TR15_179_182

R.614. Barytes concentration tests

A barytes chip sample which was stated to have come from the St Valentines Peak area was supplied by L.H. McNeair for barytes concentration tests.

SAMPLE PREPARATION

The ore as received was in large chip form. It was staged crushed to -½ in in a Chipmunk laboratory jaw crusher, mixed, then riffled to provide samples for:

(1) Flotation tests

(2) Gravity concentration

(3) Magnetic separation

(4) Head assay (this R.614 head sample was later given the registered number 700941).

PROCEDURE

Flotation

One kilogram samples of the -¼ in ore were batch ground in a laboratory ball mill for an arbitrary grinding time of 10 minutes. Grinding was carried out at 60% solids. The ground ore was washed into a Denver laboratory flotation cell for flotation under various conditions, in an attempt to find a satisfactory process for concentration of the barytes. Flotation reagents and conditions are shown in Table 1. Flotation time, and accurate pH values were not measured at this preliminary stage.

Gravity concentration

A portion of the ore was wet screened to provide the following sized fractions for heavy liquid separation:

-¼ in	+⅛ in	-100#	+100#
-⅛ in	+10#	-200#	
-10#	+22#		

The -200# fraction was gravity concentrated on a Deister slime table as it was considered too small in particle size for heavy liquid separation. The heavy liquid used was acetylene tetrabromide which has a specific gravity of 2.95.

Magnetic separation

Portions of the ore were wet and dry screened to provide the fractions: -10# +22# and -22# +60# for magnetic separation. The non-magnetic fraction of both sized fractions was further concentrated by heavy liquid separation.

RESULTS

Head assay

Ba	50.3%	*i.e.* 85.5% barytes		Pb	Nil
SO_4	36.5%			Ca	2.3%

Table 1. FLOTATION TEST PROCEDURES

Test	Grinding time (minutes)	Primary Flotation			Secondary or Cleaner Flotation	Remarks
		Modifier (lb/ton)	Collector (lb/ton)	Frother (drops)	Collector (lb/ton)	
N1	5	Lime 6.0	Oleic acid 0.4	Cresylic acid 5	-	-
N2	7	Lime 6.0	Sodium oleate 0.5	Cresylic acid	-	Deslimed
N3	10	-	Sulphonated castor oil 0.5	-	-	Deslimed
N4	10	Sodium silicate 0.5	Aeropromotor 825 0.5	Cresylic acid 5	-	Deslimed
N5	10	Sodium silicate 0.2	Aeropromotor 825 0.2	-	Aeropromotor 825 0.2	Deslimed
N6	10	Sodium silicate 0.3	Aeropromotor 825 0.7	-	Aeropromotor 825 0.2	-
N7	10	-	(Gardinol CA) Sodium oleyl cetyl sulphate 0.3	-	-	-
N8	10	-	Gardinol CA 0.7	-	-	-
N9	10	-	Aeropromotor 825 0.7	-	-	-
N10	10	-	Aeromine 3035 promotor 0.5	-	-	-
N11	10	-	Phenyl ethylene phosphonic acid 0.5	Cresylic acid 5	Aeropromotor 825 0.5	-

NOTES. 1. Reagent quantity shown is in lb/short ton.
2. In test *N11* an attempt was made to float first the impurities, then the barytes.

Flotation Tests

Test	Fraction	% Wt	% Ba	% Distn Ba
N1	FC	67.9	53.1	71.7
	FT	32.1	(44.4)	28.3
	Head	100.0	50.3	100.0
N2	Slime	13.2	46.6	12.2
	FC	11.4	51.7	11.7
	FT	75.4	(50.7)	76.1
	Head	100.0	50.3	100.0
N3	Slime	11.9	49.0	11.6
	FC	86.9	51.7	84.2
	FT	6.2	(34.3)	4.2
	Head	100.0	50.3	100.0
N4	Slime	13.0	49.2	12.7
	FC	76.2	56.9	86.2
	FT	10.8	(5.1)	1.1
	Head	100.0	50.3	100.0
N5	Slime	11.1	47.3	10.4
	F2T	2.5	38.6	1.9
	F2C	38.9	57.8	44.7
	F1C	41.4	(56.6)	46.6
	F1T	47.5	(45.5)	43.0
	Head	100.0	50.3	100.0
N6	F2T	8.0	36.2	5.8
	F2C	80.1	55.4	88.2
	F1C	88.1	(53.7)	94.0
	F1T	11.9	(25.5)	6.0
	Head	100.0	50.3	100.0
N7	FC	36.2	55.9	40.2
	FT	63.8	(47.1)	59.8
	Head	100.0	50.3	100.0
N8	FC	55.8	57.4	63.7
	FT	44.2	(41.3)	36.3
	Head	100.0	50.3	100.0
N9	FC	78.1	57.8	89.7
	FT	21.9	(23.6)	10.3
	Head	100.0	50.3	100.0

Flotation Tests - continued

Test	Fraction	% Wt	% Ba	% Distn Ba
N10	FC	35.6	53.3	37.7
	FT	64.4	(48.6)	62.3
	Head	100.0	50.3	100.0
N11	FC1	9.5	34.5	6.5
	FC2	76.5	57.9	88.1
	FT	14.0	(19.5)	5.4
	Head	100.0	50.3	100.0

Gravity Concentration

Fraction		% Wt	% Ba	% Distn Ba
-¼ in +⅛ in	H/L S/K	44.6	52.4	45.9
-⅛ in +10#	H/L S/K	14.1	53.4	14.8
-10# +22#	H/L S/K	12.0	55.6	13.1
-22# +100#	H/L S/K	6.9	56.9	7.7
-100# +200#	H/L S/K	8.0	57.3	9.0
-200#	TC	2.5	56.9	2.8
Total Concentrates		88.1	(53.9)	93.3
-¼ in +⅛ in	H/L F/T	2.9	6.61	0.4
-⅛ in +10#	H/L F/T	0.8	2.77	Trace
-10# +22#	H/L F/T	0.7	4.76	0.1
-22# +100#	H/L F/T	0.6	22.5	0.3
-100# +200#	H/L F/T	1.6	45.6	1.4
-200#	TT	5.3	43.6	4.5
Total Tailings		11.9	(28.8)	6.7
Total Concentrates		88.1	(53.9)	93.3
Total Tailings		11.9	(28.8)	6.7
Head		100.0	50.9	100.0

NOTE: Gravity separation of the finer fractions was very difficult.

Magnetic Separation

Analysis of magnetic separation products was not carried out, as the non-magnetic fractions produced contained minor amounts of impurities even after heavy liquid separation. It was found however, that small amounts of iron bearing minerals could be removed from the ore.

CONCLUSIONS

(1) 89.7% of the barytes can be recovered by flotation at a grade of 98.2% using the collector Aeropromotor 825 at a rate of 0.7 lb/ short ton.

(2) Gravity concentration results indicate that 93.3% of the barytes may be recovered at a grade of 91.6%.

(3) Magnetic separation can be used to remove minor amounts of iron bearing minerals from the ore.