ALS Metallurgy Kamloops
2957 Bowers Place
Kamloops, BC V1S 1W5

T +250 828 6157 F +250 828 6159

February 12, 2019

Ms. Daana Pascoe
Project Geologist
Nicola Mining Inc.

Dear Ms. Pascoe;

Re: Metallurgical Testing for Nicola Mining – KM5841

A program of magnetic separation and flotation testing has been conducted on samples provided by Nicola Mining. A total of 39 samples were provided for magnetic separation testing using a Davis Tube. Following magnetic separation, two composites were prepared from the samples for flotation testing. Details of the 39 samples along with details of composite construction can be located in Appendix I – Sample Origin.

The iron content of the 39 samples, based on recalculated Davis Tube test feed grades, ranged from 2 to 20 percent, and averaged about 7.5 percent. Davis Tube tests were completed at 4000 Gauss on pulverized cuts of the samples. Between 0 and 82 percent of the iron was recovered to the magnetic concentrates from the feed during these tests. The average recovery of iron to the magnetic concentrates measured 24 percent. Iron that was recovered to the magnetic concentrates represented between 0 and 16 percent of the feed mass to the Davis Tube, averaging 2.4 percent. Complete Davis Tube test results can be located in Appendix II – Metallurgical Test Data.

The two composites that were constructed for flotation testing represented low and high copper grade material. The composites were assayed in duplicate for copper, iron, and sulphur; Table 1 displays the duplicate head assays for the two composites.

TABLE 1
FLOTATION COMPOSITE HEAD ASSAYS

Composite	Assay - percent		
	Cu	Fe	S
HG Composite Head 1	3.21	11.1	3.80
HG Composite Head 2	3.06	10.8	3.52
HG Composite Average Head	3.14	11.0	3.66
LG Composite Head 1	0.26	4.9	0.32
LG Composite Head 2	0.27	5.1	0.32
LG Composite Average Head	0.27	5.0	0.32

The High Grade Composite (HG) measured about 3.1 percent copper and 3.7 percent sulphur; the Low Grade Composite (LG) assayed about 0.3 percent copper and sulphur.

A limited program of flotation testing was completed on the two composites. The testing included rougher and cleaner tests. The testing was completed at a nominal primary grind sizing of 100µm K_{80} using potassium amyl xanthate (PAX) as the sulphide mineral collector and methyl isobutyl carbonyl (MIBC) as the frother. Rougher flotation was completed at a natural pH. Cleaner flotation was completed at natural pH for the HG Composite. An elevated pH of 10 using lime in the rougher and cleaner circuit was tested for the LG Composite as was incorporation of a regrind on the rougher concentrate. Figure 1 displays a summary of the flotation results.

In rougher testing, about 96 percent of the copper and 95 percent of the sulphur was recovered from the HG Composite to the rougher concentrate. After 3 stages of dilution cleaning at natural pH a copper concentrate grading 28 percent copper was produce, recovering 88 percent of the feed copper.

About 81 percent of the copper and 88 percent of the sulphur was recovered from the LG Composite to the rougher concentrate. Only limited upgrading was measured through dilution cleaning for the LG Composite at natural pH; a copper concentrate grading 14 percent copper was produced containing 70 percent of the feed copper. Regrinding the rougher concentrate to 21µm K_{80} allowed for production of a copper concentrate grading 26 percent copper containing 70 percent of the feed copper. Using an elevated pH in the rougher and cleaner circuit did not significantly improve flotation performance.

Davis tube separations were also completed on the rougher tailings from each flotation test. About 70 to 71 percent of the remaining iron in the rougher tailings produced from the flotation of the HG Composite was recovered to the magnetic concentrate. Between 26 and 31 percent of the iron in the rougher tailings produced from the flotation of the LG Composite was recovered to the magnetic concentrate.

The metallurgical testing conducted in this program was preliminary and limited. The results, however, indicate that the copper contained in the samples may be economically recovered by froth flotation. Results also indicate that possibly 25 percent of the iron in the feed could be recovered by magnetic means. Considerably more detailed testing and knowledge of the deposit would be required to confirm the economic value of the recoverable magnetite relative to the recoverable copper in the deposit. Using assumptions based on the metal recoveries indicated in this testing, along with feed grades of 0.3 percent copper and 6 percent iron and a magnetite concentrate pricing of 60 dollars per tonne, recovering a magnetite concentrate might add 10 percent of the recoverable copper value. Consultation with a magnetite concentrate marketing expert would be required to confirm.

Once the metal content and variability of the deposit is better defined, the flowsheet and reagent scheme for processing this material can be better developed through optimization and variability testing to improve recovery and/or concentrate grades. There is opportunity to better define the optimal primary grind sizing, the necessity and sizing target of a regrind, and the

reagent scheme through additional metallurgical testing and mineralogical analyses.

Thank you for choosing ALS Metallurgy Kamloops for your testing requirements. Please contact us if you have any questions regarding this program.

Written by:

David Roulston, EIT
Project Metallurgist

Reviewed by:

Peter Mehrfert, P. Eng.
Operations Manager
ALS Metallurgy Kamloops

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
P. J. MEHRFERT
24527

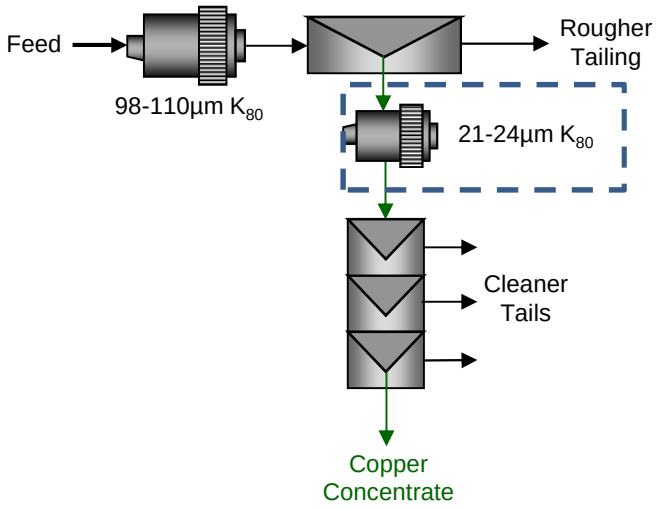
PM
Feb 12, 2019

February 12, 2019
KM5841

Electronic Distribution:
Daana Pascoe, Nicola Mining Inc.

