MR-112-15

Laboratory Tests of Nickel-Copper Ore

from

Admiralty-Alaska Mining Corporation, Alaska

Ottawa, Canada,
July 12, 1956.

Quebec Metallurgical
Industries Ltd.

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On May 25, 1956, a shipment of 175 pounds of ore was received at the Ottawa Research Laboratories from Juneau, Alaska. This shipment had been prepared by Mr. E.A. Hart in the course of his geological examination of the Admiralty-Alaska mine workings on Admiralty Island, 18 miles west of Juneau. The purpose of the shipment was to determine the nature of the ore and its amenability to concentration of its nickel-copper-cobalt content.

The shipment was given our No. 1335. It was crushed to minus 1/8 inch. A head sample gave the following analysis:

Nickel	-	0.81%
Copper	-	0.58
Cobalt	-	0.09
Iron	-	19.30
Sulphur	-	8.20
Arsenic	-	0.07%

The specific gravity of the dry ore was 2.50.

Fifteen concentration tests were conducted, as described in detail in the attached pages. A summary of the results is given in the following table. It is assumed that the values in the cleaner circuit will be recovered in the concentrate on a second pass through the mill circuit.

Summary of Test Results

Test Number	Calculated Heads		Concentrate Grade		Percent Recovery	
	Ni %	Cu %	Ni %	Cu %	Ni %	Cu %
1	0.81	0.65	2.60	2.90	86.45	98.03
2	0.71	0.48	2.20	1.79	80.88	96.02
3	0.87	0.65	1.39	2.21	68.96	86.33
4	0.69	0.60	2.25	0.80	86.20	92.59
5	0.78	0.56	2.51	2.14	91.46	97.26
6	0.78	0.60	1.61	1.27	90.92	92.71
7	0.88	0.64	2.30	2.10	87.26	97.10
8	0.84	0.63	2.20	1.98	87.78	97.12
9	0.83	0.61	2.30	2.00	85.95	96.85
10	0.82	0.62	2.40	2.10	81.00	93.13
11	0.81	0.60	1.95	2.00	68.45	93.08
12	0.73	0.59	2.35	1.90	83.85	94.61
13	0.84	0.64	2.30	2.40	89.58	99.07
14	0.89	0.64	2.10	2.80	85.96	96.90
15	0.65	0.65	2.10	2.20	89.13	97.31
Calculated Average	0.81	0.61	2.17	2.04	84.26	95.21
By analysis	0.81	0.58				

The results show that a bulk concentrate can be made by a combination of flotation and wet magnetic concentration that will contain 4.5% to 5.0% nickel plus copper with a recovery of 85% of the nickel and 95% of the copper in the ore. The bulk concentrate will contain, in addition, about 0.1% cobalt.

Ottawa, Canada,
July 12, 1956.

Quebec Metallurgical
Industries Ltd.

Lab. Test 237-1 May 28, 1956.

Object - To make a copper-nickel bulk concentrate from Admiralty-Alaska ore, our Sample No. 1335.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 30 minutes with the addition of 1,500 c.c. water, 2.0 lbs. per ton Soda Ash and 0.20 lb. per ton Xanthate (Z-11).

2. Transferred the ground pulp to a laboratory flotation cell at 35% solids.

3. Floated off a bulk concentrate in 5 minutes with the addition of 3 drops Dow 250 frother.

4. Conditioned remainder of pulp for 10 minutes with 0.30 lb. per ton Copper Sulphate and 0.10 lb. per ton Xanthate (Z-11).

5. Floated off a second concentrate and added it to the bulk concentrate (3 above).

6. Transferred remainder of pulp to a Crockett magnetic separator to give a magnetic fraction and a tailing.

7. Dried, weighed, and analysed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Fe	Insol.
* Bulk concentrate	22.05	2.60	2.90	30.80	38.70
* Magnetic conc.	13.38	0.95	0.01	44.80	18.30
Tailing	64.57	0.17	0.02	10.40	61.80
Heads (calc.)	100.00	0.81	0.65	19.50	50.89

Product	Percent Weight	Percent Distribution Ni	Cu	Fe	Insol.
Bulk concentrate	22.05	70.76	97.83	34.82	16.76
Magnetic conc.	13.38	15.69	0.20	30.74	4.82
Tailing	64.57	13.55	1.97	34.44	78.42
Heads (calc.)	100.00	100.00	100.00	100.00	100.00

* Analysis of combined concentrates:

Percent Weight	Analysis % Ni	Cu	Percent Recovery Ni	Cu
35.43	1.98	1.81	86.45	98.03

Lab. Test 217-2 May 28, 1956

Object - To produce a nickel concentrate, a copper concentrate, and a magnetic concentrate from Admiralty-Alaska ore, our Sample No. 1335.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 45 minutes with the addition of 1,500 c.c. water, 2.0 lbs. per ton Soda Ash, 0.20 lb. per ton Xanthate (Z-11), and 1 drop Dow 250 frother.

