\gamma = 120°$, volume 389 (all based on $\lambda_{CuK\alpha_1} = 1.54050$ Å). This cell is very oblique. In a personal communication addressed to the author, Professor Horace Winchell, of Yale University, very kindly drew the author's attention to the fact that the base-diagonal [110] is shorter than the a axis given above. He suggested the transformation: [110] (old)$\rightarrow a$(new), $-b$(old)$\rightarrow b$(new), c(old)$\rightarrow c$(new) thus giving a new cell with the following dimensions: $a = 9.65$, $b = 7.32$, $c = 5.74$, $\alpha = 90°$, $\beta = 101.3°$, $\gamma = 101.1°$. The volume of this new cell is the same as that of the old one. The new cell is less oblique and should be preferably adopted for götzenite. The author is grateful to Professor Winchell for this suggestion.

During the Inaugural Meeting of the International Mineralogical Association held in April, 1958, in Madrid, Professor Clifford Frondel, of the Harvard University, kindly informed the author about the existence of a paper by Slepnev (1957) that deals with the minerals of the rinkite group. Dr. Michael Fleischer, of the U. S. Geological Survey, very helpfully placed an English translation of this paper at the author's disposal. The paper by Slepnev contains some new data for calcium rinkite, the most important of which is the tabulation of the powder pattern previously not recorded. During the same Madrid meeting, Professor K. A. Vlasov, of Moscow, very generously gave the author a beautiful specimen of calcium rinkite from the original Kola locality to be used for comparison with the African götzenite.

Through the courtesy of the three gentlemen mentioned above—Frondel, Fleischer, Vlasov—an accurate comparison of calcium rinkite with götzenite has now become possible. From the specimen handed over by Vlasov a pure fraction of calcium rinkite was extracted by heavy liquids. The material was chemically analyzed by Mr. Pentti Ojanperä, of the Geological Survey of Finland, with the following result: SiO_2 32.34, TiO_2 8.74, ZrO_2 0.19, Nb_2O_5 3.36, Al_2O_3 0.45, rare earth oxides 1.84, Fe_2O_3 0.02, FeO 0.14, MnO 0.62, MgO 0.04, CaO 38.95, BaO 0.00, SrO 0.87, Na_2O 6.32, K_2O 0.09, P_2O_5 0.00, SO_3 0.00, F 9.15, Cl 0.00, H_2O+ 0.57, H_2O^- 0.04, -0 for F 3.85, total 99.88. Spectroscopic test for Ta negative. Under the microscope, the needle-like mineral appears to be multiply twinned with very strong dispersion. Optical α is subparallel to the needle axis, here taken as b. $2V_\gamma$ = ca. 60°. The refractive indices and the specific gravity determined by Mr. Kai Hytönen, of this Institute, are: $\alpha = 1.651$, $\beta = 1.653$, $\gamma = 1.659$, sp. gr. = 3.106 (pycnometer). A b-axis rotation photograph yielded $b = 7.34 \pm 0.02$ Å with a very strongly pronounced sub-cell with $b/2$. Zero and second layer b-axis Weissenberg photographs were found to be virtually identical with those for götzenite. Accordingly, it seems justified to conclude that the unit

cells of the two minerals are identical. The unit cell content of calcium rinkite was calculated as follows: Si 3.92, Ti 0.80, Zr 0.01, Nb 0.18, Al 0.06, rare earth metals ca. 0.08, Fe 0.01, Mn 0.06, Mg 0.01, Ca 5.06, Sr 0.06, Na 1.49, K 0.01, F 3.51, OH 0.46, O 14.09. The powder pattern data recorded with the Philips Norelco Diffractometer are reproduced below,

TABLE 1. POWDER PHOTOGRAPH DATA FOR CALCIUM RINKITE AND GÖTZENITE

Calcium rinkite (Slepnev)		Calcium rinkite (this paper)		Götzenite (Sahama-Hytönen)	
I	d	I	d	I	d
—	—	15	3.988	15	3.994
w	3.58–3.40	—	—	5	3.601
m	3.265	5	3.286	—	—
s	3.07	100	3.099	100	3.100
s	2.97	50	2.982	100	2.986
—	—	15	2.863	10	2.859
—	—	10	2.828	7	2.822
m	2.625	25	2.653	40	2.648
m	2.48	15	2.522	25	2.511
—	—	15	2.324	10	2.323
vw	2.25	5	2.263	15	2.261
—	—	—	—	7	2.214
w	2.15	5	2.171	5	2.152
vw	2.04	—	—	5	2.059
—	—	—	—	7	1.989
s	1.93	20	1.915	50	1.911
m	1.87	15	1.879	15	1.876
m	1.834	10	1.834	15	1.833
m	1.81	5	1.806	10	1.798
s	1.685	10	1.680	25	1.690
w	1.64	5	1.680	7	1.646
—	—	—	—	10	1.594
m	1.563	—	—	10	1.573
vw	1.537	—	—	10	1.543
vw	1.49	—	—	15	1.482
vw	1.457	—	—	—	—

compared with the data published by Slepnev for calcium rinkite and those for götzenite by Sahama and Hytönen (Table 1).

The information summarized above seems to justify the conclusion that calcium rinkite and götzenite do represent the same species, found so far only in Kola and in the Belgian Congo. As has been remarked by Fleischer (1958 *a*), götzenite is closer to a pure end-member and, ac-

cordingly, calcium rinkite may be termed a rare earth- and niobium-bearing strontian götzenite.

The unit cell dimensions of götzenite separate it from the minerals of the mosandrite-rinkite group. Based on some differences in powder pattern between mosandrite (johnstrupite) on the one hand and rinkite on the other, Sahama and Hytönen (1957 *b*) considered rinkite to represent a species separate from mosandrite (johnstrupite). As very truly was remarked by Flesicher (1958 *b*), the differences may be caused by the less pronounced metamict alteration of rinkite. Both Slepnev and Fleischer agree in considering mosandrite (johnstrupite) and rinkite one single species. As mentioned by Fleischer, the name mosandrite has the priority and, accordingly, names like rinkite, johnstrupite, rinkolite and lovchorrite should be dropped in mineralogical nomenclature. If this is accepted, then also the name calcium rinkite should be dropped in favor of götzenite.

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THE AMERICAN MINERALOGIST, VOL. 45, JANUARY–FEBRUARY, 1960

A PLASTIC UNIVERSAL STAGE FOR STUDENT USE

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For many optical techniques a clear understanding of the indicatrix is essential. This concept is fundamental in the use of convergent light figures, in refractive index measurements, in the relation of vibration axes to crystallographic directions, and in similar techniques.

Geology students frequently encounter difficulty in fully understanding the indicatrix. The "three-dimensional thinking" involved is aided by use of the universal stage before the student is introduced to con-

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