FIGURE 1
FLOTATION TEST RESULT SUMMARY

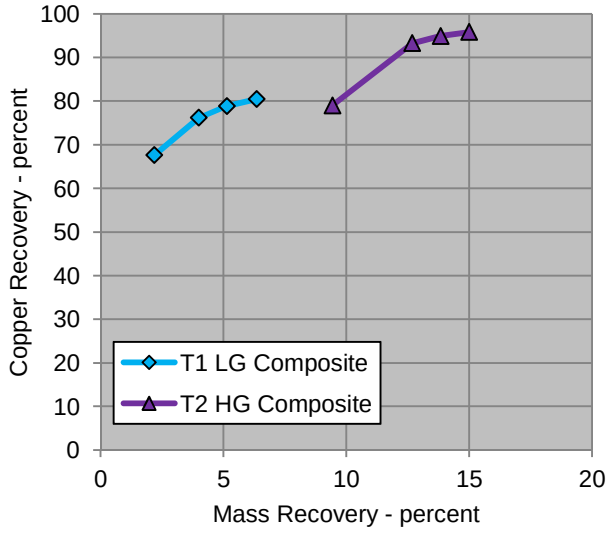
Cleaner Test Flowsheet Schematic



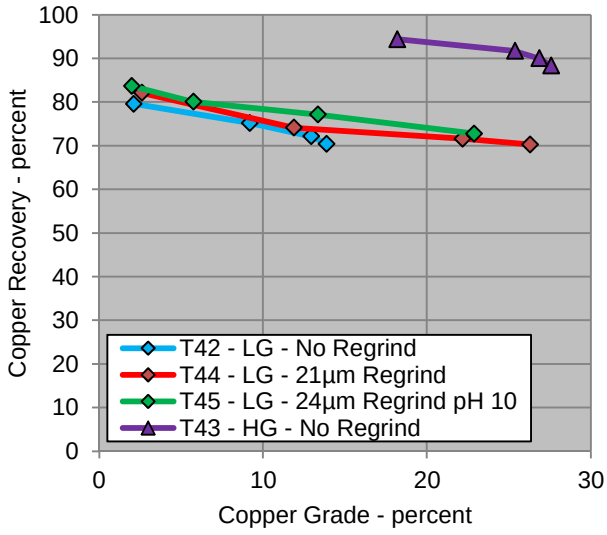
Condition and Reagent Summary

Stage	pH	redox mV	Reagents - g/tonne	
			PAX	Lime
Primary Grind	8.1-9.2	96-190	-	0-150
Rougher	8.1-10.0	41-194	8	0-100
Regrind	8.8-10.0	101-108	-	0-100
Cleaner	8.3-10.0	90-183	0-3	-

Rougher Test Copper Results



Cleaner Test Copper Results



Note: Complete test conditions and results can be located in Appendix II – Metallurgical Test Data.

APPENDIX I – KM5841

SAMPLE ORIGIN

1.0 Sample Origin

Samples for use in this testing program were received at ALS Metallurgy Kamloops on December 13, 2018. The shipment consisted of 39 samples weighing a total of 106 kilograms. Table I-1 displays the sample receiving information for this shipment.

Following completion of Davis tube testing. Samples were combined into two composites as per client instruction for metallurgical testing. The composites were prepared as to create a high grade composite (HG Composite) and a low grade composite (LG Composite). Table I-2A and I-2B display the details of the construction of these two composites.

TABLE I-1
SAMPLES RECEIVED DECEMBER 13, 2018

Sample ID	Weight Received kg	Sample Form
1448359	5.3	<06 mesh bulk
5090143	1.0	<06 mesh bulk
5090144	0.7	<06 mesh bulk
5090174	1.1	<06 mesh bulk
5090187	0.7	<06 mesh bulk
5090198	0.7	<06 mesh bulk
5090201	0.8	<06 mesh bulk
5090238	1.3	<06 mesh bulk
5090239	0.9	<06 mesh bulk
5090243	0.9	<06 mesh bulk
5090258	1.0	<06 mesh bulk
5090761	6.6	<06 mesh bulk
5090764	6.0	<06 mesh bulk
5090765	3.1	<06 mesh bulk
5090831	6.1	<06 mesh bulk
5090832	5.9	<06 mesh bulk
5090903	6.6	<06 mesh bulk
5090904	4.9	<06 mesh bulk
5090905	5.7	<06 mesh bulk
5091059	5.0	<06 mesh bulk
5091103	3.0	<06 mesh bulk
5091104	2.4	<06 mesh bulk
5092857	6.9	<06 mesh bulk
5093108	7.6	<06 mesh bulk
5093109	8.3	<06 mesh bulk
5093409	1.8	<06 mesh bulk
5093412	1.9	<06 mesh bulk
5093413	2.3	<06 mesh bulk
5093825	5.5	<06 mesh bulk
5090182	0.3	test
5090183	0.3	test
5090194	0.3	test
5090195	0.3	test
5090196	0.3	test
5092080	0.3	test
5092336	0.2	test
5092337	0.1	test
5092338	0.2	test
5092340	0.1	test

TABLE I-2A
HIGH GRADE (HG) COMPOSITE CONSTRUCTION

Sample ID	Weight Used kg	Sample Interval Information		
		Hold ID	From (m)	To (m)
1448359	2.2	CW-DDH-THU-002	415	417
5090182	0.1	CC-RC-18-12	4	6
5090183	0.1	CC-RC-18-12	6	8
5090194	0.1	CC-RC-18-12	26	28
5090195	0.1	CC-RC-18-12	28	30
5090196	0.1	CC-RC-18-12	30	32
5090764	2.5	CC-18-03	163	164.5
5090765	1.3	CC-18-03	164.5	166
5091059	2.1	CC-18-04	147	148.5
5092080	0.1	P-44	4	5
5092336	0.1	P-72	0	1
5092338	0.1	P-72	2	3
5092340	0.1	P-72	3	4
5092857	2.9	CW-NC-2017-04	542	544
5093108	3.2	CC-18-02	270.5	272
5093109	3.5	CC-18-02	272	273.5
5093409	0.8	CW-NC-2018-03	297.6	298.6
5093412	0.8	CW-NC-2018-03	298.6	300
5093413	0.9	CW-NC-2018-03	300	300.95

TABLE I-2B
LOW GRADE (LG) COMPOSITE CONSTRUCTION

Sample ID	Weight Used kg	Sample Interval Information		
		Hold ID	From (m)	To (m)
5090143	0.4	CC-RC-18-08	4	6
5090144	0.2	CC-RC-18-08	6	8
5090174	0.4	CC-RC-18-10	14	16
5090187	0.3	CC-RC-18-12	14	16
5090198	0.3	CC-RC-18-12	34	36
5090201	0.3	CC-RC-18-12	36	38
5090238	0.5	CC-RC-18-13	18	20
5090239	0.3	CC-RC-18-13	20	22
5090243	0.3	CC-RC-18-15	0	2
5090258	0.4	CC-RC-18-20	10	12
5090761	2.5	CC-18-03	158.5	160
5090831	2.3	CC-18-03	250	251.5
5090832	2.2	CC-18-03	251.5	253
5090903	2.5	CC-18-03	344.5	346
5090904	1.9	CC-18-03	346	347.5
5090905	2.1	CC-18-03	347.5	349
5091103	1.1	CC-18-04	206	208
5091104	0.9	CC-18-04	208	210
5093825	2.1	CC-18-02	164.5	166

APPENDIX II – KM5841

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DATE: January 10, 2019

PROJECT NO: KM5841-01

PURPOSE: Preliminary Rougher Test.

