of the hemisphere was approached, departures from extinction were nearly 1.0 degree. All hemispheres tested contained some strain.

A comparison of the accuracy with the standard orthoscopic method and with the Nakamura plate was made by determining the extinction positions on an optically perfect plagioclase grain. The standard deviation for extinction positions with the Nakamura plate was 0.16 degree; with the standard method 0.39 degree.

For precise optical measurements with the universal stage it is recommended that the Nakamura plate be used in conjunction with standard orthoscopic orientation procedures. Uncertainties with respect to the optical orientation are eliminated with this accessory.

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IRIGINITE FROM SOUTH DAKOTA[1]

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X-RAY DATA

The *x*-ray powder data given by Getseva and Savel'eva (1956) for iriginite agree well with those obtained from the South Dakota mineral. Additional powder data obtained by Kazitsyn and Komkov (Fleischer, 1960) also agree with the data of the current investigation. All lines and intensities calculated from the South Dakota mineral are listed in Table 1. The data of Getseva and Savel'eva (G&S) are also listed for

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comparison. It is interesting to note that the powder data for iriginite correspond broadly to some of the medium and small d-values of meta-tyuyamunite. Intensity measurements were obtained from diffractometer charts, whereas d-values were calculated from photographic films.

Kazitsyn (*Chem. Abs.*, 1961) finds that iriginite is monoclinic with $a=8.58$ Å, $b=12.87$ Å, $c=7.48$ Å, $\beta=107°40'$, and $Z=3$, whereas Rocha and Baptista (1960) find it to be tetragonal with $a=15.70$ Å and $c=12.76$ Å. The cell data of Rocha and Baptista were obtained from powder

TABLE 1. POWDER DATA FOR IRIGINITE[1]

d	I	G&S	d	I	G&S
8.71	30	—	1.638	35	1.630
6.35	100	6.39	1.598	25	1.611
5.76	30	—	—	—	1.584
5.25	45	—	1.539	30	1.545
4.96	1	—	1.520	5	1.520
4.28	50	4.30	—	—	1.493
3.60	30	3.55	1.465	15	1.462
3.42	20	3.442	1.437	15	1.435
3.33	40	3.323	1.425	20	1.420
3.21	100	3.222	—	—	1.403
3.11	45	3.110	1.396	30	1.392
2.951	40	2.963	1.376	15	1.379
2.885	20	2.883	1.355	15	1.354
2.786	20	2.785	1.344	15	1.342
2.621	55	2.625	1.314	20	1.310
2.555	20	2.565	1.277	5	1.273
—	—	2.353	1.251	30	1.249
2.317	15	2.295	1.227	25	1.229
2.132	20	2.142	1.206	25	1.206
2.075	35	2.075	1.190	25	1.188
2.022	40	2.024	1.166	25	1.165
1.977	25	1.987	1.149	5	1.147
—	—	1.968	1.129	25	1.129
1.938	25	1.941	1.104	10	1.104
1.916	20	1.918	—	—	1.074
1.875	15	1.870	—	—	1.064
1.835	45	1.836	1.055	10	—
1.792	15	1.797	1.050	5	1.051
1.760	25	1.757	1.034	10	1.034
1.735	20	1.733	1.023	5	—
1.695	20	1.693	1.009	10	—
1.660	30	1.660	0.999	5	—

[1] These data were obtained from a 114.59 mm diam. Norelco powder camera using filtered Cu radiation.

photographs of synthetic iriginite. The validity of the latter cell data is in question, since the observed and calculated d-values do not agree within the limits of error in many instances. Furthermore, the chemical analysis of the synthetic compound entailed a loss of some uranium and the determination of the water content was by difference from 100%; so the authors can not be sure the synthetic compound was chemically and structurally identical to natural iriginite.

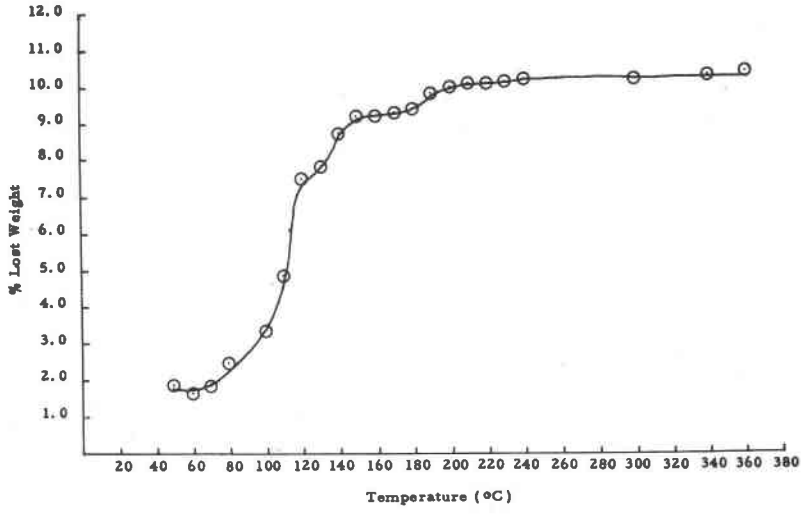

FIG. 1. Dehydration curve for iriginite.