2. Transferred the ground pulp to a laboratory flotation cell at 35% solids.

3. Floated off a copper rougher concentrate in 5 minutes with the addition of 3 drops Dow 250 frother.

4. Conditioned for 20 minutes with 3.0 lbs. per ton Sulphuric Acid.

5. Floated off a nickel-pyrrhotite concentrate in 5 minutes with the addition of 0.10 lb. per ton Xanthate (Z-11).

6. Transferred remainder of pulp to a Crockett magnetic separator to give a magnetic fraction and a tailing.

7. Transferred the copper rougher concentrate (3 above) to another cell and conditioned for 10 minutes with 3.0 lbs. per ton Hydrated Lime.

8. Floated off a cleaned copper concentrate with the addition of 3 drops Dow frother. Remainder of pulp was designated a copper cleaner tailing.

9. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Fe	Insol.
* Copper concentrate	3.75	7.20	12.20	29.10	20.40
Copper cleaner tailing	1.41	0.84	0.33	13.00	51.00
* Nickel concentrate	9.20	1.90	0.04	30.00	41.30
* Magnetic concentrate	12.90	1.00	0.01	51.40	11.00
Tailing	72.74	0.17	0.02	10.00	56.60
Heads (calc.)	100.00	0.71	0.48	17.91	47.87

Product	Percent Weight	Percent Distribution Ni	Cu	Fe	Insol.
* Copper concentrate	3.75	38.16	94.97	6.09	1.59
Copper cleaner tailing	1.41	1.49	0.97	0.86	1.51
* Nickel concentrate	9.20	24.74	0.76	15.41	7.94
* Magnetic concentrate	12.90	18.18	0.29	37.02	2.97
Tailing	72.74	17.43	3.01	40.62	85.99
Heads (calc.)	100.00	100.00	100.00	100.00	100.00

* Analysis of combined concentrates:

Analysis % Ni	Cu	Percent Recovery Ni	Cu
2.22	1.79	80.88	96.02

Lab. Test 237-3 May 29, 1956

Object - To produce a copper concentrate and a nickel concentrate by flotation, magnetic separation, and tabling from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 20 minutes with the addition of 1,500 c.c. water.

2. Transferred the ground pulp to a Crockett magnetic separator to give a magnetic fraction, designated a pyrrhotite concentrate and a non-magnetic fraction.

3. Dewatered the non-magnetic fraction and reground for 20 minutes with the addition of 2.0 lbs. per ton Soda Ash, 0.20 lb. per ton Reagent 238 and 2 drops Dow 250 frother.

4. Transferred the reground pulp to another cell and conditioned with 0.20 lb. per ton Reagent 238 and 2 drops Dow frother.

5. Floated off a copper rougher concentrate in 5 minutes.

6. Added to remainder of pulp 3.0 lbs. per ton Sulphuric Acid and 0.20 lb. per ton Xanthate (Z-11), and floated off a scavenger concentrate in 5 minutes with the addition of 3 drops Aerofloat 15.

7. Transferred remainder of pulp to a laboratory Wilfley table to give a table concentrate and a tailing.

8. Cleaned the copper rougher concentrate (5 above) three times in a dilute pulp.

9. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Co	Fe	Insol.
* Magnetic concentrate	18.63	1.50	0.43	0.09	48.90	13.50
* Copper concentrate	2.81	0.70	14.00	0.04	17.90	36.20
Copper cleaner tailing	12.73	2.20	0.33	0.12	9.80	56.10
Scavenger concentrate	8.93	1.10	0.26	0.05	26.20	36.10
Table concentrate	1.13	0.38	0.10	Tr	18.20	44.00
Tailing	55.77	0.14	0.04	0.009	7.30	55.60
Heads (calc.)	100.00	0.87	0.65	0.06	27.26	48.10

