MINES BRANCH

DEPARTMENT OF MINES

OTTAWA - CANADA

RADIUM-BEARING MINERALS FROM GREAT BEAR LAKE, NORTHWEST TERRITORIES

Memorandum Series
No. 48
March, 1931

MINES BRANCH

DEPARTMENT OF MINES

OTTAWA - CANADA

RADIUM-BEARING MINERALS FROM GREAT BEAR LAKE, NORTHWEST TERRITORIES

Memorandum Series
No. 48
March, 1931

MINES BRANCH

DEPARTMENT OF MINES, OTTAWA, CANADA

Memorandum Series March, 1931 Number 48

RADIUM-BEARING MINERALS FROM GREAT BEAR LAKE, NORTHWEST TERRITORIES

By

Hugh S. Spence*

- - - - - - - - -

Introduction.

Late in 1930, the Mines Branch received for examination and test, a small shipment of ore samples submitted by Eldorado Gold Mines, Ltd., and which was believed to consist of pitchblende, the most important commercial ore of radium. The samples were stated to have been taken from a deposit discovered during 1930 on Echo Bay, Great Bear Lake, N. W. T.

Preliminary examination and electroscopic tests confirmed the pitchblende nature of the samples, and it was decided to conduct a number of chemical analyses and electroscopic determinations on them, in order to determine the general character and uranium-radium content of the material. It was also decided to conduct a concentration test on one of the larger samples to ascertain whether a separation of the mineral constituents could be effected.

Location.

The site of the pitchblende discovery lies at water's edge on LaBine Point, a promontory on Echo Bay, at the east end of Great Bear Lake. The discovery was visited during 1930 by C. W. Knight, who described its main features and geology in the Canadian Mining Journal of October 10th, 1930

* Mineral Technologist, Mines Branch, Department of Mines.

Character of Deposit.

From Knight's description, and from data supplied by the owners, the deposit from which the samples were taken consists of two parallel veins, 300 feet apart, and having a more or less vertical dip. The maximum observed width of pitchblende ore thus far exposed is reported to be about four inches. The two veins have been traced by outcrops along their strike for a distance of several hundred feet. They lie in a severely faulted and disturbed zone in which, besides pitchblende, occur copper sulphides, bismuth, arsenopyrite, and traces of cobalt and nickel. The principal gangue mineral of the veins is quartz. The veins occur near the contact of granite intruded into lava flows, and perhaps are related genetically to the former rock.

Characteristics of the Samples.

All the samples containing pitchblende sent to the Mines Branch were essentially uniform in type. They are stated to have been taken from various exposures along the two veins, and consisted of lump and chipped material.

The samples, in the main, consisted of massive pitchblende, having a conspicuous mammillated structure which breaks into slab-like masses, that can be readily freed from adhering gangue. The pitchblende should thus be readily amenable to recovery by hand-cobbing methods, with the production of a clean shipping product.

Under the microscope, however, polished pieces of the massive pitchblende show it to be highly shattered and to be traversed by a fine network of minute veinlets of quartz and chalcopyrite. In some samples, quartz may constitute up to nearly 50 per cent. Other minerals are not conspicuously present, but traces of arsenopyrite, pyrite and galena have been reported. Some specimens showed a dentritic growth of pitchblende in a groundmass of quartz.

In its general character, and in the nature of the associated metallic minerals, the samples show a resemblance to the pitchblende from the deposits of Joachimsthal (Jachymov) in Czechoslovakia.

Examination of Samples.

In order to obtain an approximate indication of the uranium content, a number of laboratory-mixed samples were made up from the various bulk samples submitted. These comprised carefully selected pitchblende, as free from extraneous material as it was possible to make them. Specific gravity determinations were run on these samples, and were found to range from 3.8 to 7.0 indicating considerable differences in the purity of the material that it would be possible to obtain in a hand-cobbed state.

The samples were then subjected to electroscopic test and chemical analysis to determine the content of uranium oxide (U_3O_8). Determinations were run on eight samples, the uranium oxide content of which was found to range from 27.88 to 83.90 per cent; the equivalent range of radium content would thus be approximately from 70.79 to 213 milligrams per ton.