DEHYDRATION AND DTA

After stored for 200 hours over P_2O_5, a 0.3011-gram sample of iriginite was heated for 30-minute periods at 10-degree intervals in order to establish a dehydration curve. A plot of temperature vs. per cent lost weight is shown in Fig. 1. The total water content of the mineral (not dried), after deducting impurities, was found to be 10.34%.

A differential thermal analysis diagram was prepared on a Deltatherm machine operating at 5% sensitivity. Endothermic peaks at 156 and 204 degrees and exothermic peaks at 295 and 466° C. were represented on the diagram. The curve is reproduced in Fig. 2.

Epshtein reports that the DTA curve shows a large, broad endothermic peak at 100–400° C. and an exothermic peak at 480° C. (Fleischer, 1960).

CHEMISTRY

A 1.3-gram sample of the mineral was analyzed by Dr. D. H. Reynolds

of the New Mexico Bureau of Mines and Mineral Resources chemical laboratories. A 1.5-meter grating spectrograph showed the following elements present:

Strong:	U, Mo, Ca, Si
Medium:	Al, Fe, Ti, Mg
weak:	Ba

The results of the wet-chemical analysis were as follows:

Fe_2O_3	trace	U_3O_8	31.24
H_2O	7.97	MoO_3	36.80
SiO_2	23.92	CaO	0.02
		Total	99.75%

From these data and the dehydration study, the formula of iriginite was calculated as $U(MoO_4)_2(OH)_2 \cdot 2H_2O$. It should be understood that this formula was derived from a somewhat impure sample and is therefore approximate. The water content is especially inaccurate due to surface absorption.

Getseva and Savel'eva list the formula as $U_2(MoO_4)(OH)_4 \cdot 4H_2O$ (Fleischer, 1958). This is an incorrect formula as Table 2 demonstrates. The formula was based on an analysis by V. A. Iskuyl (Fleischer, 1958) which is as follows:

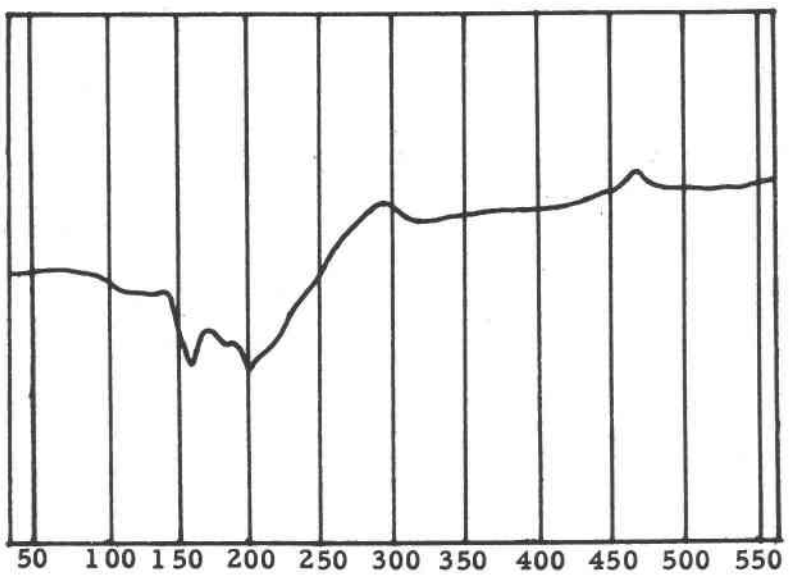

FIG. 2. DTA of iriginite.

H_2O	9.70
insol.	9.04
UO_3	41.91
MoO_3	38.62
CaO	0.46
Total	99.73%

The erroneous formula of Getseva and Savel'eva was corrected by Kazitsyn (1960) who gives the formula as $U(MoO_4)_2(OH)_2 \cdot 3H_2O$ and by Epshtein (Fleischer, 1960) who concludes that the formula is $H_2(UO_2)(MoO_4)_2 \cdot 3H_2O$ on the basis that a potentiometric pH determination by N. I. Komarova gave pH 4.4. The latter formula is not in

TABLE 2. CHEMICAL DATA FOR IRIGINITE

Locality	Percentage Composition			Molecular Proportions		
	H_2O	MoO_4	U	H_2O	MoO_4	U
South Dakota	10.49	54.66	34.85	3.98	2.33	1.00
Russia	10.75	50.59	38.66	3.67	1.98	1.00
Formula	11.15	50.93	37.91	3.89	2.00	1.00

accord with the analysis from which it was derived (Fleischer, 1960). It should have read $H_2(UO_2)(MoO_4)_2 \cdot 2H_2O$.

