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by

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EXTRACTION METALLURGY DIVISION

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Mines Branch Investigation Report IR 66-67

MINERALOGICAL INVESTIGATION OF MILL TAILING SAMPLES FROM ELDORADO MINING AND REFINING LTD., BEAVERLODGE, SASK.

by

M.R. Hughson* and S. Kaiman**

SUMMARY

Pitchblende and brannerite are the only uranium-bearing minerals identified in mill tailing samples from the Fay mine of Eldorado Mining and Refining Ltd., Beaverlodge, Sask. Pitchblende is the major uranium mineral in both the normal and high-grade tailings. Brannerite is present in the high-grade tailings and is believed to be present in the normal tailings: it comprises only a minor proportion of the radioactive mineral content but it appears to be more abundant in the high-grade tailings than in the normal tailings.

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INTRODUCTION

Sized mill tailing samples were submitted to the Mineralogy Section by Mr. G.F. Colborne, Assistant Manager, Research and Development Division, Eldorado Mining and Refining Limited on April 25, 1966. They were reported to be from the Fay mine of the Company's property at Beaverlodge, Saskatchewan and were assigned our Reference No. 4/66-4. The size fractions submitted and their respective uranium assays as reported by the company are shown in Table 1. It was requested that a mineralogical examination be made to compare the uranium minerals occurring in the high-grade tailings and in the normal tailings.

MINERALOGY

Two of the normal and three of the high-grade tailings fractions were selected for the mineralogical investigation. These are the minus 100 plus 150 mesh and the minus 200 mesh plus 40 micron size fractions of the normal tailings, and the plus 65 mesh, the minus 100 plus 150 mesh, and the minus 200 mesh plus 40 micron size fractions of the high-grade tailings. Autoradiographs were prepared of polished sections of these fractions by contacting the sections with alpha-sensitive plates for 430 hours. Radioactive grains in the polished sections were located by comparing the sections with the autoradiographs, and were examined with an ore microscope. As far as possible mineral identifications were confirmed by X-ray diffraction methods.

The two fractions of the normal tailings studied were found to be similar to each other as were the three fractions of high-grade tailings and they are referred to in this report simply as normal or high-grade tailings.

Pitchblende was the only radioactive mineral identified in the normal tailings in which it forms irregular intergrowths with gangue minerals, including plagioclase feldspar, quartz, calcite, chlorite, hematite and magnetite. The colour of the pitchblende in polished sections varies from light to dark grey and in places the latter type is almost indistinguishable from the transparent gangue minerals (Figure 1). Although several occurrences of light grey, lath-like grains resembling brannerite were noted in the polished sections of normal tailings (Figure 2) their identification could not be confirmed by X-ray diffraction. However, these unidentified grains are much less abundant than pitchblende.

TABLE 1

Sizes and Uranium Assays of High-Grade and Normal Tailings

Size	% U_3O_8	
	High-grade tailing 60-18-01	Normal tailing 60-05-01-3
+ 65 mesh	0.038	
-65 + 100 "	0.040	0.030
-100 + 150 "	0.044	0.023
-150 + 200 "	0.044	0.024
-200 mesh + 40 microns	0.048	0.025
-40 + 20 "	0.036	0.021
-20 + 10 "	0.035	0.016
-10 "	0.037	0.016
Average	0.039	0.021

In the high-grade tailings the presence of pitchblende and brannerite (Figures 3 and 4) was confirmed by X-ray diffraction methods. The nature of occurrence of pitchblende in these tailings is similar to that in the normal tailings. Brannerite occurs in gangue as fine lath-shaped crystals (Figure 4) and irregular masses (Figure 5). In some cases the brannerite is indistinguishable from the gangue (Figure 6). Pitchblende is several times more abundant than brannerite in the high-grade tailings.

PHOTOMICROGRAPHS

The mounting-medium in which the radioactive grains are set is marked m-m in the photomicrographs.