PROCEDURE: Perform a one product rougher test.

FEED: 2 kg of LG Composite ore ground to a nominal 110μm K_{80}.

Stage	Reagents Added g/tonne			Time (minutes)			pH	Redox
	PAX		MIBC	Grind	Cond.	Float		
Primary Grind				25			8.7	190
COPPER CIRCUIT:								
Rougher 1	3		22		1	2	8.7	178
Rougher 2	2		11		1	2	8.7	186
Rougher 3	2		-		1	2	8.7	181
Rougher 4	1		11		1	2	8.7	177

Flotation Data	Rougher	
Flotation Machine	Denver	
Cell Size in liters	4.4	
Aspiration	Air	
Water Type	Fresh	
Impeller Speed in rpm	1100	

Grinding Data	Primary Grind
Mill:	M3-Mild
Charge/Material:	20kg-Mild
Water:	1000ml

KM5841-01 LG Composite
Overall Metallurgical Balance

Product	Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Copper Ro Con 1	2.2	43.8	8.40	12.3	10.4	67.6	5.1	72.2
Copper Ro Con 2	1.8	35.8	1.30	6.2	2.05	8.6	2.1	11.6
Copper Ro Con 3	1.1	22.9	0.64	6.1	0.79	2.7	1.3	2.9
Copper Ro Con 4	1.2	24.2	0.36	6.2	0.40	1.6	1.4	1.5
Copper Ro Tail	93.6	1865.3	0.06	5.1	0.04	19.5	90.1	11.8
Feed	100.0	1992.0	0.27	5.3	0.32	100	100	100

KM5841-01 LG Composite
Cumulative Metallurgical Balance

Cumulative Product	Cum. Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Product 1	2.2	43.8	8.40	12.3	10.4	67.6	5.1	72.2
Product 1 to 2	4.0	79.6	5.21	9.6	6.64	76.2	7.2	83.8
Product 1 to 3	5.1	102.5	4.19	8.8	5.34	78.9	8.5	86.6
Product 1 to 4	6.4	126.7	3.46	8.3	4.39	80.5	9.9	88.2
Product 5	93.6	1865.3	0.06	5.1	0.04	19.5	90.1	11.8
Feed	100.0	1992.0	0.27	5.3	0.32	100	100	100

DATE: January 10, 2019

PROJECT NO: KM5841-02

PURPOSE: Preliminary Rougher Test.

PROCEDURE: Perform a one product rougher test.

FEED: 2 kg of HG Composite ore ground to a nominal 98μm K_{80}.

Stage	Reagents Added g/tonne			Time (minutes)			pH	Redox
	PAX		MIBC	Grind	Cond.	Float		
Primary Grind				15			8.1	154
COPPER CIRCUIT:								
Rougher 1	4		22		1	2	8.1	136
Rougher 2	2		22		1	2	8.1	194
Rougher 3	1		11		1	2	8.2	184
Rougher 4	1		-		1	2	8.3	185

Flotation Data	Rougher	
Flotation Machine	Denver	
Cell Size in liters	4.4	
Aspiration	Air	
Water Type	Fresh	
Impeller Speed in rpm	1100	

Grinding Data	Primary Grind
Mill:	M3-Mild
Charge/Material:	20kg-Mild
Water:	1000ml

KM5841-02 HG Composite
Overall Metallurgical Balance

Product	Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Copper Ro Con 1	9.4	188.5	27.2	26.7	28.7	79.0	22.0	73.7
Copper Ro Con 2	3.2	64.8	14.3	19.8	20.5	14.3	5.6	18.1
Copper Ro Con 3	1.2	23.0	4.61	11.1	6.93	1.6	1.1	2.2
Copper Ro Con 4	1.2	23.2	2.60	9.4	3.92	0.9	1.0	1.2
Copper Ro Tail	85.0	1697.0	0.16	9.5	0.21	4.2	70.4	4.9
Feed	100.0	1996.5	3.25	11.5	3.68	100	100	100

KM5841-02 HG Composite
Cumulative Metallurgical Balance

Cumulative Product	Cum. Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Product 1	9.4	188.5	27.2	26.7	28.7	79.0	22.0	73.7
Product 1 to 2	12.7	253.3	23.9	24.9	26.6	93.3	27.6	91.7
Product 1 to 3	13.8	276.3	22.3	23.8	25.0	94.9	28.7	93.9
Product 1 to 4	15.0	299.5	20.8	22.7	23.3	95.8	29.6	95.1
Product 5	85.0	1697.0	0.16	9.5	0.21	4.2	70.4	4.9
Feed	100.0	1996.5	3.25	11.5	3.68	100	100	100

DATE: January 11, 2019

PROJECT NO: KM5841-03

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090143

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.35	2	
Comments:			

KM5841-03 5090143

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	2.4	1.4	16.0	10.6
Magnetic Tail	97.6	57.2	3.3	89.4
Feed	100.0	58.6	3.6	100

DATE: January 11, 2019

PROJECT NO: KM5841-04

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090144

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-04 5090144

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	2.2	1.3	14.2	8.2
Magnetic Tail	97.8	58.4	3.5	91.8
Feed	100.0	59.7	3.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-05

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090174

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2		
Comments:			

KM5841-05 5090174

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.3	0.1	No Mag.	N/A
Magnetic Tail	99.7	29.0	3.2	100.0
Feed	100.0	29.1	3.2	100

DATE: January 11, 2019

PROJECT NO: KM5841-06

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090182

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	5		
Comments:			

KM5841-06 5090182

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	8.9	2.6	60.8	39.7
Magnetic Tail	91.1	26.7	9.0	60.3
Feed	100.0	29.3	13.6	100

DATE: January 11, 2019

PROJECT NO: KM5841-07

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090183

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3.5		
Comments:			

KM5841-07 5090183

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	11.0	3.2	63.8	40.8
Magnetic Tail	89.0	26.0	11.4	59.2
Feed	100.0	29.2	17.1	100

