URANINITE FROM THE HURON CLAIM, WINNIPEG RIVER AREA, S. E. MANITOBA*

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It has been demonstrated in recent years that eastern Manitoba has a wealth of pegmatites containing a wide variety of rare minerals and elements. The rock formations in which they occur are widely separated from the Precambrian bodies farther east, which have been named and classified.

The pegmatites occur in both plutonics and associated roof-pendants of metamorphosed volcanics and sediments. The latter occurrences are more likely to contain rare elements. Dykes and other forms of pegmatite, seemingly of the same general character and with some or all of an assemblage of rare minerals, are found as far south as Shoal lake, near the Ontario boundary of southeast Manitoba, and as far north as Grass river, beyond the Hudson Bay railway. They are most abundant, so far as is known, between and near Oiseau and Winnipeg rivers and to the south near West Hawk and Falcon lakes. Some have been found near Island lake.

The association of rare minerals, in whole or in part, which appears to permit a correlation over wide areas, consists of the lithium minerals (spodumene, lepidolite, and amblygonite), beryl, topaz, cassiterite, molybdenite, bismuthinite, bismuth, apatite, monazite and several lithium-bearing phosphates, columbite-tantalite and last among others, uraninite.

Uraninite was discovered during the summer of 1930 on the Huron claim. This is one of a large group of claims staked by the Winnipeg River Tin Company near Winnipeg river. The Huron claim is about a half mile inland from a point on the southeast shore of the river, nine or ten miles above Pointe du Bois. It is believed to be the first discovery of the mineral in Manitoba. The pegmatite body carrying the uraninite lies in and is parallel to the strike of a roof-pendant of andesite schist. The schist has an east-west strike parallel to a granite contact about 1,500 feet to the north.

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There are seven or eight outcrops of pegmatite in a surface depression which is largely filled by a thick accumulation of drift. Contacts of pegmatite and schist have been exposed on either side of the depression. They dip away from the depression at low angles on each side, thus suggesting that the several outcrops are joined into a single dyke in the form of an anticlinal arch or dome. The top of the arch has been eroded.

In two or three of the outcrops of pegmatite on the Huron claim, notable segregations of beryl were encountered. Further work led to the finding of tantalite-columbite and finally of monazite and uraninite in one of the outcrops.

The most prominent mineral in the pegmatite is a reddish-weathering feldspar. Quartz is also prominent and shows an unusual degree of segregation from the feldspar, appearing in more or less pure masses. Beryl is prominent and is associated with both quartz and feldspar. In the one outcrop, which so far has yielded uraninite, this mineral together with monazite and tantalite occur as crystals and grains embedded in feldspar.

Monazite is more abundant than uraninite and if it has a sufficiently high content of thorium, a determination of the lead ratio will be of great interest for comparison with that from the uraninite.

Composition

The material as received from DeLury consisted of several pounds of pegmatite fragments composed chiefly of pinkish albite with some yellowish beryl and grayish-green radiating fibrous zoisite. The uraninite occurs sparingly as small crystals of cubic habit from one eighth to one quarter inch diameter embedded in the feldspar. On examination under the binocular some of the uraninite crystals appeared to be in a very good state of preservation, being hard, grayish steely black and with uneven fracture. Others, however, were more altered, some to the pitch-black stage of uraninite alteration, some showing outer rims and cracks with yellowish alteration products.

The small amount of uraninite available did not permit a rigid hand selection of only the hardest material. The better crystals were broken out from the feldspar and the quantity of about 6 grams of crude material thus obtained was crushed on a steel plate, picked over to eliminate decomposition products as much as possible, then gently ground under water in an agate mortar, the slimes being discarded, until all passed 100 mesh. The 100 mesh product, about 4.5 g., was panned in a clean aluminum pan until a heavy fraction of slightly over 2 g. with Sp. Gr. = 8.082 at 21.70°C. was obtained. Two grams of this was used for analysis I. The rest, with the material remaining from the panning, having Sp. Gr. = 7.856, was subjected to further severe panning using as wash liquid dilute hydrochloric acid of approximately 17 per cent HCl content, at room temperature. This acid panning, which required several hours of manipulation, was carried out on large watch glasses and was very effective. The acid solution seems to have some effect on the surface tension which facilitates panning. All the feldspar grains were removed and much of the lighter black uraninite. If a larger quantity of mineral had been available it probably would have been possible to isolate an even heavier fraction of steely colored material by eliminating the black grains. The acid dissolved some uranium during the first few minutes of treatment with a slight momentary evolution of gas, probably either CO_2, or helium or both, from minute films of soluble secondary minerals. During the subsequent treatment of perhaps 3 hours or more duration the acid remained practically colorless. The final heavy product stood in acid of this strength for an hour or two without producing visible coloration. After very thorough, prolonged washing, the concentrate was found to have Sp. Gr. = 8.968 and the total amount of 1.4 g. was used for Analysis II.