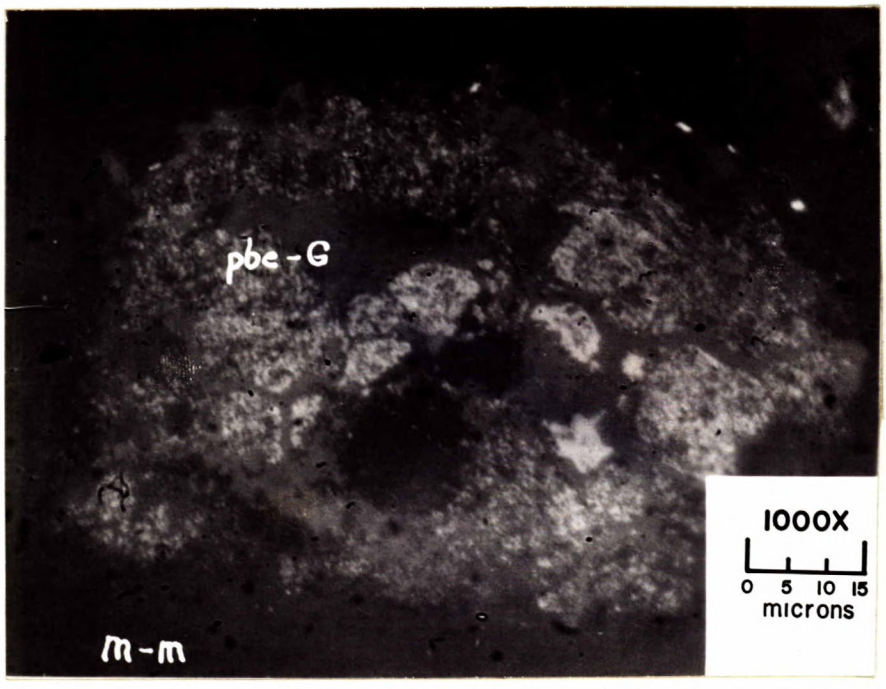

Figure 1. A pitchblende-bearing grain of gangue (pbe-G). Normal tailings.

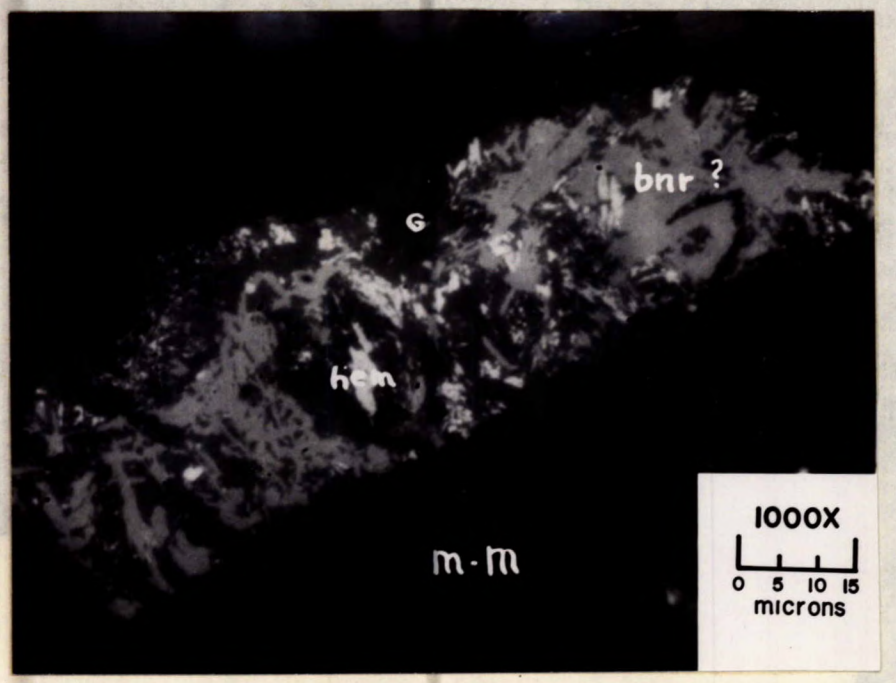

Figure 2. Light grey, acicular, brannerite-like mineral (bnr ?) in a grain of gangue. Hematite (hem) is present. Normal tailings.