Product	Percent Weight	Percent Distribution Ni	Cu	Co	Fe	Insol.
* Magnetic concentrate	18.63	66.71	25.62	57.33	69.31	10.84
* Copper concentrate	2.81	2.25	60.71	1.83	1.85	2.11
Copper cleaner tailing	12.73	10.26	6.48	25.20	4.57	14.84
Scavenger concentrate	8.93	11.31	3.57	7.41	8.59	6.72
Table concentrate	1.13	0.49	0.16	-	0.75	1.03
Tailing	55.77	8.98	3.46	8.23	14.93	64.46
Heads (calc.)	100.00	100.00	100.00	100.00	100.00	100.00

	Analysis % Ni	Cu	Percent Distribution Ni	Cu
* Combined concentrates	1.39	2.21	68.96	86.33

Lab. Test 237-h May 30, 1956.

Object - To produce a nickel-pyrrhotite concentrate and a copper concentrate from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 45 minutes with the addition of 1,500 c.c. water.

2. Transferred the ground pulp to a Crockett magnetic separator to give a nickel-pyrrhotite concentrate and a non-magnetic fraction.

3. Dewatered the non-magnetic fraction and reground for 30 minutes at a suitable density.

4. Transferred the reground pulp to a laboratory flotation cell and conditioned with 2.0 lbs. per ton Soda Ash, 0.30 lb. per ton Xanthate (Z-11), and four drops Aerofloat 15.

5. Floated off a copper concentrate in 12 minutes.

6. Transferred remainder of pulp to a laboratory Wilfley table to give a table concentrate and a tailing.

7. Cleaned the copper concentrate (5 above) three times in a dilute pulp.

8. Dried, weighed and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Co	Fe	Insol.
Nickel pyrr. conc.	12.52	1.30	0.34	0.06	50.40	10.20
Copper concentrate	1.45	1.40	4.70	0.06	12.90	56.10
Copper cleaner tailing	20.93	1.90	2.10	0.11	19.60	45.20
Table concentrate	1.96	0.52	0.08	Tr.	21.10	43.00
Tailing	63.14	0.15	0.07	0.10	10.60	56.60
Heads (calc.)	100.00	0.69	0.60	0.09	17.70	48.13

Product	Percent Weight	Percent Distribution Ni	Cu	Co	Fe	Insol.
Nickel pyrr. conc.	12.52	23.74	7.14	7.90	35.63	2.65
Copper concentrate	1.45	2.96	11.47	0.90	1.06	1.70
Copper cleaner tailing	20.93	58.00	73.72	24.33	23.16	19.65
Table concentrate	1.96	1.50	0.26	-	2.35	1.75
Tailing	63.14	13.80	7.41	66.87	37.80	74.25
Heads (calc.)	100.00	100.00	100.00	100.00	100.00	100.00

Screen Analysis of Tailing

Mesh size	Percent Weight	Ni %	Distribution Percent Ni
+ 150	4.03	0.21	3.36
- 150 + 200	7.33	0.10	2.88
- 200 + 325	36.63	0.18	26.02
- 325	52.01	0.33	67.74

Lab. Test 237-5 May 31, 1956.

Object - To produce a copper concentrate, a nickel concentrate, a pyrrhotite concentrate, and a table concentrate from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,200 c.c. water.

2. Transferred the ground pulp to a laboratory flotation cell at 35% solids.

3. Floated off a copper concentrate in 5 minutes with the addition of 4.0 lbs. per ton Sodium Silicate, 0.10 lb. per ton Reagent 238, and one drop of Frother No. 80.

4. Conditioned remainder of pulp with 0.20 lb. per ton Xanthate (Z-3), 0.20 lb. per ton Xanthate (Z-11) and 3 drops Aerofloat 15.

5. Floated off a nickel concentrate in 10 minutes.

6. Added to remainder of pulp 5.0 lbs. per ton Sulphuric Acid and 0.30 lb. per ton Xanthate (Z-3) and floated off a pyrrhotite concentrate in 5 minutes.