Character of the Analyzed Material

Lot No. I obtained by panning the whole original quantity in water, appeared under the microscope to be first class steely to black material free of yellow or orange decomposition products, but containing a few grains of feldspar.

Lot No. II similarly consisted of steely to black grains entirely free of feldspar and colored decomposition products.

It might be added in view of the high lead results obtained, that there is not the least suspicion that galena or any other foreign minerals were present. The material used for analysis was to all appearances just as good as that of numerous other uraninites previously analyzed by the writer.

As only 2 g. was available for analysis I and 1.4 g. for II, it was considered advisable to use the whole amount in each case for the main determinations, so that UO_2, H_2O, etc. were not determined.

The analytical results are as follows:

URANINITE, HURON CLAIM, WINNIPEG RIVER DISTRICT, S. E. MANITOBA
H. V. Ellsworth, Analyst

The Analysis of Uraninite from S. Dakota by C. W. Davis is given in part for comparison under III.*

	I	II	III
	Manitoba Uraninite, Heavy fract. of Water Concentrate	Manitoba Uraninite, Acid treated Concentrate	Uraninite from Ingersoll Claim, Black Hills, S. Dakota
PbO	16.63	16.71	16.42
(Pb)	(15.44)	(15.50)	(15.24)
UO_2	—	—	48.87
UO_3	—	—	28.58
U_3O_8	63.08	64.86	—
(U)	(53.50)	(55.01)	(66.90)
ThO_2	14.18	13.94	2.15
(Th)	(12.46)	(12.25)	(1.89)
$(Th \times 0.38)$	(4.73)	(4.65)	(0.72)
$(Ce, La, Di)_2O_3$	0.37	0.28	1.06
$(Yt, Er)_2O_3$	1.02	1.19	1.01
Fe_2O_3	0.64	0.75	0.30
MnO	0.18	0.13	0.001
Al_2O_3, etc.	0.10	0.12	—
CaO	1.45	1.72	0.46
MgO	0.07	0.06	0.01
SiO_2	0.67	0.37	0.05
Insol. feldspar, etc.	0.12	none	0.15
H_2O, He, etc.	not det.	not det.	H_2O 0.44
Sp. Gr.	8.082	8.968	9.182
$\frac{Pb}{U+0.38\ Th}$	0.265	0.260	0.225

* *Am. Jour. Sc.*, March, 1926.

ANALYTICAL NOTES

The lead, uranium and thorium precipitates were very carefully checked for impurities. The lead is, if anything, slightly low due to exceptional precautions having been taken to ensure a pure product.

The manganese content is unusually high for uraninite, in the writer's experience.

Summations of uraninite analyses do not mean much unless all constituents such as UO_2, UO_3, H_2O, CO_2, He, etc. have been determined. The low total of Analysis I, however, probably indicates that an unusually large amount of H_2O and probably CO_2 were present in minute films of alteration products which were removed by the acid treatment from the material of Analysis II.