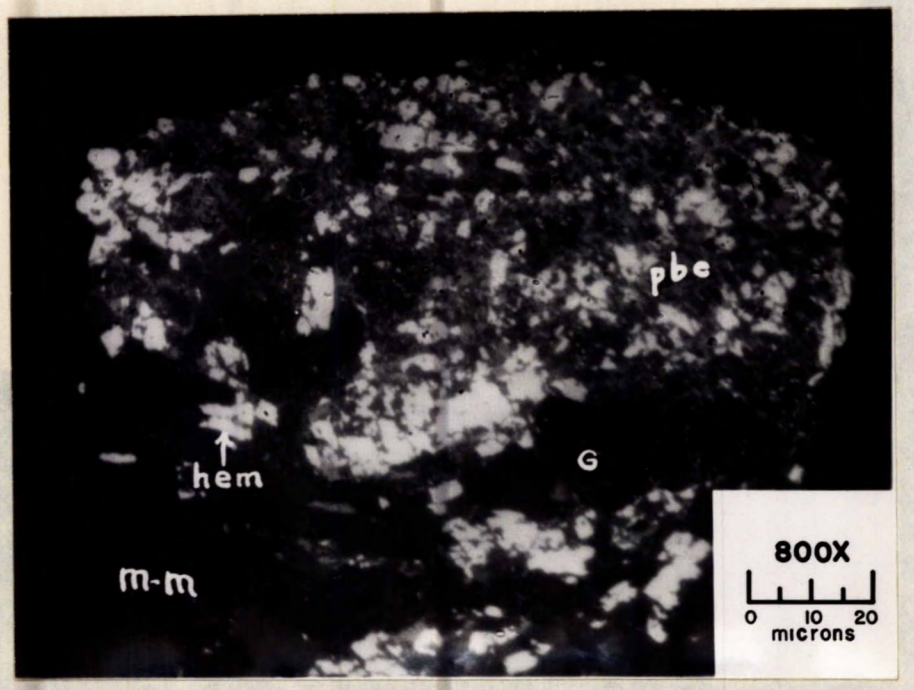

Figure 3. Pitchblende (pbe) in a grain of gangue (G). Hematite (hem) is present. High-grade tailings.

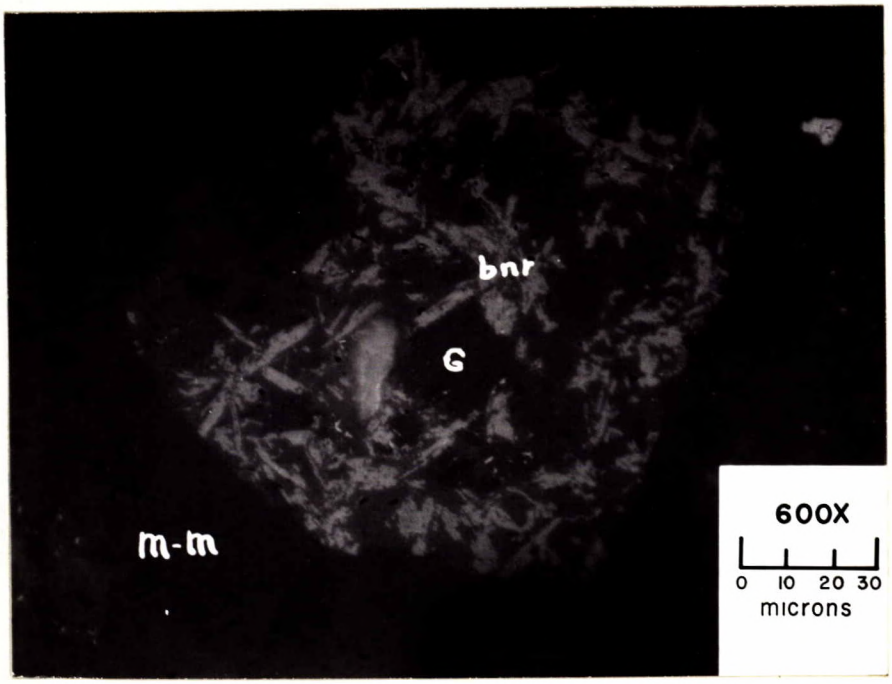

Figure 4. Acicular crystals of brannerite (bnr) in a grain of gangue (G). High-grade tailings.