7. Transferred remainder of pulp to a laboratory Wilfley table to give a table concentrate and a tailing.

8. Cleaned the copper concentrate (3 above) once in a dilute pulp with the addition of one drop Frother No. 80.

9. Cleaned the pyrrhotite concentrate (6 above) twice in a dilute pulp without the addition of further reagents.

10. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Co	Fe	Insol.
* Copper concentrate	1.62	0.91	25.40	-	30.30	10.40
Copper cleaner tailing	0.76	1.40	1.60	0.08	13.80	54.00
* Nickel concentrate	13.99	3.60	0.75	0.19	35.10	27.30
* Pyrrhotite concentrate	8.90	1.10	0.07	0.03	47.20	17.20
Pyrrhotite cleaner tailing	13.48	0.56	0.07	0.02	23.10	42.20
Table concentrate	10.07	0.09	0.02	0.01	11.50	60.20
Tailing	51.18	0.13	0.03	Nil	8.00	54.50
Heads (calc.)	100.00	0.78	0.56	0.03	18.07	45.57

Product	Percent Weight	Percent Distribution Ni	Cu	Co	Fe	Insol.
* Copper concentrate	1.62	1.88	73.30	-	2.26	0.39
Copper cleaner tailing	0.76	1.42	2.17	1.79	0.58	0.90
* Nickel concentrate	13.99	64.73	18.67	79.13	27.66	8.38
* Pyrrhotite concentrate	8.90	12.59	1.10	8.05	23.24	3.35
Pyrrhotite cleaner tailing	13.48	9.70	1.67	8.05	17.23	12.48
Table concentrate	10.07	1.14	0.35	2.98	6.40	13.30
Tailing	51.18	8.54	2.74	-	22.63	61.20
Heads (calc.)	100.00	100.00	100.00	100.00	100.00	100.00

	Analysis % Ni	Cu	Percent Distribution Ni	Cu
* Combined concentrates	2.51	2.14	79.20	93.07

Screen Test of Tailing

Mesh size	Weight, grams	Percent Weight
+150	2	0.94
-150 +200	5	2.32
-200 +325	32	14.88
-325	176	81.86
	215	100.00

Lab. Test 237-6 June 1, 1956.

Object - To produce a magnetic concentrate, a copper concentrate, and a nickel concentrate from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,200 c.c. water.

2. Transferred the ground pulp to a Crockett magnetic separator to give a magnetic concentrate and a non-magnetic fraction.

3. Dewatered the non-magnetic fraction and transferred the pulp to a laboratory flotation cell at 35% solids.

4. Conditioned the pulp for 20 minutes with 0.20 lb. per ton Xanthate (Z-11) and 3 drops Aerofloat 15.

5. Floated off a copper rougher concentrate in 5 minutes.

6. Added to remainder of pulp 1.0 lb. per ton Copper Sulphate, 0.30 lb. per ton Xanthate (Z-11), and 2 drops Dow frother, and floated off a scavenger concentrate which was added to the copper rougher concentrate (5 above).

7. Transferred remainder of pulp to a laboratory Wilfley table to give a table concentrate and a tailing.

8. Transferred the copper rougher concentrate (5 above) to another cell and cleaned 3 times in a dilute pulp with the addition of 3 lbs. per ton Hydrated Lime. The underflow was designated a nickel concentrate.

9. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Co	Fe	Insol.
* Magnetic concentrate	13.89	1.30	0.21	0.06	51.60	7.90
* Copper concentrate	1.56	1.05	24.31	0.20	32.50	4.80
Table concentrate	2.09	0.17	0.02	0.02	16.00	41.20
* Nickel concentrate	28.13	1.80	0.51	0.09	20.90	48.60
Tailing	54.33	0.13	0.08	0.01	8.60	56.10
Heads (calc.)	100.00	0.78	0.60	0.04	18.56	46.17

Product	Percent Weight	Percent Distribution Ni	Cu	Co	Fe	Insol.
* Magnetic concentrate	13.89	23.23	4.90	19.52	38.61	2.37
* Copper concentrate	1.56	2.10	63.66	7.30	2.74	0.15
Table concentrate	2.09	0.47	0.07	0.96	1.81	1.87
* Nickel concentrate	28.13	65.12	24.08	59.52	31.67	29.61
Tailing	54.33	9.08	7.29	12.70	25.17	66.00
Heads (calc.)	100.00	100.00	100.00	100.00	100.00	100.00

Lab. Test 237-7 June 11, 1956.

Object - To produce a bulk concentrate from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 25 minutes with the addition of 1,500 c.c. water.