Geological Age Relationships

The Huron claim uraninite is remarkable for its high content of lead and thorium, and its very high lead ratio which makes it the oldest uraninite known so far as the writer is aware. The question immediately arises as to whether the age indications can be accepted as reliable. So far as the quality of the material analyzed is concerned, it appeared to be fully as good as that of some other Canadian Precambrian uraninites previously analyzed which have yielded lead ratios of 0.15 to 0.16. Further, the high percentage of ThO_2 in the Manitoba uraninite is not altogether exceptional as the Wilberforce, Ontario, uraninite has nearly the same thorium content and yet yields a lead ratio between 0.15 and 0.16. The high lead ratio of the Huron claim uraninite is closely approached by that of only one other known uraninite, that from the Ingersoll claim, South Dakota, analyzed by C. W. Davis, the essential figures for which are reproduced in the third column of analyses above.[1] It is significant that both uraninites occur in the same general region in pegmatites of a very similar, one might say identical, type characterized by the presence of large amounts of albite and lithium and beryllium minerals. It has been claimed by Hess and Schaller that the albite in such pegmatites is a replacement on a large scale of earlier formed minerals during the later phase of magmatic activity. If earlier formed minerals including possibly uraninite have been reworked in this way, one might wonder what is the effect of such alteration and replacement on the uraninite. Schaller and Hess, however, believe that uraninite and other rare element minerals occurring in albite pegmatites do not belong to the first gen-

[1] It is true that some of the specimens of uraninite from Sinyaya Pala, Carelia, Russia, have shown even higher lead ratios, but these are described as being contaminated either by galena or by red and yellow alteration products such as gummite. The purest and freshest specimen analyzed yielded the lead ratio 0.17.

eration of minerals but were formed during the albitization process. That uraninites occurring in albite pegmatites do not on that account yield abnormal lead ratios is supported by the fact that uraninites of the albitic lithium-bearing New England pegmatites yield comparatively small lead ratios in complete accord with the age as determined by ordinary geological methods. Thus, there seems to be no reason to doubt the age indications of the Dakota and Manitoba uraninities on the ground that a special sort of alteration or replacement associated with albitization and lithium mineralization has increased the lead content. The only other doubts which may enter result from the lack of exact knowledge as to the origin of actinium and the possibility of the existence in the early stages of the earth's history of short-lived isotopes of uranium. The older idea of physicists that ordinary lead occurs as a constituent of uraninites has been pretty well exploded by recent work, and has always seemed most improbable to mineralogists.

The rocks of the area in which the Huron claim pegmatite occurs have been studied and mapped in detail by J. F. Wright[2] who states that the oldest rocks there are a complex of ancient Precambrian lavas and sediments named by him the Rice Lake series. The lavas comprise basalt, andesite, dacite and rhyolite. The sediments include quartz-mica-garnet gneiss, mica schist, quartzite, arkose and slate, with some conglomerate beds carrying granite pebbles. In places the lavas and sediments are interbedded but large areas are occupied mainly by either volcanics or sediments. No evidence of an unconformity between the different members of the complex has yet been found.

The Rice Lake series is cut by intrusives ranging in composition from peridotite to granite, all believed to be closely related in origin and of about the same age. The most abundant of these intrusives are granites and diorites and especially microcline granite. Four types of granitic bodies have been distinguished by Wright: (1) Diorite and granodiorite; (2) Granodiorite and quartz diorite; (3) Pink microcline granite; (4) White and pink pegmatitic albite granite. All these are believed to be differentiates from the same magma. The earlier more basic types are sometimes cut by the later more acid differentiates. The albitic lithium-bearing pegmatites are associated with the albite granite.

[2] *Geol. Sur. Canada*, Summary Report, **1924**, Part B, p. 51.

The Rice Lake series has not yet been definitely correlated with the classical Keewatin-Couchiching rocks to the eastward in Ontario but both are evidently very similar lithologically.

If the age indication of the Huron claim uraninite is accepted, the Rice Lake series must comprise some of the oldest rocks of the earth's crust and the granitic rocks and pegmatites which cut them are much older than the granites and pegmatites which cut the Grenville series in Old Ontario and Quebec.

Further, taking as limits the Huron claim uraninite with ratio 0.26 and the Henvey uraninite, which is early Precambrian with ratio 0.11, the interval of Precambrian time thus defined appears to comprise at least three fifths of all geological time.

NOTE—In comparing the Manitoba and Dakota uraninites it may be noticed that the lead percentages are much the same in both, also the total U and Th of the Manitoba uraninite is about the same as the U of the Dakota. It may be only a remarkable coincidence, but possibly there is some significance attached to the fact that if the Th of the Huron claim uraninite be calculated as U replacing it in molecular proportions, i.e. 12.25 Th = 12.56 U, the resulting lead ratio of the Manitoba uraninite becomes 0.227, very close to that (0.221) of the South Dakota uraninite calculated in a similar way.