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8. R. 572

MT HORROR WOLFRAM ORE CONCENTRATION TEST

At the request of Mr G. Gerke concentration tests were carried out on a sample of ore stated to be from Mt Horror, near Winnaleah, to determine the recovery of wolfram possible.

Sample

About 150 lbs of wolfram bearing quartz was submitted as a sample. The maximum size of the quartz pieces was about five to six inches in size. The quartz appeared to have originated from a vein of about five inches in width. Blades of wolfram were abundant in the quartz, and the maximum width of the blades was about ¼ inch. A separate sample of about 30 lbs of the host rock was also submitted.

Note 1. No responsibility will be accepted for the results shown in this report except insofar as they apply to the samples received.

Note 2. All screens used were from the British Standard Screen Series.

Test Work

The whole sample was crushed to about minus $\frac{3}{8}$ inch by crushing in the Braun Chipmunk jaw crusher. A head assay sample was cut, and a sample of about 23 lbs was cut for sizing and heavy liquid separation of the screen fractions. The remaining portion of the sample was halved by riffling to provide the sample for the concentration test.

The head sample assayed 4.8% WO_3.

The sizing sample cut from the main sample was screened on $\frac{3}{8}$ inch, $\frac{1}{4}$ inch, and 3/16 inch screens. The minus 3/16 inch fraction was riffled to provide a smaller sample for screening on the finer screens, viz., 5 mesh, 7 mesh, 10 mesh, 14 mesh, 25 mesh and 52 mesh.

Each size fraction except the minus 52 mesh fraction was subject to heavy liquid separation at a specific gravity of 2.68.

The minus 52 mesh fraction was concentrated by panning, and the concentrate and tailing assays are shown under sink and float on Table 1, together with the results of the heavy liquid separations.

Table 1.

Product	Sink		Float		WO_3 Distribution in each sizing		Overall WO_3 Distribution	
	% *Wt*	% WO_3	% *Wt*	% WO_3	*Sink*	*Float*	%	% *Cum*
+⅜ inch	0.2	39.6	1.4	0.18	97.5	2.5	1.7	1.7
−⅜ inch +¼ inch	1.8	23.8	13.0	0.13	97.0	3.0	9.0	10.7
−¼ inch + 3/16 inch ..	2.0	23.8	16.4	0.10	98.0	2.0	10.0	20.7
−3/16 inch + 5 mesh ..	1.5	33.8	10.9	0.15	97.7	2.3	10.6	31.3
−5 mesh +7 Mesh	1.9	41.2	12.0	0.15	98.2	1.8	16.3	47.6
−7 Mesh +10 Mesh ..	1.0	47.5	7.1	0.18	98.0	2.0	9.9	57.5
−10 Mesh +14 Mesh ..	1.1	37.0	6.0	0.25	96.9	3.1	8.6	66.1
−14 Mesh +25 Mesh ..	1.0	49.4	7.3	0.43	94.1	5.9	10.7	76.8
−25 Mesh +52 Mesh ..	0.7	47.4	4.9	0.55	92.6	7.4	7.3	84.1
−52 Mesh	1.2	43.0	8.6	2.65	66.7	33.3	15.9	100.0
Total	12.4	36.3	87.6	0.44	..	..	..	..
	87.6	0.44	..	..	..	..	..	..
Head (calculated)	100.0	4.89	..	..	..	..	..	..

The results in Table 1 showed that the lowest float assay was in the size fraction minus ¼ inch plus 3/16 inch. Accordingly the sample for concentration testing was screened on a ¼ inch screen, and the oversize was lightly crushed in the Denver 10 inch. diameter by 6 inch rolls crusher. The crusher discharge was screened on the ¼ inch screen, and the oversize was returned to the rolls. This was repeated until all the material passed through the ¼ inch screen.

The sample was then screened on the following screens:—3/16 inch, 5 mesh, 7 mesh, 18 mesh, 30 mesh, and 100 mesh screens. The fractions coarser than 18 mesh were concentrated separately in the 6 inch by 4 inch Denver jig. The jig bed remaining at the Completion of jigging of each size fraction (except minus ¼ inch plus 3/16 inch) was fed over a No. 1 M Denver jig. The tail and concentrate from each jigging operation for each size fraction were respectively bulked, and the jig bed remaining in the No. 1 M jig was included in the concentrate for each size fraction.

The jig bed remaining after the jigging of the minus ¼ inch plus 3/16 inch fraction could not be accommodated in the No. 1 M jig because the particle size was too large. The jig bed was therefore subjected to heavy liquid separation at a specific gravity of 2.9. The sink was bulked with the minus ¼ inch plus 3/16 inch jig concentrate, and the float was bulked with the jig tail.