2. Transferred the ground pulp to a Crockett magnetic separator to give a magnetic fraction and a non-magnetic fraction.

3. Dewatered the non-magnetic fraction and reground for 20 minutes at a suitable density with the addition of 0.20 lb. per ton Xanthate (Z-3), 0.20 lb. per ton Xanthate (Z-5), and 3 drops Aerofloat 31.

4. Transferred the reground pulp to a laboratory flotation cell and floated off a bulk concentrate (copper-nickel) in 10 minutes. Remainder of pulp was designated the tailing.

5. Cleaned the bulk concentrate twice in a dilute pulp.

6. Combined the magnetic fraction (2 above) with the cleaned bulk concentrate.

7. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis %		Percent Distribution	
		Ni	Cu	Ni	Cu
Bulk concentrate	27.89	2.30	2.10	73.31	91.38
Cleaner tailing	10.17	1.20	0.36	13.95	5.72
Tailing	61.94	0.18	0.03	12.74	2.90
Heads (calc.)	100.00	0.88	0.64	100.00	100.00

Lab. Test 237-8 June 11, 1956.

Object - To produce a bulk concentrate from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of Admiralty-Alaska ore in a laboratory ball mill for 25 minutes with the addition of 1,500 c.c. water.

2. Transferred the ground pulp to a Crockett magnetic separator to give a magnetic fraction and a non-magnetic fraction.

3. Dewatered the non-magnetic fraction, transferred it to a laboratory ball mill, and reground with the addition of 0.20 lb. per ton Xanthate (Z-3), 0.20 lb. per ton Xanthate (Z-5), and 3 drops Aeroflont 31.

4. Transferred the reground pulp to a laboratory flotation cell and floated off a bulk concentrate (nickel-copper) in 10 minutes. Remainder of pulp was designated the tailing.

5. Cleaned the bulk concentrate 3 times in a dilute pulp and added to the cleaned concentrate the magnetic fraction (2 above).

6. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Analysis % Cu	Percent Distribution Ni	Percent Distribution Cu
Bulk concentrate	30.07	2.20	1.98	78.93	94.96
Cleaner tailing	9.63	0.77	0.14	8.85	2.16
Tailing	60.30	0.17	0.03	12.22	2.88
Heads (calc.)	100.00	0.84	0.63	100.00	100.00

Lab. Test 237-9 June 11, 1956.

Object - To produce a bulk concentrate by magnetic separation and flotation from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 0.20 lb. per ton Xanthate (Z-3), 0.20 lb. per ton Xanthate (Z-5), 3.0 lbs. per ton Soda Ash, and 4 drops Aerofloat 31.

2. Transferred the ground pulp to a laboratory flotation cell at 35% solids.

3. Floated off a bulk concentrate (nickel-copper) in 12 minutes with the addition of 3 drops frother No. 80. Remainder of pulp was designated a flotation tailing.

4. Transferred the flotation tailing to a Crockett magnetic separator to give a magnetic concentrate and a tailing.

5. Cleaned the bulk flotation concentrate (3 above) twice in a dilute pulp without the addition of further reagents.

6. Combined the cleaned flotation concentrate and the magnetic concentrate (4 above) to form a bulk concentrate.

7. Roasted the bulk concentrate at 1000°F in a clay roasting dish to remove sulphur.

8. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Percent Distribution Ni	Cu
Bulk concentrate	29.07	2.30	2.00	81.24	95.20
Cleaner tailing	6.70	0.58	0.15	4.71	1.65
Tailing	64.23	0.18	0.03	14.05	3.15
Heads (calc.)	100.00	0.83	0.61	100.00	100.00

Lab. Test 237-10 June 12, 1956.

Object - To produce a bulk concentrate by flotation and magnetic separation from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,500 c.c. water, 3.0 lbs. per ton Soda Ash, 0.20 lb. per ton Xanthate (Z-3), 0.20 lb. per ton Xanthate (Z-5), and 4 drops Aerofloat 31.

2. Transferred the ground pulp to a laboratory flotation cell at 35% solids.

3. Floated off a bulk concentrate (nickel-copper) in 5 minutes with the addition of 3 drops Dow frother.

4. Added to remainder of pulp 5.0 lbs. per ton Sulphuric Acid, 0.10 lb. per ton Xanthate (Z-3), and 2 drops Dow frother, and floated off a second bulk concentrate in an acid circuit.

5. Transferred remainder of pulp to a Crockett magnetic separator to give a magnetic fraction and a non-magnetic fraction which was designated the tailing.