DATE: January 11, 2019

PROJECT NO: KM5841-08

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090187

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	1.5		
Comments:			

KM5841-08 5090187

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	No Mag.	N/A
Magnetic Tail	99.3	29.1	4.4	100.0
Feed	100.0	29.3	4.4	100

DATE: January 11, 2019

PROJECT NO: KM5841-09

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090194

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	7.8	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-09 5090194

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	5.0	2.9	57.4	40.0
Magnetic Tail	95.0	55.4	4.5	60.0
Feed	100.0	58.3	7.1	100

DATE: January 11, 2019

PROJECT NO: KM5841-10

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090195

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-10 5090195

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	3.4	2.0	57.8	33.1
Magnetic Tail	96.6	57.0	4.1	66.9
Feed	100.0	59.0	5.9	100

DATE: January 11, 2019

PROJECT NO: KM5841-11

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090196

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2	2	
Comments:			

KM5841-11 5090196

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	4.1	2.4	56.6	35.8
Magnetic Tail	95.9	56.6	4.3	64.2
Feed	100.0	59.0	6.4	100

DATE: January 11, 2019

PROJECT NO: KM5841-12

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090198

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-12 5090198

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	1.9	1.1	50.2	18.3
Magnetic Tail	98.1	57.3	4.3	81.7
Feed	100.0	58.4	5.2	100

DATE: January 11, 2019

PROJECT NO: KM5841-13

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090201

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	1.5	1.5	
Comments:			

KM5841-13 5090201

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	1.2	0.7	36.9	11.0
Magnetic Tail	98.8	58.0	3.6	89.0
Feed	100.0	58.7	4.0	100

DATE: January 11, 2019

PROJECT NO: KM5841-14

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090238

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2	2	
Comments:			

KM5841-14 5090238

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	2.0	1.2	60.0	22.6
Magnetic Tail	98.0	57.4	4.3	77.4
Feed	100.0	58.6	5.4	100

DATE: January 11, 2019

PROJECT NO: KM5841-15

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090239

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2.5		
Comments:			

KM5841-15 5090239

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	9.2	2.8	63.6	54.0
Magnetic Tail	90.8	27.6	5.5	46.0
Feed	100.0	30.4	10.9	100

DATE: January 11, 2019

PROJECT NO: KM5841-16

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090243

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	1.5	1.5	
Comments:			

KM5841-16 5090243

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	1.9	1.1	35.2	12.9
Magnetic Tail	98.1	56.9	4.6	87.1
Feed	100.0	58.0	5.2	100

DATE: January 11, 2019

PROJECT NO: KM5841-17

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090258

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2.5		
Comments:			

KM5841-17 5090258

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	36.7	5.9
Magnetic Tail	99.3	29.4	4.0	94.1
Feed	100.0	29.6	4.2	100

DATE: January 11, 2019

PROJECT NO: KM5841-18

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090761

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2	2	
Comments:			

KM5841-18 5090761

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	4.4	2.6	55.2	35.7
Magnetic Tail	95.6	56.3	4.6	64.3
Feed	100.0	58.9	6.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-19

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090764

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	7.8	7.8	
DCA	1.2	1.2	
Gauss	400	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	1.5	1.5	
Comments:			

KM5841-19 5090764

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	4.5	2.7	57.2	41.2
Magnetic Tail	95.5	56.9	3.9	58.8
Feed	100.0	59.6	6.3	100

DATE: January 11, 2019

PROJECT NO: KM5841-20

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090765

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	7.8	7.8	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2	2	
Comments:			

KM5841-20 5090765

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	2.9	1.7	60.8	31.1
Magnetic Tail	97.1	57.3	4.0	68.9
Feed	100.0	59.0	5.6	100

DATE: January 11, 2019

PROJECT NO: KM5841-21

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090831

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	7.8	7.8	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2	2	
Comments:			

KM5841-21 5090831

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	1.0	0.6	25.6	5.4
Magnetic Tail	99.0	59.0	4.6	94.6
Feed	100.0	59.6	4.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-22

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090832

Conditions	Cycle I		
Mass (g)	30		
DCV	7.8		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	1.5		
Comments:			

KM5841-22 5090832

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	32.0	6.1
Magnetic Tail	99.3	29.4	3.4	93.9
Feed	100.0	29.6	3.6	100

DATE: January 11, 2019

PROJECT NO: KM5841-23

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090903

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	7.8	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-23 5090903

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	4.9	2.9	60.6	42.9
Magnetic Tail	95.1	55.7	4.2	57.1
Feed	100.0	58.6	7.0	100

DATE: January 11, 2019

PROJECT NO: KM5841-24

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090904

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3		
Comments:			

KM5841-24 5090904

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	22.3	4.7
Magnetic Tail	99.3	29.1	3.1	95.3
Feed	100.0	29.3	3.2	100

DATE: January 11, 2019

PROJECT NO: KM5841-25

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5090905

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3		
Comments:			

KM5841-25 5090905

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	45.7	7.8
Magnetic Tail	99.3	29.1	3.7	92.2
Feed	100.0	29.3	4.0	100

DATE: January 11, 2019

PROJECT NO: KM5841-26

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5091059

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	3	3	
Comments:			

KM5841-26 5091059

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	3.9	2.3	33.1	20.4
Magnetic Tail	96.1	56.2	5.3	79.6
Feed	100.0	58.5	6.4	100

DATE: January 11, 2019

PROJECT NO: KM5841-27

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5091103

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	3	3	
Comments:			

KM5841-27 5091103

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	1.4	0.8	38.2	13.6
Magnetic Tail	98.6	57.9	3.4	86.4
Feed	100.0	58.7	3.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-28

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5091104

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-28 5091104

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.8	0.5	24.0	6.3
Magnetic Tail	99.2	58.8	3.1	93.7
Feed	100.0	59.3	3.2	100

DATE: January 11, 2019

PROJECT NO: KM5841-29

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5092080

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3		
Comments:			

KM5841-29 5092080

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	8.8	2.6	28.4	38.0
Magnetic Tail	91.2	26.8	4.5	62.0
Feed	100.0	29.4	6.6	100

DATE: January 11, 2019

PROJECT NO: KM5841-30

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5092336

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.2		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3		
Comments:			

KM5841-30 5092336

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	4.7	1.4	65.2	39.8
Magnetic Tail	95.3	28.2	4.9	60.2
Feed	100.0	29.6	7.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-31

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5092337

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	3	3	
Comments:			

KM5841-31 5092337

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	2.4	1.4	58.6	24.1
Magnetic Tail	97.6	57.3	4.5	75.9
Feed	100.0	58.7	5.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-32