Rocha and Baptista (1959) probably have synthesized iriginite, since the powder data of the synthetic compound agree fairly well with those of the natural material. However, as mentioned earlier, some uranium was lost during analysis and the water content was determined by difference from 100% so that the chemical equivalence of their synthetic compound and iriginite is not definitely established. Rocha and Baptista (1960) believe the formula of iriginite to be $(UO_2)(Mo_2O_7) \cdot 4$ or $5H_2O$ since "A spot test carried out on the synthetic iriginite to detect the presence of the hydroxyl was negative."

The author suggests that the formula of iriginite be taken as $U(MoO_4)_2(OH)_2 \cdot 2H_2O$ until concrete evidence pointing toward an isopoly salt or hydrogen salt is presented.

Table 2 shows a comparison of the percentage composition and the atomic and molecular proportions of the two iriginite analyses, recalculated to 100%. The chemical data of Rocha and Baptista (1960) have not been included in the table for the aforementioned reasons. Theoretical composition and proportions calculated from the formula are also listed.

Other Data

Because of the extreme powdery nature of the mineral, no optical data could be obtained, even though an oil immersion objective was employed. The indices of refraction of iriginite given by Getseva and Savel'eva (Fleischer, 1958), Kazitsyn (*Chem. Abs.*, 1961) and Epshtein (Fleischer, 1960) are tabulated as follows:

	α	β	γ
Getseva and Savel'eva	1.82	—	1.93
Kazitsyn	1.764	1.889	1.936
Epshtein	1.730	1.82	1.93

Although these values seem fairly consistent, it should be noted that they correspond exceptionally well with the indices of ferrimolybdite ($\alpha = 1.72$–1.80, $\beta = 1.73$–1.82, $\gamma = 1.93$–2.04) (Kerr, 1963). Since ferrimolybdite is definitely present in the South Dakota material, it is possible that the Russian investigators mistook ferrimolybdite needles for the new mineral. Kazitsyn reports that iriginite has parallel extinction, $2V = 60°$, $Z = c$, and $Y = b$ (*Chem. Abs.*, 1961).

The density of iriginite could not be determined accurately, but probably lies between 3.6 and 3.9. Epshtein (Fleischer, 1960) gives the density as 3.84, which he states is probably somewhat low due to impurities.

Iriginite is insoluble in both hot and cold water, but completely soluble in strong acids and strong bases. Ferric hydroxide, resulting from impurities, may be precipitated in basic solutions. Upon heating, iriginite turns gray, yellow, greenish gray, and finally fuses to a black bead around 1700° C. The mineral is not fluorescent under either short- or long-wave ultraviolet radiation nor under *x*-rays.

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A STEREOGRAPHIC NET MOUNTED ON A PHONOGRAPH

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A highly satisfactory mounting for a stereographic net has been found in an old phonograph turn-table. The inner workings of the phonograph were scrapped, leaving only the governor and brake. Four corks glued around the table serve for pinning down the stationary tracing paper. Lying as it does in its original case, the instrument is kept clean; spare papers may be stored within the lid, while pins are kept neatly in the original needle box. Some details of construction follow:

The net is first glued on to a glass disc, taking care to avoid distortion of the paper; a dark-room roller helps to obtain an even spreading of the glue. The glass disc is now to be glued to the turn-table from which the felt must be stripped, and the protruding part of the axle sawed off. Centering of the net is effected at this stage before the glue between glass disc and turn-table has a chance to dry: a sheet of tracing paper is pinned on the corks and a cross marked above the center of the net; the table is turned until the net center is at its greatest distance from the mark on the paper and a new cross marked half-way between the old one and the newly positioned net center; this new cross will lie approximately over the center of rotation, and so the net center is brought below it; the process is repeated until cross and net center remain coincident throughout rotation of the table, at which stage the disc is left to dry.

The arrangement here described has certain advantages over the more usual rotation of the paper above a stationary net. There is no danger of tearing the paper on account of wear around the pin, as so often happens with many conventional arrangements. In addition, the ease with which the net may be rotated is particularly satisfying in practice; the brake is of course a luxury. The principal advantage, however, is that the orientation of the projection remains constant; it is helpful, especially for