

TR18.186-189

R.660. Reduction of impurities in tin concentrates produced from ore from the open cut, Razorback mine, Dundas.

K.J. Austin
H.K. Wellington

As mineralogical work commissioned by Minops Pty Ltd had shown that the arsenopyrite in the tin concentrates produced in Investigation R.649 was present as free grains, Minops requested froth flotation tests to reduce the penalizable impurities As, Pb, S and Fe. The two tin concentrate samples used were as follows:

- (1) Investigation R.649, T2C M/S1N 64.7% Sn
- (2) Investigation R.649, T3C M/S2N 69.5% Sn

METHOD

Test samples (500 g) of both concentrates, were floated separately in a Denver D1 laboratory flotation cell. Test conditions were as given in Table 1.

RESULTS

The results of tests are given in Table 2.

CONCLUSION

The sulphide minerals present responded readily to flotation; the tin losses occurring entirely due to mechanical entrainment.

Tests N3 and N5 reveal that a high recovery of cassiterite, with a reasonably high rejection of impurities, may be achieved very simply through the use of sodium ethyl xanthate as collector and methyl iso-butyl carbinol as frother. A summary of the tests is given below:

Test No.	Sample	% Tin Recovery	% Rejection			
			As	Fe	Pb	S
N3	2	98.9	68.9	57.2	67.3	73.5
N5	1	99.0	73.2	55.2	61.5	82.6

The final tin concentrates assayed as follows:

Product	% Sn	% As	% Fe	% Pb	% S
N3 FlT	73.4	0.28	1.28	0.02	0.47
N5 FlT	72.4	0.11	1.68	0.03	0.18

The results indicate that, using conventional reagent combinations, sulphide removal after gravity concentration does not present any problem.

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Table 1. TEST CONDITIONS

Test No.	Sample No.	Rougher Flotation					Cleaner Flotation			Remarks
		Conditioner (g/t)	Activator (g/t)	Collector (g/t)	Frother (drops)	Flotation time (minutes)	Collector (g/t)	Frother (drops)	Flotation time (minutes)	
N3	2	-	-	SEX (445)	4 MIBC	4	SEX (220)	2 MIBC	3	30 minute scrub in flotation cell prior to flotation.
N4	2	Na ₂ CO ₃ (445)	CuSO ₄ (445)	SEX (220), KAX (220)	4 MIBC	2½	-	2 MIBC	2	30 minute scrub in flotation cell prior to flotation.
N5	1	-	-	SEX (445)	10 MIBC	10	-	4 MIBC	3	30 minute scrub in flotation cell prior to flotation.
N6	1	Na ₂ CO ₃ (445)	CuSO ₄ (445)	SEX (220), KAX (220)	10 MIBC	7½	-	4 MIBC	5	30 minute scrub in flotation cell prior to flotation.
N7	2	-	CuSO ₄ (445)	SEX (220), KAX (220)	6 MIBC	5	-	4 MIBC	-	Ground in laboratory ball mill at approximately 70% solids for 3 minutes.
N8	1	-	CuSO ₄ (445)	SEX (220), KAX (220)	6 MIBC	7	-	4 MIBC	-	Ground in laboratory ball mill at approximately 70% solids for 3 minutes.

SEX = Sodium ethyl xanthate, KAX = Potassium amyl xanthate, MIBC = Methyl iso-butyl carbinol.

- Note: (1) Samples were either flotation cell scrubbed or ball mill ground prior to flotation in an attempt to remove oxidised or partly oxidised mineral surfaces, caused through previous infra-red drying of the gravity concentrate samples.
- (2) The preliminary nature of these tests must be emphasised. No attempt has been made to establish optimum conditions.
- (3) Launceston tap water was used as make up water.