6. Combined the two bulk concentrates (3 and 4 above) and cleaned 3 times in a dilute pulp. Added the magnetic fraction (5 above) to the cleaned bulk concentrate.

7. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Analysis % Cu	Percent Distribution Ni	Percent Distribution Cu
Bulk concentrate	27.02	2.40	2.10	78.84	91.92
Cleaner tailing	2.35	0.79	0.32	2.16	1.21
Tailing	70.63	0.22	0.06	19.00	6.87
Heads (calc.)	100.00	0.82	0.62	100.00	100.00

Lab. Test 237-11 June 13, 1956.

Object - To produce a bulk concentrate (nickel-Copper) by magnetic concentration and flotation from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,500 c.c. water.

2. Transferred the ground pulp to a Crockett magnetic separator to give a magnetic fraction and a non-magnetic fraction.

3. Dewatered the non-magnetic fraction, transferred the pulp to a laboratory flotation cell, and conditioned for 20 minutes with 0.10 lb. per ton Reagent 610, 0.10 lb. per ton Reagent 238, and 2 drops Dow frother.

4. Floated off a bulk concentrate in 10 minutes. Remainder of pulp was designated the tailing.

5. Transferred the bulk concentrate to another cell and cleaned twice in a dilute pulp with the addition of 0.10 lb. per ton Reagent 610. Combined the cleaned bulk concentrate and the magnetic fraction (2 above).

6. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis %			Percent Distribution	
		Ni	Cu	SiO_2	Ni	Cu
Bulk concentrate	27.14	1.95	2.00	14.70	65.40	90.69
Cleaner tailing	3.87	0.64	0.37	-	3.05	2.39
Tailing	68.99	0.37	0.06	-	31.55	6.92
Heads (calc.)	100.00	0.81	0.60		100.00	100.00

Results

Product	Percent Weight	Analysis % Ni	Analysis % Cu	Percent Distribution Ni	Percent Distribution Cu
Bulk concentrate	24.92	2.35	1.90	75.39	92.46
Cleaner tailing	8.55	0.66	0.14	7.75	2.02
Magnetic concentrate	1.25	0.41	0.01	0.71	0.13
Tailing	65.28	0.18	0.05	16.15	5.39
Heads (calc.)	100.00	0.73	0.59	100.00	100.00

Screen Analysis and Chemical Analysis of Bulk Concentrate

Mesh size		Percent Weight	Ni	Cu	Ni	Cu
	+150	Nil	-	-	-	-
-150	+200	9.33	1.50	0.92	6.06	3.46
-200	+325	25.34	1.60	1.50	17.55	15.25
-325		65.33	2.70	3.10	76.39	81.29
		100.00	2.31	2.49	100.00	100.00

Lab. Test 237-12 June 12, 1956.

Object - To produce a bulk concentrate (nickel-copper) by flotation and magnetic concentration from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,500 c.c. water, 5 lbs. per ton Soda Ash, 0.20 lb. per ton Reagent 610 and 0.10 lb. per ton Reagent 238.

2. Transferred the ground pulp to an aerating cone and aerated for 8 hours.

3. Transferred the aerated pulp to a laboratory flotation cell at 35% solids.

4. Floated off a bulk concentrate in 5 minutes with the addition of 0.10 lb. per ton Reagent 238 and 2 drops Dow frother.

5. Added to remainder of pulp 5.0 lbs. per ton Sulphuric Acid and 0.20 lb. per ton Xanthate (Z-11) and floated off a second bulk concentrate in an acid pulp. Combined it with the first bulk concentrate (4 above).

6. Transferred remainder of pulp to a Crockett magnetic separator to give a magnetic concentrate (pyrrhotite) and a non-magnetic fraction which was designated the tailing.

7. Cleaned the combined bulk concentrate once in a dilute pulp.

8. Dried, weighed, and analyzed the products.

Lab. Test 237-13 June 15, 1956.

Object - To produce a bulk concentrate (nickel-copper) and a magnetic concentrate from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,500 c.c. water, 0.10 lb. per ton Reagent 238, 0.20 lb. per ton Reagent 610, and 5.0 lbs. per ton Soda Ash.