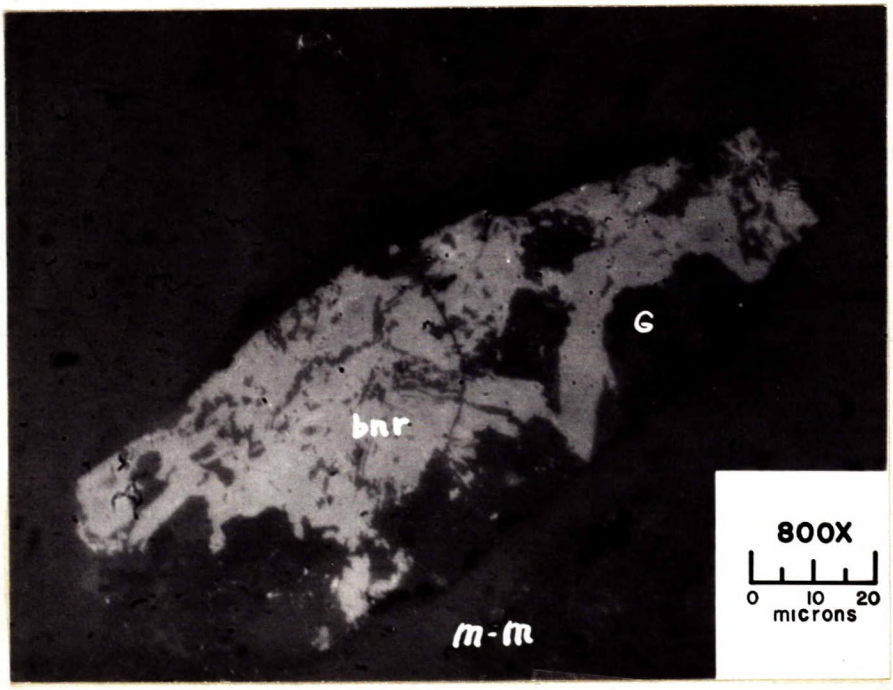

Figure 5. Massive brannerite (bnr) in a grain of gangue (G). High-grade tailings.

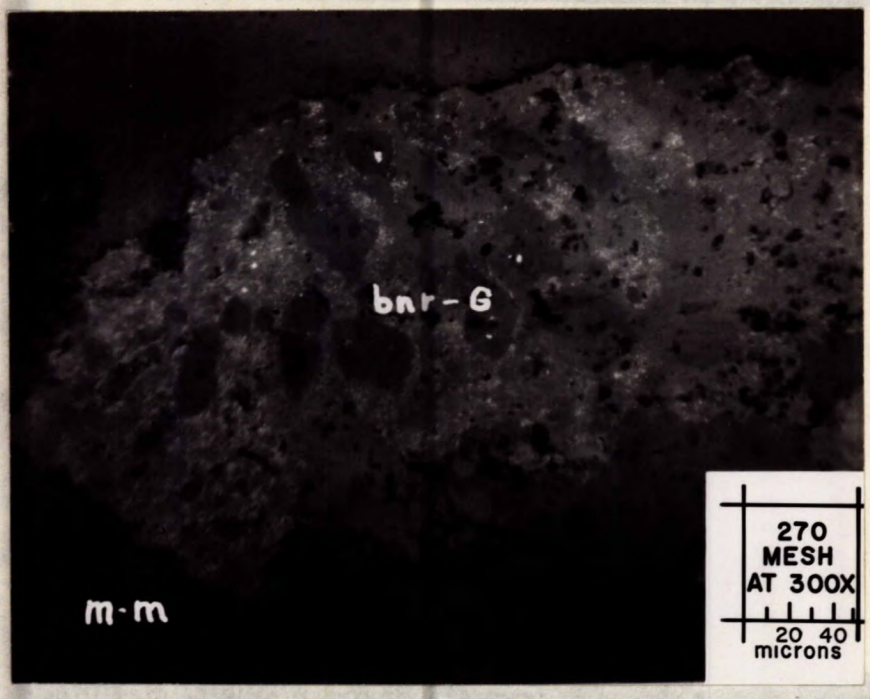

Figure 6. A brannerite-bearing grain of gangue (bnr-G). High-grade tailings.

DISCUSSION AND CONCLUSIONS

Pitchblende was identified in the normal and high-grade tailings and brannerite in the high-grade tailings. However, grains having the appearance of brannerite were observed in the normal tailings as well. Pitchblende is several times more abundant than brannerite or suspected brannerite in both tailings samples. The polished section study of the two types of tailings indicates that there is a higher proportion of brannerite in the high-grade tailings than in the normal tailings.

The variation in colour of the pitchblende, as seen in polished sections, is probably due to the degree of alteration and oxidation: the less altered varieties appear light grey whereas those in which the UO_3 to UO_2 ratio is higher appear darker.

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