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5092338

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.2	1.2	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-32 5092338

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	4.3	2.5	63.4	29.9
Magnetic Tail	95.7	56.2	6.6	70.1
Feed	100.0	58.7	9.0	100

DATE: January 11, 2019

PROJECT NO: KM5841-33

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5092340

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2.5		
Comments:			

KM5841-33 5092340

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	10.6	3.1	55.0	47.2
Magnetic Tail	89.4	26.1	7.3	52.8
Feed	100.0	29.2	12.4	100

DATE: January 11, 2019

PROJECT NO: KM5841-34

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5092857

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3.5		
Comments:			

KM5841-34 5092857

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	No Mag	N/A
Magnetic Tail	99.3	29.2	2.0	100.0
Feed	100.0	29.4	2.0	100

DATE: January 11, 2019

PROJECT NO: KM5841-35

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5093108

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	4.5		
Comments:			

KM5841-35 5093108

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	24.7	7.2	65.2	82.0
Magnetic Tail	75.3	21.9	4.7	18.0
Feed	100.0	29.1	19.7	100

DATE: January 11, 2019

PROJECT NO: KM5841-36

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5093109

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3.5		
Comments:			

KM5841-36 5093109

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	13.6	4.0	66.6	48.6
Magnetic Tail	86.4	25.4	11.1	51.4
Feed	100.0	29.4	18.7	100

DATE: January 11, 2019

PROJECT NO: KM5841-37

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5093409

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2.5		
Comments:			

KM5841-37 5093409

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.3	0.1	19.1	0.7
Magnetic Tail	99.7	29.1	9.1	99.3
Feed	100.0	29.2	9.1	100

DATE: January 11, 2019

PROJECT NO: KM5841-38

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5093412

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2.5		
Comments:			

KM5841-38 5093412

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.7	0.2	6.3	0.6
Magnetic Tail	99.3	28.8	6.8	99.4
Feed	100.0	29.0	6.8	100

DATE: January 11, 2019

PROJECT NO: KM5841-39

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5093413

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2.5		
Comments:			

KM5841-39 5093413

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	0.3	0.1	13.5	0.4
Magnetic Tail	99.7	28.8	12.7	99.6
Feed	100.0	28.9	12.7	100

DATE: January 11, 2019

PROJECT NO: KM5841-40

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 5093825

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-40 5093825

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	1.9	1.1	31.9	13.7
Magnetic Tail	98.1	58.3	3.8	86.3
Feed	100.0	59.4	4.3	100

DATE: January 11, 2019

PROJECT NO: KM5841-41

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: 1448359

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3.5		
Comments:			

KM5841-41 1448359

Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	19.2	5.6	55.4	55.6
Magnetic Tail	80.8	23.6	10.5	44.4
Feed	100.0	29.2	19.1	100

DATE: January 17, 2019

PROJECT NO: KM5841-42

PURPOSE: Preliminary Cleaner Test.

PROCEDURE: Perform a standard one product cleaner test.

FEED: 2 kg of LG Composite ore ground to a nominal 110µm K_{80}.
Copper Rougher Concentrate - 40µm K_{80}.

Stage	Reagents Added g/tonne			Time (minutes)			pH	Redox
	PAX		MIBC	Grind	Cond.	Float		
Primary Grind				25			8.7	124
COPPER CIRCUIT:								
Rougher 1	3		22		1	2	8.8	62
Rougher 2	2		11		1	2	8.7	141
Rougher 3	2		-		1	2	8.7	155
Rougher 4	1		-		1	2	8.7	154
Cleaner 1	2		-		1	3	8.6	167
Cleaner 2	-		-		1	2	8.6	170
Cleaner 3	-		11		1	2	8.6	183

Flotation Data	Rougher	Cleaner
Flotation Machine	Denver	Denver
Cell Size in liters	4.4	2.2
Aspiration	Air	
Water Type	Fresh	
Impeller Speed in rpm	1100	1200

Grinding Data	Primary Grind
Mill:	M3-Mild
Charge/Material:	20kg-Mild
Water:	1000ml

KM5841-42 LG Composite
Overall Metallurgical Balance

Product	Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Copper Con	1.3	26.0	13.9	16.1	17.7	70.4	4.3	70.9
Copper 3rd Clnr Tail	0.1	2.6	3.44	6.5	4.04	1.7	0.2	1.6
Copper 2nd Clnr Tail	0.7	13.3	1.17	6.1	1.40	3.0	0.8	2.9
Copper 1st Clnr Tail	7.5	150.3	0.15	5.5	0.22	4.4	8.6	5.1
Copper Ro Tail	90.4	1808.2	0.06	4.6	0.07	20.4	86.1	19.5
Feed	100.0	2000.4	0.26	4.8	0.32	100	100	100

KM5841-42 LG Composite
Cumulative Metallurgical Balance

Cumulative Product	Cum. Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Product 1	1.3	26.0	13.9	16.1	17.7	70.4	4.3	70.9
Product 1 to 2	1.4	28.6	12.9	15.2	16.5	72.1	4.5	72.5
Product 1 to 3	2.1	41.9	9.21	12.3	11.7	75.2	5.3	75.4
Product 1 to 4	9.6	192.2	2.13	7.0	2.72	79.6	13.9	80.5
Product 5	90.4	1808.2	0.06	4.6	0.07	20.4	86.1	19.5
Feed	100.0	2000.4	0.26	4.8	0.32	100	100	100

DATE: January 17, 2019

PROJECT NO: KM5841-43

PURPOSE: Preliminary Cleaner Test.

PROCEDURE: Perform a standard one product cleaner test.

FEED: 2 kg of HG Composite ore ground to a nominal 98µm K_{80}.
Copper Rougher Concentrate - 77µm K_{80}.