2. Transferred the ground pulp to an aerating cone and aerated for 40 minutes.

3. Transferred the aerated pulp to a laboratory flotation cell at 35% solids.

4. Floated off a bulk concentrate in 5 minutes with the addition of 4 drops Frother 80.

5. Added to remainder of pulp 5.0 lbs. per ton Sulphuric Acid and 0.10 lb. per ton Reagent 238 and floated off a second bulk concentrate (chiefly pyrrhotite) which was combined with the first bulk concentrate (4 above).

6. Transferred remainder of pulp to a Crockett magnetic separator to give a magnetic fraction and a non-magnetic fraction which was designated the tailing.

7. Transferred the combined bulk concentrate to another cell and cleaned 3 times in a dilute pulp with the addition of 0.05 lb. per ton Reagent 610.

8. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Percent Distribution Ni	Cu
Bulk concentrate	25.50	2.30	2.40	70.00	95.35
Cleaner tailing	12.38	1.20	0.19	17.69	3.66
Magnetic concentrate	2.50	0.63	0.01	1.89	0.06
Tailing	59.62	0.15	0.01	10.42	0.93
Heads (calc.)	100.00	0.84	0.64	100.00	100.00

Screen Test and Analyses of Bulk Concentrate

Mesh size		Percent Weight	Analysis % Ni	Cu	Percent Distribution Ni	Cu
	+200	15.34	1.50	0.92	10.78	6.39
-200	+325	34.66	1.60	1.50	25.98	23.51
-325		50.00	2.70	3.10	63.24	70.10
		100.00	2.13	2.21	100.00	100.00

Screen Test and Analyses of Tailing

Mesh size		Percent Weight	Analysis % Ni	Cu	Percent Distribution Ni	Cu
	+200	13.34	0.084	0.01	7.30	5.85
-200	+325	22.66	0.094	0.01	13.80	9.91
-325		64.00	0.190	0.03	78.90	84.24
		100.00	0.154	0.02	100.00	100.00

Lab. Test 237-14 June 18, 1956.

Object - To produce a bulk concentrate (nickel-copper) by flotation from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 70 minutes with the addition of 1,400 c.c. water, 0.10 lb. per ton Xanthate (Z-3), and 5 lbs. per ton Soda Ash.

2. Transferred the ground pulp to an aerator and aerated for 40 minutes.

3. Transferred the aerated pulp to a laboratory flotation cell at 35% solids.

4. Floated off a bulk concentrate in 5 minutes with the addition of 0.30 lb. per ton Reagent 610 and 3 drops Dow frother.

5. Added to remainder of pulp 5.0 lbs. per ton Sulphuric Acid and 0.10 lb. per ton Xanthate (Z-3), and floated off a second bulk concentrate in 5 minutes, which was added to the first bulk concentrate (4 above). Remainder of pulp was designated the tailing.

6. Reground the combined bulk concentrate for 20 minutes.

7. Transferred the reground bulk concentrate to another cell in a dilute pulp and cleaned 3 times without the addition of further reagents.

8. Dried, weighed, and analyzed the products.

Results

Product	Percent Weight	Analysis % Ni	Cu	Insol.	Percent Distribution Ni	Cu
Bulk concentrate	20.62	2.10	2.80	10.4	48.24	90.00
Cleaner tailing	13.02	2.60	0.34	-	37.72	6.90
Tailing	66.36	0.19	0.03	-	14.04	3.10
Heads (calc.)	100.00	0.89	0.64		100.00	100.00

Lab. Test 237-15 June 18, 1956.

Object - To produce a bulk concentrate (nickel-copper) by flotation and magnetic separation from Admiralty-Alaska ore.

Procedure

1. Ground 2,000 grams of minus 10 mesh Admiralty-Alaska ore in a laboratory ball mill for 60 minutes with the addition of 1,300 c.c. water, 5.0 lbs. per ton Soda Ash, and 5 lbs. per ton Sodium Silicate.

2. Transferred the ground pulp to a laboratory flotation cell at 35% solids.

3. Floated off a bulk concentrate in 5 minutes with the addition of 0.10 lb. per ton Xanthate (Z-3) and 5 drops Dow 250 frother.

4. Transferred remainder of pulp to a Crockett magnetic separator to give a magnetic fraction and a non-magnetic fraction, which was designated the tailing.

5. Combined the magnetic fraction with the bulk concentrate (3 above) and reground at a heavy density with the addition of 5.0 lbs. per ton Sodium Silicate.

6. Cleaned the reground combined concentrates 4 times in a dilute pulp without the addition of further reagents.

7. Dried, weighed, and analyzed the products.