MR-043-05

1948

PRELIMINARY CONCENTRATION REPORT for ALASKA GRAPHITE SYNDICATE

by

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May 22, 1948

Mr. Ralph Lomen
Lomen Commercial Company
Seattle, Washington

KA 43.3'

Dear Mr. Lomen,

Several samples of float graphitic rock were submitted to writer for purpose of classification and tentative beneficiation studies. These samples were reputedly collected at the properties under control of Ralph Lomen and Associates located near Graphite Bay on the north side of the Kigluaik Mtns., Seward Peninsula, Alaska.

According to USGS Report by R. R. Coats, "The graphite deposits on the north side of Kigluaik Mtns., are in a sequence of quartzite schists, gneisses and marble which form the abrupt north front of rugged Kigluaik Mtns." Some igneous intrusions of sills and dikes of granodiorite aplite, olivine basalt and other members were noted. The graphite occurs as high grade lenses in parent metamorphic schists and most of past production has come from these lenses either by direct mining or collection of surface float.

Owing to the nature and regional occurrence of these deposits the possible tonnage of graphitic material should be very large. Coats & Heide estimated 2 - 3 million tons at a grade of 10% graphite.

From the commercial standpoint the approach should not be from a mere basis of tonnage and % graphite grade. Graphite is not all alike in structure as it varies in crystalline nature from very finely crystalline (less than 200 mesh) or amorphous to coarsely crystalline flake up to -20 mesh sizes.

The preferred grades of flake are coarse and command the premium prices if clean from inclusion and gritty impurities.

Price	Class	Size	Grade
9-16c / lb.	No. 1 Flake	-20 - 60 mesh	-88% graphite
7c. up	No. 2 Flake	-20 - 60 "	-82% "
3c.	Inferior	-20 - 60 "	-80% "

Amorphous lump may be useful if +90% graphite grade and free from frit. 10c. 1 lb.
Crude amorphous is valued at from $16. - $32 / ton.

Laboratory Investigation

Several batches of Alaskan ore were prepared by roll crushing and screening. The material was sized and beneficiated by gravity and flotation methods with further cleaning of included biotite middlings by high intensity magnetic separation methods.

The object of tests was to separate flake-like aggregates and check their purity by specific gravity and analytical methods. No attempt was made to specially prepare laboratory products not capable of reproduction in normal plant.

The correlation of specific gravity to assay percent graphite is given in following graph. This method of testing graphite samples for purity should be a considerable help in the field and in preliminary laboratory examination of field samples.

Heavy Liquid Separation

A representative sample of minus 1 inch graphite was sized on 1/2 inch, 1/4 inch and 1/8 inch screens and separated in a liquid of 2.37 specific gravity. The float product, that material which would not sink in medium of 2.37 specific gravity, was the higher grade graphitic material. The material which sank was the lower grade material.

Product	Wt. %	% Graphitic C	% Ash
+ 1/2 inch Float	20.9	64.5	34.1
" Sink	23.2	31.2	66.2
+ 1/4 " Float	14.3	58.7	39.3
" Sink	10.7	23.2	74.1
+ 1/8 " Float	4.3	77.2	21.3
" Sink	12.2	26.9	69.6
- 1/8 inch	14.4	(45.0)	(52.0)
Total Head	100.0	42.6	52.8
Comb. Float	39.5	63.8	34.4

The significance of these tests are as follows:

1. There was no appreciable proportion of high grade (plus 80 percent) in the coarse sizes of this sample.

2. There was little true liberation of graphite at coarse sizes and beneficiation by simple crushing and screening processes is not possible.

3. It is possible to sort ore by heavy media concentration (sink and float) methods for rejection of low grade material, thus raising the grade of shipping product sent to final cleaning plant in the states.

Flotation of minus 1/8" material

A representative sample of minus 1/8" material was treated by flotation without further grinding. The concentrates were recleaned, dried and sized.

Product		Wt. %	Assay %C	Assay % Ash	Distribution % C	Distribution % Ash
Conc.	+ 35 mesh	1.48	75.7	22.7	2.5	0.6
	+ 65	5.35	75.1	23.1	8.8	2.4
	- 65	24.75	(82.0)	(16.7)	44.5	7.9
Mid.	+ 35 mesh	3.31	(59.2)	(37.8))		
	+ 65	4.95	67.0	31.3)	19.1	9.5
	- 65	5.70	60.0	38.1)		
Tailing	+ 35 mesh	24.00	31.2	66.2)		
	+ 65	7.12	22.4	76.2)	23.6	57.4
	- 65	10.95	15.2	80.1)		
Slime		12.39	5.4	92.6	1.5	22.2
Total Head		100.00	45.6	52.4	100.0	100.0

The significance of this test was as follows:

1. The graphite recovered was principally fine dust and the pseudo-flake products were aggregates of interlocked rock material and microcrystalline graphite.

2. The middling products were nodular aggregates of microcrystalline graphite and rock material.

3. The tailing reject products were lowgrade locked graphite-rock material aggregates.

4. No attempts were made to retreat coarse concentrates by pebble mills and reflotation because the quantity in those sizes was of too small a percentage.