Stage	Reagents Added g/tonne			Time (minutes)			pH	Redox
	PAX		MIBC	Grind	Cond.	Float		
Primary Grind				15			8.3	130
COPPER CIRCUIT:								
Rougher 1	4		22		1	2	8.3	50
Rougher 2	2		11		1	2	8.3	41
Rougher 3	1		-		1	2	8.3	140
Rougher 4	1		11		1	2	8.3	136
Cleaner 1	-		-		1	5	8.3	144
Cleaner 2	-		-		1	4	8.4	150
Cleaner 3	-		-		1	3	8.3	145

Flotation Data	Rougher	Cleaner
Flotation Machine	Denver	Denver
Cell Size in liters	4.4	2.2
Aspiration	Air	
Water Type	Fresh	
Impeller Speed in rpm	1100	1200

Grinding Data	Primary Grind
Mill:	M3-Mild
Charge/Material:	20kg-Mild
Water:	1000ml

KM5841-43 HG Composite
Overall Metallurgical Balance

Product	Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Copper Con	10.4	208.4	**27.6**	26.1	29.4	88.4	23.9	81.0
Copper 3rd Clnr Tail	0.5	9.7	11.1	17.7	16.9	1.7	0.8	2.2
Copper 2nd Clnr Tail	0.9	17.1	6.50	12.5	9.70	1.7	0.9	2.2
Copper 1st Clnr Tail	5.1	102.5	1.70	7.8	2.38	2.7	3.5	3.2
Copper Ro Tail	83.1	1659.7	0.22	9.7	0.52	5.6	70.8	11.4
Feed	100.0	1997.4	3.26	11.4	3.79	100	100	100

KM5841-43 HG Composite
Cumulative Metallurgical Balance

Cumulative Product	Cum. Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Product 1	10.4	208.4	27.6	26.1	29.4	88.4	23.9	81.0
Product 1 to 2	10.9	218.1	26.9	25.7	28.8	90.0	24.7	83.2
Product 1 to 3	11.8	235.2	25.4	24.8	27.5	91.7	25.6	85.4
Product 1 to 4	16.9	337.7	18.2	19.6	19.8	94.4	29.2	88.6
Product 5	83.1	1659.7	0.22	9.7	0.52	5.6	70.8	11.4
Feed	100.0	1997.4	3.26	11.4	3.79	100	100	100

DATE: January 23, 2019

PROJECT NO: KM5841-44

PURPOSE: To Repeat Test 42 With Regrind.

PROCEDURE: Perform a standard one product cleaner test.

FEED: 2 kg of LG Composite ore ground to a nominal 110µm K_{80}.
Copper Regrind Discharge - 21µm K_{80}.

Stage	Reagents Added g/tonne			Time (minutes)			pH	Redox
	PAX		MIBC	Grind	Cond.	Float		
Primary Grind				25			8.8	96
COPPER CIRCUIT:								
Rougher 1	3		22		1	2	8.8	77
Rougher 2	2		11		1	2	8.7	135
Rougher 3	2		-		1	2	8.7	134
Rougher 4	1		11		1	2	8.7	104
Regrind				10			8.8	101
Cleaner 1	2		11		1	3	8.8	90
Cleaner 2	1		11		1	2	8.4	168
Cleaner 3	-		11		1	2	8.5	170

Flotation Data	Rougher	Cleaner
Flotation Machine	Denver	Denver
Cell Size in liters	4.4	2.2
Aspiration	Air	
Water Type	Fresh	
Impeller Speed in rpm	1100	1200

Grinding Data	Primary Grind	Copper Regrind
Mill:	M3-Mild	RM2-Mild
Charge/Material:	20kg-Mild	6kg-Stainless Steel
Water:	1000ml	estimated

KM5841-44 LG Composite
Overall Metallurgical Balance

Product	Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Copper Con	0.7	14.5	26.3	26.9	31.6	70.3	3.8	66.7
Copper 3rd Clnr Tail	0.1	3.0	2.35	8.4	4.02	1.3	0.2	1.8
Copper 2nd Clnr Tail	0.8	16.3	0.84	6.6	1.36	2.5	1.1	3.2
Copper 1st Clnr Tail	6.8	135.9	0.32	6.3	0.62	8.0	8.4	12.3
Copper Ro Tail	91.5	1831.2	0.05	4.8	0.06	17.9	86.4	16.0
Feed	100.0	2000.9	0.27	5.1	0.34	100	100	100

KM5841-44 LG Composite
Cumulative Metallurgical Balance

Cumulative Product	Cum. Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Product 1	0.7	14.5	26.3	26.9	31.6	70.3	3.8	66.7
Product 1 to 2	0.9	17.5	22.2	23.7	26.9	71.6	4.1	68.5
Product 1 to 3	1.7	33.8	11.9	15.5	14.6	74.1	5.1	71.7
Product 1 to 4	8.5	169.7	2.63	8.1	3.40	82.1	13.6	84.0
Product 5	91.5	1831.2	0.05	4.8	0.06	17.9	86.4	16.0
Feed	100.0	2000.9	0.27	5.1	0.34	100	100	100

DATE: January 23, 2019

PROJECT NO: KM5841-45

PURPOSE: To Repeat Test 44 at pH 10.0.

PROCEDURE: Perform a standard one product cleaner test.

FEED: 2 kg of LG Composite ore ground to a nominal 110µm K_{80}.
Copper Regrind Discharge - 24µm K_{80}.

Stage	Reagents Added g/tonne			Time (minutes)			pH	Redox
	Lime	PAX	MIBC	Grind	Cond.	Float		
Primary Grind	150			25			9.2	56
COPPER CIRCUIT:								
Rougher 1	100	3	44		1	2	10.0	75
Rougher 2	√	2	-		1	2	10.0	84
Rougher 3	√	2	-		1	2	10.0	91
Rougher 4	√	1	11		1	2	10.0	89
Regrind	100			10			10.0	108
Cleaner 1	-	2	33		1	4	10.0	102
Cleaner 2	√	1	33		1	3	10.0	90
Cleaner 3	√	-	44		1	2	10.0	102

Flotation Data	Rougher	Cleaner
Flotation Machine	Denver	Denver
Cell Size in liters	4.4	2.2
Aspiration	Air	
Water Type	Fresh	
Impeller Speed in rpm	1100	1200

Grinding Data	Primary Grind	Copper Regrind
Mill:	M3-Mild	RM2-Mild
Charge/Material:	20kg-Mild	6kg-Stainless Steel
Water:	1000ml	estimated

KM5841-45 LG Composite
Overall Metallurgical Balance

Product	Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Copper Con	0.8	16.9	22.9	22.7	26.4	72.7	3.7	67.6
Copper 3rd Clnr Tail	0.7	13.8	1.69	7.3	3.02	4.4	1.0	6.3
Copper 2nd Clnr Tail	2.2	43.0	0.36	5.6	0.66	2.9	2.4	4.3
Copper 1st Clnr Tail	7.5	149.2	0.13	5.6	0.25	3.6	8.2	5.7
Copper Ro Tail	88.8	1771.6	0.05	4.9	0.06	16.3	84.8	16.1
Feed	100.0	1994.5	0.27	5.1	0.33	100	100	100

