

TR16-303-306

R.633. Sulphide removal of scheelite gravity concentrates previously subject to sulphide flotation.

Two samples of scheelite gravity concentrates each in a jute concentrate bag were received from King Island Scheelite Ltd. The samples were described as follows:

Reg. No.	Description	
712108	No. 1	22.6.1971 Gravity sulphide sink; M.I.B.C. used as frother.
712109	No. 2	5.7.1971 Gravity sulphide sink; causticised resin used as frother.

Sample No. 1 contained about 30 kg of concentrate and Sample No. 2 contained about 18 kg of concentrate.

The details of flotation to produce the above samples were given as:

Sample		Assays %		
		WO ₃	Mo	S
No. 1	Gravity sulphide feed	41.0	1.45	6.4
	Gravity sulphide float	0.86	0.25	39.4
	Gravity sulphide sink	54.5	1.82	1.02
No. 2	Gravity sulphide feed	29.6	0.92	8.4
	Gravity sulphide float	1.8	0.21	39.4
	Gravity sulphide sink	44.8	1.32	1.2

Test Work

The aim of the tests was to further lower the sulphur content of the scheelite concentrates.

Head samples were taken by riffing each original sample and they were assayed for WO₃, Mo and S.

It was initially thought that it might be necessary to carry out table flotation to satisfactorily remove the sulphides at the coarser end of the size range of the scheelite concentrates. Accordingly, the samples were dry screened to determine the sulphur and molybdenum distribution over the size range, and the weight distribution so that suitable screens could be chosen for table flotation.

While awaiting results, a few cell flotation tests were carried out with various reagent conditions. It soon became apparent from the weight of sulphide concentrate being produced that practically all the sulphur was being recovered by cell flotation.

Each sample was then subjected to cell flotation using the following reagent conditions:

- Collector 0.3 lb/ton potassium amyl xanthate
- Frother 0.1 lb/ton pine oil
- Flotation time 6 minutes

Very little molybdenite was seen during flotation and the flotation concentrate appeared to be substantially pyrite.

The sulphide concentrates produced were given sizing analyses and the flotation tails were also sized and assayed for molybdenum and sulphur.

The results of the sizing analyses from the initial dry screening and the sizing analyses on the flotation tailings indicated that agglomerations had not disintegrated during dry screening. Two fresh samples were taken and subjected to water scrubbing in the flotation cell for six minutes (the same time as for flotation) and then dried and screened. The size fractions were assayed for molybdenum and sulphur.

TEST RESULTS

The results of the sizing analyses together with the molybdenum and sulphur distributions are as follows:

Dry Screening

Sample 712108 No. 1

B.S.S. Screen Size			Assay %		Distribution %	
#	µm	% Wt	Mo	S	Mo	S
+72	+210	21.5	1.91	1.54	22.4	47.0
+85	+180	7.3	2.25	1.15	9.0	11.9
+100	+150	9.9	2.08	1.01	11.2	14.2
+120	+125	9.5	1.93	0.66	10.0	8.9
+150	+105	10.0	1.83	0.46	10.0	6.5
+170	+90	9.3	1.83	0.31	9.3	4.1
+200	+75	11.0	1.66	0.20	9.9	3.1
-200	-75	21.5	1.55	0.14	18.2	4.3
		100.0	1.83	0.71	100.0	100.0

Sample 712109 No. 2

B.S.S. Screen Size			Assay %		Distribution %	
#	µm	% Wt	Mo	S	Mo	S
+72	+210	15.3	1.48	4.14	18.2	45.3
+85	+180	5.7	1.72	3.08	7.9	12.6
+100	+150	6.7	1.56	2.58	8.4	12.4
+120	+125	8.2	1.38	1.52	9.1	8.9
+150	+105	9.2	1.41	1.00	10.4	6.6
+170	+90	10.8	1.39	0.66	12.0	5.1
+200	+75	15.5	1.01	0.36	12.6	4.0
-200	-75	28.6	0.93	0.25	21.4	5.1
		100.0	1.25	1.40	100.0	100.0

Wet Scrubbing

Sample 712108 No. 1

B.S.S. Screen Size			Assay %		Distribution %	
#	µm	% Wt	Mo	S	Mo	S
+72	+210	13.7	1.99	2.1	14.0	40.4
+85	+180	7.2	2.35	1.3	8.7	13.1
+100	+150	9.8	2.19	1.08	11.1	14.9
+120	+125	10.3	2.02	0.74	10.7	10.7
+150	+105	11.1	1.97	0.51	11.3	7.9
+170	+90	9.8	1.95	0.28	9.8	3.9
+200	+75	10.0	1.78	0.20	9.2	2.8
-200	-75	28.1	1.74	0.16	25.2	6.3
		100.0	1.94	0.71	100.0	100.0