Test Results for New Sample

Larger samples of Alaskan graphite were submitted by Mr. Lomen and the material was reclassified in the plus 4 inch sizes as received. There appeared to be at least three distinct classifications.

(a) Low grade biotite schist carrying graphite
(b) Intermediate grade amorphous graphite aggregates
(c) High grade graphitic ore with more distinct crystallization but badly folded and twisted.

The low grade biotite schist and the high grade ore were treated separately by flotation and stage rod milling, the concentrates were dried, screened and separated magnetically.

Low Grade Schist Test

The low grade graphitic biotite schist had more nearly parallel bedding and was tested to determine quality of flake.

Product		Wt. %	Assay		Dist.
			% C	% Ash	% C
conc.	+ 35 mesh non mag.	0.44	80	-	5.8
	+ 35 " mag.	0.45	55	-	4.2
	+ 65 " non mag.	1.50	85	-	21.2
	+ 65 " mag	1.56	45	-	11.7
	- 65 " non mag.	1.50	85	-	21.4
	- 65 " mag.	.58	45	-	4.3
Tailing	- 35 "	93.97	2	-	31.4
Total head		100.00	6		100.0

The above test brought out some new features concerning the graphitic ores from this area.

1. Physically, the graphite from the low grade biotite schist was more satisfactory flake than that from higher grade ore. It had greater transverse strength and was more resistant to grinding forces which cleaved rather than broke across the lamellae.

2. The flake was interbedded with biotite mica which could be segregated both as to free mica and mica-graphite middling products, by high intensity magnetic separation.

3. Less fine crystalline or amorphous graphite was produced from this ore than in processing higher grade material.

High Grade Graphitic Ore

A representative sample of high grade graphite ore was roll crushed to minus 1/4 inch and screened on 10 mesh. The plus 10 mesh was treated by table agglomeration and flotation. The minus 10 mesh was treated by flotation using fuel oil and cresylic acid respectively for frother and collector. The concentrate was recleaned three times; the tailings were stage ground and refloated; the +35 mesh middlings were treated by table agglomeration and magnetic separation. The final graphite concentrate was dried, sized on 35, 65 and 100 mesh and the plus sizes recleaned by magnetic separation.

Product	Wt. %	Assay % C	Assay % Ash	Distribution % C	Distribution % Ash
+ 35 mesh conc.	6.81	83.3	15.9	11.1	2.3
+ 65 " "	9.12	80.4	18.6	14.3	3.7
+ 100 " "	6.24	83.1	15.8	10.2	2.2
- 100 " "	24.38	88.8	10.1	42.4	5.3
Mag. conc. mid.	5.68	60.0	35.0	6.7	4.3
Agglom. conc.	4.50	70.0	25.0	6.2	2.5
Agglom. Tail.	19.17	21.0	75.0	7.9	31.1
Flot. Tail.	17.10	1.5	95.0	0.5	35.0
Slime	7.00	5.0	90.1	0.7	13.6
Total Heads	100.00	51.0	46.3	100.0	100.0
Comb. Flake	22.17	81.8	17.1	35.5	8.2
Comb. Conc.	46.55	85.5	13.4	77.9	13.5

The above test shows that a fair recovery of flake-like graphite can be obtained without regrinding of concentrate. The flake obtained from this material could probably be further liberated and recleaned but a considerable decrease in quantity would result.

Table agglomeration shows promise for recovering coarse sizes for retreatment and could well be included in a treatment flow sheet.

One major feature still remains, namely, that much of so-called flake is really amorphous aggregate with weak structure.

The ash content of graphite appears to be mainly silica although some biotite and garnet were present.

Conclusions and Recommendations

1. The graphitic ore from Kigluaik Mtns., Seward Peninsula, Alaska is extremely rich in graphite.

2. The graphite in samples submitted appears to be largely amorphous (microcrystalline) aggregates although some psuedo-flake was recovered.

3. The psuedo-flake graphite is much weaker structurally than better grades of flake and breaks down when retreatment methods are employed.

4. The flake products produced should be submitted to qualified purchasers for their testing and appraisal. Likewise the 88% minus 100 mesh dust should be submitted.

5. From the geology and reports of examination submitted over the years by various engineers, it would appear that the samples submitted may not be truly representative of the best sections of Kigluaik deposits.

6. It would be justifiable to recommend a more complete mapping

Conclusions and Recommendations (Cont'd.)

and prospecting campaign by competent geological or mining engineers for the purpose of determining what the potentialities are for high grade crystalline flake or low ash lump graphite.

7. The areas associated with graphitic marble are suggested for examination in this connection. Likewise the lower grade schist areas should not be neglected as they may make up in quality for what they lack in quantity.

Respectfully submitted,

/s/ H. GORDON POOLE

H. Gordon Poole

Graphite Near Nome

Volatile Matter	1.56%
Fixec Carbon	71.43%
Ash	27.01%
Sulphur	trace
SiO_2	21.58%
Al_2O_3	2.67%

The last two percentages were the contained amount within the Ash content itself.