KM5841-45 LG Composite
Cumulative Metallurgical Balance

Cumulative Product	Cum. Weight		Assay - percent or g/tonne			Distribution - percent		
	%	grams	Cu	Fe	S	Cu	Fe	S
Product 1	0.8	16.9	22.9	22.7	26.4	72.7	3.7	67.6
Product 1 to 2	1.5	30.7	13.4	15.8	15.9	77.1	4.7	73.9
Product 1 to 3	3.7	73.7	5.78	9.8	7.0	80.0	7.1	78.2
Product 1 to 4	11.2	222.9	2.00	7.0	2.48	83.7	15.2	83.9
Product 5	88.8	1771.6	0.05	4.9	0.06	16.3	84.8	16.1
Feed	100.0	1994.5	0.27	5.1	0.33	100	100	100

DATE: February 7, 2019

PROJECT NO: KM5841-46

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: Test 01 Copper Rougher Tail

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.45	2.45	
Comments:			

KM5841-46 Test 01 Copper Rougher Tail
Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	3.5	2.1	35.8	26.7
Magnetic Tail	96.5	57.4	3.6	73.3
Feed	100.0	59.5	4.7	100

DATE: February 7, 2019

PROJECT NO: KM5841-47

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: Test 02 Copper Rougher Tail

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	2		
Comments:			

KM5841-47 Test 02 Copper Rougher Tail
Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	13.2	3.9	51.8	70.2
Magnetic Tail	86.8	25.7	3.3	29.8
Feed	100.0	29.6	9.7	100

DATE: February 7, 2019

PROJECT NO: KM5841-48

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: Test 42 Copper Rougher Tail

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-48 Test 42 Copper Rougher Tail
Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	3.7	2.2	42.0	31.2
Magnetic Tail	96.3	57.3	3.6	68.8
Feed	100.0	59.5	5.0	100

DATE: February 7, 2019

PROJECT NO: KM5841-49

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: Test 43 Copper Rougher Tail

Conditions	Cycle I		
Mass (g)	30		
DCV	78		
DCA	1.3		
Gauss	4000		
Flow Rate (L/min)	0.4		
Agitation Speed (rpm)	82		
Time (min)	3		
Comments:			

KM5841-49 Test 43 Copper Rougher Tail
Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	13.1	3.9	52.2	71.1
Magnetic Tail	86.9	25.8	3.2	28.9
Feed	100.0	29.7	9.6	100

DATE: February 7, 2019

PROJECT NO: KM5841-50

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: Test 44 Copper Rougher Tail

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.5	2.5	
Comments:			

KM5841-50 Test 44 Copper Rougher Tail
Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	3.7	2.2	33.6	26.2
Magnetic Tail	96.3	57.6	3.6	73.8
Feed	100.0	59.8	4.7	100

DATE: February 7, 2019

PROJECT NO: KM5841-51

PURPOSE: To Determine the Amount of Magnetic Material in Sample.

PROCEDURE: Perform a Standard Davis Tube Magnetic Separation Test.

FEED: Test 45 Copper Rougher Tail

Conditions	Cycle I	Cycle II	
Mass (g)	30	30	
DCV	78	78	
DCA	1.3	1.3	
Gauss	4000	4000	
Flow Rate (L/min)	0.4	0.4	
Agitation Speed (rpm)	82	82	
Time (min)	2.45	2.45	
Comments:			

KM5841-51 Test 45 Copper Rougher Tail
Overall Metallurgical Balance

Product	Weight		Fe Assay	Fe Distribution
	%	grams	%	%
Magnetic Con	3.7	2.2	34.2	26.0
Magnetic Tail	96.3	57.8	3.7	74.0
Feed	100.0	60.0	4.8	100

APPENDIX III – KM5841

PARTICLE SIZING DATA

INDEX

TABLE		µm K_{80}	PAGE
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III-2	KM5841 HG Composite – 20 Minute Grind	70	2
III-3	KM5841 LG Composite – 25 Minute Grind	110	3
III-4	KM5841-42 Copper Rougher Concentrate	40	4
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III-6	KM5841-44 Copper Regrind Discharge	21	6
III-7	KM5841-45 Copper Regrind Discharge	24	7

TABLE III-1
SCREEN ANALYSIS
KM5841 HG Composite - 15 Minute Grind Calibration

Product	Particle Size µm	Weight % Retained	Cumulative % Passing
48 Mesh	300	0.00	100.0
65 Mesh	212	0.10	99.9
100 Mesh	150	3.60	96.3
150 Mesh	106	12.70	83.6
200 Mesh	75	15.10	68.5
270 Mesh	53	12.20	56.3
400 Mesh	38	9.90	46.4
TOTAL		100.00	**

K80= 98µm

Note: 15 min. grind calibration using 2 kg. Ore, 1500 ml water and 20 kg. of Mild Steel rods in Mill: M3

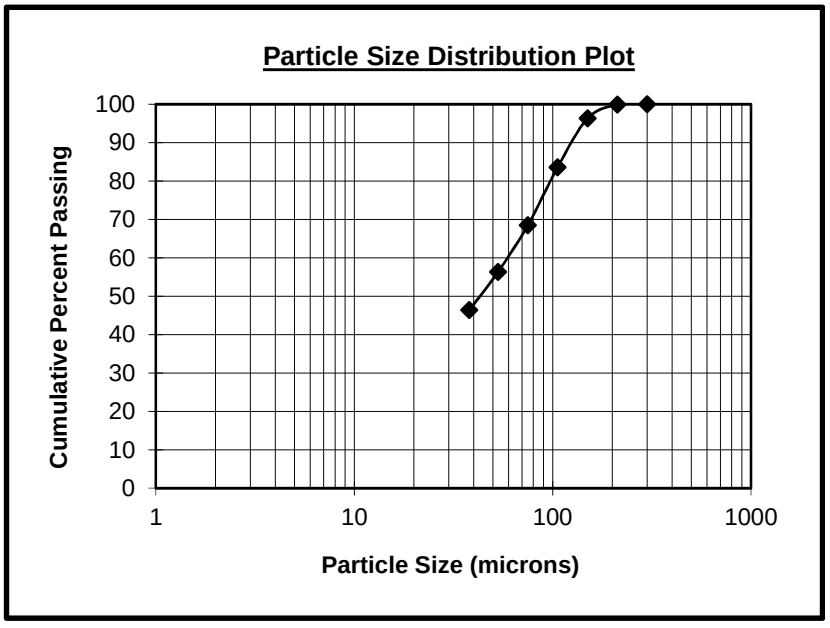


TABLE III-2
SCREEN ANALYSIS
KM5841 HG Composite - 20 Minute Grind Calibration

Product	Particle Size µm	Weight % Retained	Cumulative % Passing
65 Mesh	212	0.00	100.0
100 Mesh	150	0.10	99.9
150 Mesh	106	4.60	95.3
200 Mesh	75	12.40	82.9
270 Mesh	53	14.40	68.5
400 Mesh	38	12.50	56.0
TOTAL		100.00	**