Table 2. FLOTATION TEST RESULTS

Test No.	Fraction	% Mass	% Sn	% S	% Pb	% Fe	% As	% Sn Distn	% S Distn	% Pb Distn	% Fe Distn	% As Distn
N3	F2C	5.11	4.20	33.8	1.05	38.3	15.5	0.3	73.5	67.3	57.2	68.9
	F2T	1.36	41.7	13.4	0.54	(19.5)	7.0	0.8	7.8	9.2	7.8	8.3
	F1C	6.47	(12.1)	(29.5)	(0.94)	(34.4)	(13.7)	1.1	81.3	76.5	65.0	77.2
	F1T	93.53	73.4	0.47	0.02	1.28	0.28	98.9	18.7	23.5	35.0	22.8
	H	100.00	(69.4)	(2.35)	(0.08)	3.42	(1.15)	100.0	100.0	100.0	100.0	100.0
N4	F2C	8.35	23.7	24.0	0.70	26.2	11.0	2.9	81.6	70.9	64.0	73.3
	F2T	5.15	57.2	6.75	0.13	(10.0)	5.0	4.2	14.2	8.1	15.0	20.5
	F1C	13.50	(36.5)	(17.4)	(0.48)	(20.0)	(8.7)	7.1	95.8	79.0	79.0	93.8
	F1T	86.50	74.4	0.12	0.02	0.83	0.09	92.9	4.2	21.0	21.0	6.2
	H	100.00	(69.3)	(2.46)	(0.08)	3.42	(1.25)	100.0	100.0	100.0	100.0	100.0
N7	F2C	7.86	21.6	24.4	0.70	27.3	10.5	2.5	80.7	57.9	62.7	77.0
	F2T	3.51	47.1	8.5	0.38	(7.0)	4.5	2.4	12.6	14.1	7.2	14.7
	F1C	11.37	(29.5)	(19.5)	(0.60)	(21.0)	(8.6)	4.9	93.3	72.0	69.9	91.7
	F1T	88.63	73.8	0.18	0.03	1.16	0.10	95.1	6.7	28.0	30.1	8.3
	H	100.00	(68.8)	(2.38)	(0.09)	3.42	(1.07)	100.0	100.0	100.0	100.0	100.0
N3, N4, N7	H Assay	100.0	69.1	2.46	-	3.42	1.3					

Table 2 (continued)

Test No.	Fraction	% Mass	% Sn	% S	% Pb	% Fe	% As	% Sn Distn	% S Distn	% Pb Distn	% Fe Distn	% As Distn
N5	F2C	7.20	2.9	36.4	0.87	37.4	10.0	0.3	82.6	61.5	55.2	73.2
	F2T	2.19	19.3	17.7	0.55	(30.4)	7.5	0.7	12.2	11.8	13.6	16.7
	F1C	9.39	(6.72)	(32.0)	(0.80)	(35.8)	(9.4)	1.0	94.8	73.3	68.8	89.9
	F1T	90.61	72.4	0.18	0.03	1.68	0.11	99.0	5.2	26.7	31.2	10.1
H	100.00	(66.2)	(3.17)	(0.10)	4.88	(0.98)	100.0	100.0	100.0	100.0	100.0	100.0
N6	F2C	6.91	19.0	23.0	0.75	24.6	5.5	2.0	48.7	45.4	34.8	36.6
	F2T	2.53	24.2	17.9	0.32	(24.0)	4.5	1.0	13.9	7.1	12.5	11.0
	F1C	9.44	(20.4)	(21.6)	(0.63)	(24.5)	(5.2)	3.0	62.6	52.5	47.3	47.6
	F1T	90.56	69.9	1.35	0.06	2.84	0.60	97.0	37.4	47.5	52.7	52.4
H	100.0	(65.2)	(3.26)	(0.11)	4.88	(1.04)	100.0	100.0	100.0	100.0	100.0	100.0
N8	F2C	9.69	10.4	27.7	0.61	30.3	8.0	1.6	85.0	53.9	52.3	82.7
	F2T	1.84	28.8	9.9	0.34	20.8	3.5	0.8	5.8	5.7	6.8	6.9
	F1C	11.53	(13.3)	(24.9)	(0.57)	(28.8)	(7.3)	2.4	90.8	59.6	59.1	89.6
	F1T	88.47	71.0	0.33	0.05	2.60	0.11	97.6	9.2	40.4	40.9	10.4
H	100.00	64.4	(3.16)	(0.11)	(5.62)	(0.94)	100.0	100.0	100.0	100.0	100.0	100.0
N5, N6, N8	H Assay	100.0	65.4	3.22	-	4.88	1.0					

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