Sample 712109 No. 2

B.S.S. Screen Size			Assay %		Distribution %	
#	µm	% Wt	Mo	S	Mo	S
+72	+210	11.4	1.63	5.1	14.0	42.9
+85	+180	4.8	1.87	3.4	6.8	12.0
+100	+150	6.3	1.63	2.9	7.8	13.5
+120	+125	7.6	1.45	1.6	8.3	9.0
+150	+105	8.3	1.46	1.08	9.1	6.6
+170	+90	10.2	1.48	0.69	11.4	5.2
+200	+75	13.6	1.10	0.38	11.3	3.8
-200	-75	37.8	1.10	0.25	31.3	7.0
		100.0	1.33	1.36	100.0	100.0

Flotation Concentrate

B.S.S. Screen Size			Sample 712108 No. 1		Sample 712109 No. 2	
#	µm	% Weight			% Weight	
+72	+210	23.4				35.0
+85	+180	11.7				13.0
+100	+150	13.4				11.0
+120	+125	14.1				11.1
+150	+105	8.7				7.7
+170	+90	6.7				5.3
+200	+75	4.1				4.5
-200	-75	17.9				12.4
		100.0				100.0
	Assay % Mo		2.05			0.66
	% S		25.3			36.7

Flotation Tail

B.S.S. Screen Size			Sample 712108 No. 1		Sample 712109 No. 2	
#	µm	% Wt	Assay %		Distribution %	
			Mo	S	Mo	S
+72	+210	12.9	2.15	0.53	13.7	78.0
+85	+180	6.7	2.40	0.047	8.0	3.5
+100	+150	9.5	2.31	0.058	10.9	6.3
+120	+125	10.1	2.07	0.027	10.3	3.1
+150	+105	10.1	2.03	0.019	10.2	2.2
+170	+90	10.1	2.01	0.009	10.0	1.0
+200	+75	9.3	1.85	0.012	8.5	1.2
-200	-75	31.3	1.83	0.013	28.4	4.7
		100.0	2.02	0.09	100.0	100.0

B.S.S. Screen Size			Sample 712109 No. 2		Distribution %	
#	µm	% Wt	Assay %		Mo	
			Mo	S	Mo	S
+72	+210	10.4	1.88	0.35	14.0	36.1
+85	+180	4.6	2.05	0.091	6.8	4.2
+100	+150	6.1	1.75	0.11	7.7	6.6
+120	+125	7.9	1.54	0.088	8.7	7.0
+150	+105	8.4	1.50	0.086	9.1	7.1
+170	+90	10.7	1.52	0.082	11.7	8.7
+200	+75	13.8	1.14	0.069	11.3	9.4
-200	-75	38.1	1.12	0.055	30.7	20.9
		100.0	1.39	0.10	100.0	100.0

The results of the flotation tests were as follows:

Sample 712108 No. 1							
	% Wt	Assay %		Distribution %			
		Mo	S	Mo	S		
Sulphide conc.	2.33	2.05	25.3	2.4	87.3		
Sulphide tail	97.67	2.02	0.09	97.6	12.7		
	100.0	2.02	0.68	100.0	100.0		

Sample 712109 No. 2							
	% Wt	Assay %		Distribution %			
		Mo	S	Mo	S		
Sulphide conc.	3.54	0.66	36.7	1.7	93.0		
Sulphide tail	96.46	1.39	0.10	98.3	7.0		
	100.0	1.37	1.40	100.0	100.0		

The following table shows the head assays from the various sources:

	Sample 712108 No. 1			Sample 712109 No. 2		
	% WO ₃	% Mo	% S	% WO ₃	% Mo	% S
King Island Scheelite assays	54.5	1.82	1.02	44.8	1.32	1.2
Mines Dept head assays	55.0	1.84	0.72	44.6	1.17	1.32
Dry screening calc. head		1.83	0.71		1.25	1.40
Wet scrubbing calc. head		1.94	0.71		1.33	1.36
Flotation calc. head		2.02	0.68		1.37	1.40

CONCLUSIONS

About 50% of the sulphur in the gravity sulphide sink products can be removed by additional cell flotation using 0.3 lb per ton of potassium amyl xanthate as collector. A scheelite concentrate assaying about 0.1% can be produced.

The molybdenum is present as powellite; only minor amounts of molybdenum were noticed.