Table 2 shows the operating conditions during jigging.

Table 2

Feed Size	Stroke Length Ins	Ragging	Stroke Frequency No. per Min.	Hutch Water Gallons per Min. per Sq Ft	Treatment of Remaining Jig Bed
— ¼ inch + 3/16 inch	¾	7/16 inch nut wads	240	5.9	Heavy liquid sepn
— 3/16 inch plus 5 mesh	¾	7/16 inch nut wads	240	5.9	Jigging No. 1 M jig
— 5 mesh + 7 mesh	9/16	7/16 inch nut wads	240	5.9	Jigging No. 1 M jig
— 7 mesh + 18 mesh	⅜	¼ inch iron shot	240	5.9	Jigging No. 1 M jig

Above the ragging in each case an equal amount of pyrrhotite particles of comparable size to the iron particles was placed for a total depth of ragging of about 2 inches.

The minus 18 mesh plus 30 mesh, and the minus 30 mesh plus 100 mesh fractions were treated on the Diester table using the sand deck, while the minus 100 mesh fraction was tabled using the slime deck.

The results of the concentration test are shown on Table 3.

Table 3

Product	% Wt	% WO_3	% Distribution WO_3	% Distribution WO_3 Cum.
— ¼ inch + 3/16 inch J/C	1.12	52.6	12.4	12.4
—3/16 inch + 5 mesh J/C	1.42	53.6	16.1	28.5
— 5 mesh + 7 mesh J/C	1.21	42.1	10.7	39.2
— 7 mesh + 18 mesh J/C	2.34	55.6	27.4	66.6
— 18 mesh + 30 mesh T/C	0.81	35.0	6.0	72.6
— 30 mesh + 100 mesh T/C	1.06	48.4	10.8	83.3
— 100 mesh T/C	0.36	54.2	4.1	87.5
Total Concentrate	8.32	49.9	....	....
— ¼ inch + 3/16 mesh J/T	20.46	0.33	1.4	1.4
— 3/16 inch + 5 mesh J/T	18.11	0.35	1.3	2.7
— 5 mesh + 7 mesh J/T	11.94	0.48	1.2	3.9
— 7 mesh + 18 mesh J/T	23.81	0.57	2.9	6.8
— 18 mesh + 30 mesh T/T	6.61	0.78	1.1	7.9
— 30 mesh + 100 mesh T/T	6.08	0.76	1.0	8.9
— 100 mesh T/T	4.67	3.66	3.6	12.5
Total Tail	91.68	0.65	....	....
Calculated Head	....	4.74	....	....

The WO_3 recovery in the individual size range are shown below in Table 4.

Table 4

Size Range	WO_3 Recovery
— ¼ inch + 3/16 inch	89.7
— 3/16 inch + 5 mesh	92.3
— 5 mesh + 7 mesh	89.9
— 7 mesh + 18 mesh	90.6
— 18 mesh + 30 mesh	84.6
— 30 mesh + 100 mesh	91.7
— 100 mesh	53.3

A specific gravity determination was made on the host rock, and the result was 2.69.

During heavy liquid separation tests it became apparent that there was some scheelite present. In order to determine the approximate proportion of scheelite WO_3 present, the minus 18 mesh plus 30 mesh table concentrate was halved by riffling. Half was assayed for WO_3 together with the rest of the concentrates. The remaining half was treated on the dry magnetic separator. The non-magnetics were subject to heavy liquid separation at a specific gravity of 2.9. The magnetics, and the non magnetic sink and float were assayed for WO_3. The results are shown in Table 5. The non-magnetic sink was also assayed for Sn, and the result was 0.03% Sn.

Table 5

Product	% Wt	WO_3 Assay %	WO_3 Distribution %
— 18 mesh + 30 mesh Magnetics	51.5	62.5	91.3
— 18 mesh + 30 mesh Non-magnetic Sink	8.4	31.8	8.3
—18 mesh + 30 mesh Non-magnetic Float	40.1	0.35	0.4
— 18 mesh + 30 mesh Table Concentrate	100.0	35.0	100.0

Conclusions

The wolfram ore can be satisfactorily treated by jigging and tabling to recover 87.5% of the WO_3 in a concentrate assaying 49.9% WO_3. It should be possible to produce a saleable grade of concentrate (i.e. over 65% WO_3) with at least 80% recovery.

The host rock has a specific gravity close to that of quartz and therefore should behave as quartz does in the jigging and tabling operations, and should not interfere in the recovery of the wolfram.

It is important to liberate the wolfram as coarse as possible as is shown in Table 4. Recovery of WO_3 will suffer if too many fines are produced.

About 9% of the WO_3 present in the ore occurs as scheelite. Cassiterite (tin ore) is present in trace quantities only.