The principal impurity was found to be quartz, which in the poorest sample analysed amounted to nearly 45 per cent. The only other important constituent was lead, which ranged from 5.48 to 11.25 per cent. A large part of this lead is surmised to be radium-lead, formed by the atomic disintegration of uranium, of which it is one of the end-products. Small amounts of copper, cobalt, nickel, molybdenum, bismuth, arsenic, iron and sulphur were determined, as well as traces of gold and silver.

Microscopic examination having disclosed the presence of considerable disseminated quartz as well as fine chalcopyrite, tests were made to determine the possibility of improvement in grade by concentration. Owing to the small quantity of material available, it was not possible to do more than run small-scale, experimental tests with laboratory-size equipment. The extremely intimate association of the pitchblende, quartz and sulphides indicated that fine grinding would be necessary to free the mineral particles.

Two samples were taken for test, each consisting of a single slab of ore composed principally of massive pitchblende with small amounts only of adhering gangue. The slabs weighed, respectively, about 7½ and 5 pounds, and were stated to have been taken from different veins. The samples were first crushed to 50-mesh, and head samples taken for analysis. Results showed contents of 56.91 per cent and 63.94 per cent of uranium oxide, respectively; these contents are equivalent to 144.51 milligrams and 162.39 milligrams of radium per ton.* (See analyses A and B.)

Table of Analyses.

Element	Sample A %	Sample B %
U_3O_8	56.91	63.94
Th	nil	nil
V_2O_5	trace	nil
Cu	0.70	0.66
Ni	trace	trace
Co	0.13	0.10
PbO	12.00	12.13
Bi	0.18	trace
As	0.15	0.14
Fe	1.01	0.77
S	2.08	0.90
Ag	1.41 oz/ton	1.72 oz/ton
Au	0.19 oz/ton	trace

*[illegible]tion tests by J. S. Godard, Division of Ore Dressing and Metallurgy, Mines Branch.
Chemical Analyses by B. F. Coyne, Division of Ore Dressing and Metallurgy, Mines Branch.
Chemical Analyses confirmed by A. Sadler, Division of Chemistry, Mines Branch.

One of the samples was then ground to 200 mesh, and a flotation test run on it. It was found that the fine pitchblende showed a strong tendency to float with the sulphides, so that no clean separation of the latter from the pitchblende was possible by the method used. It was found, however, that the flotation concentrate contained roughly five times the head assay in copper, gold and sulphur and four times the head assy in silver. It ran slightly under 50 per cent of uranium oxide. The lead content was raised only slightly in the concentrate, from 11.14 per cent to 11.80 per cent. The fact that an increase took place, however, while there was a decrease of 7.51 in the uranium oxide content, indicated the probable presence of a small amount of galena in the ore. As remarked above, the bulk of the lead is probably present in the form of radium-lead, too intimately associated with the pitchblende to be removable except by chemical means. It was thought that some of the lead might possibly be present as a telluride mineral, but analysis failed to reveal the presence of tellurium. No trace was found of thorium, an element usually present in the uraninite variety of pitchblende found in pegmatite dykes. Ores containing thorium are difficult to treat for the isolation of pure radium, owing to the close chemical affinity of the two elements.

Conclusions.

The flotation tests indicated that in removing the metallic sulphides from the pitchblende the very little improvement made in grade was not commensurate with the loss of pitchblende associated with the sulphides. It seems probable that ordinary hand-cobbing and sorting of the ore will prove sufficient to produce a high-grade pitchblende product suitable for chemical treatment for the recovery of the contained radium.

It is to be noted that all of the samples tested and analysed consisted of selected, hand-picked or specimen ore, and, as such, some are probably of considerably higher grade than would be average run-of-mine material. Extremely extravagant statements have appeared in the press as to the actual radium values found in the ore, and in some cases these have even gone beyond the bounds of theoretical possibility, were the ore chemically pure uranium oxide. However, there is no question but that an interesting discovery of pitchblende has been made. Its possible commercial value can necessarily only be determined by the proving up of tonnage, and this will have to await the results of further development work.

M.S.48.