K80= 70µm

Note: 20 min. grind calibration using 2 kg. Ore, 1000 ml water and 20 kg. of Mild Steel rods in Mill: M3

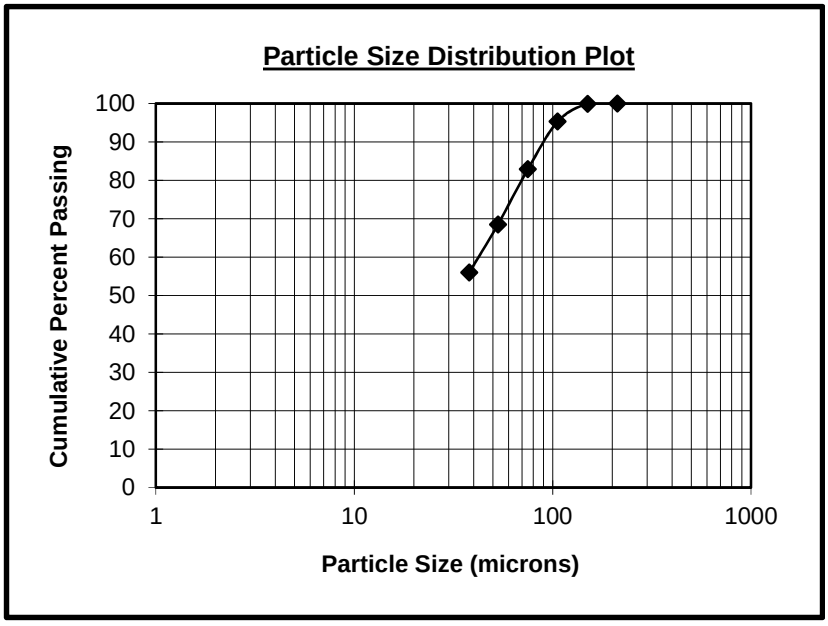


TABLE III-3
SCREEN ANALYSIS
KM5841 LG Composite - 25 Minute Grind Calibration

Product	Particle Size µm	Weight % Retained	Cumulative % Passing
48 Mesh	300	0.00	100.0
65 Mesh	212	0.20	99.8
100 Mesh	150	5.20	94.6
150 Mesh	106	16.10	78.5
200 Mesh	75	13.10	65.4
270 Mesh	53	10.20	55.2
400 Mesh	38	7.90	47.3
TOTAL		100.00	**

K80= 110µm

Note: 25 min. grind calibration using 2 kg. Ore, 1000 ml water and 20 kg. of Mild Steel rods in Mill: M3

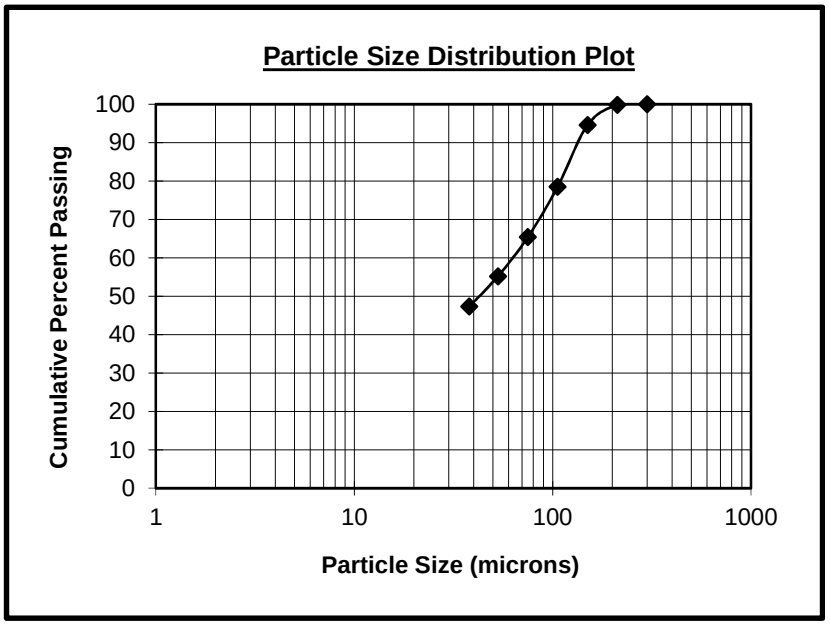


TABLE III-4
SCREEN ANALYSIS
KM5841-42 Copper Rougher Concentrate

Product	Particle Size µm	Weight % Retained	Cumulative % Passing
65 Mesh	212	0.00	100.0
100 Mesh	150	1.00	99.0
150 Mesh	106	4.50	94.5
200 Mesh	75	4.90	89.6
270 Mesh	53	5.00	84.6
400 Mesh	38	5.20	79.4
TOTAL		100.00	**

K80= 40µm

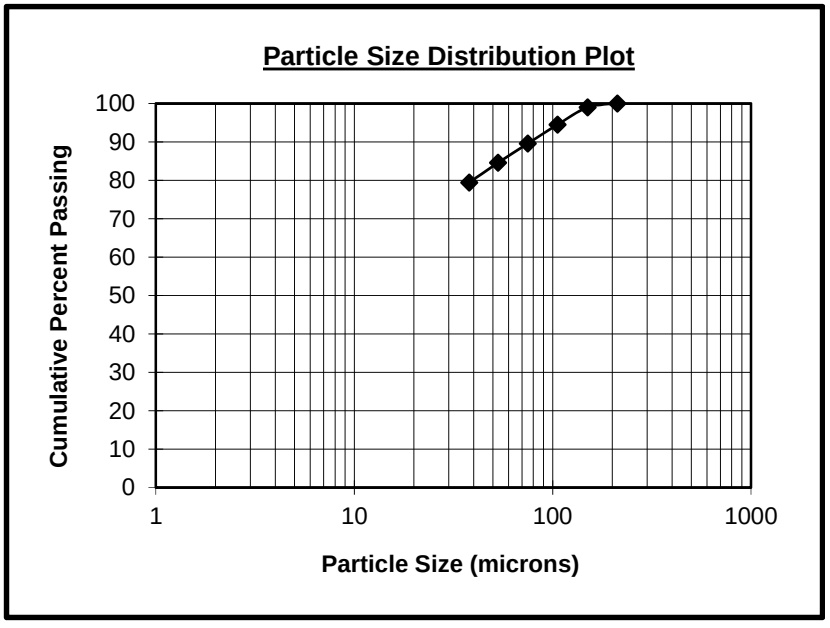
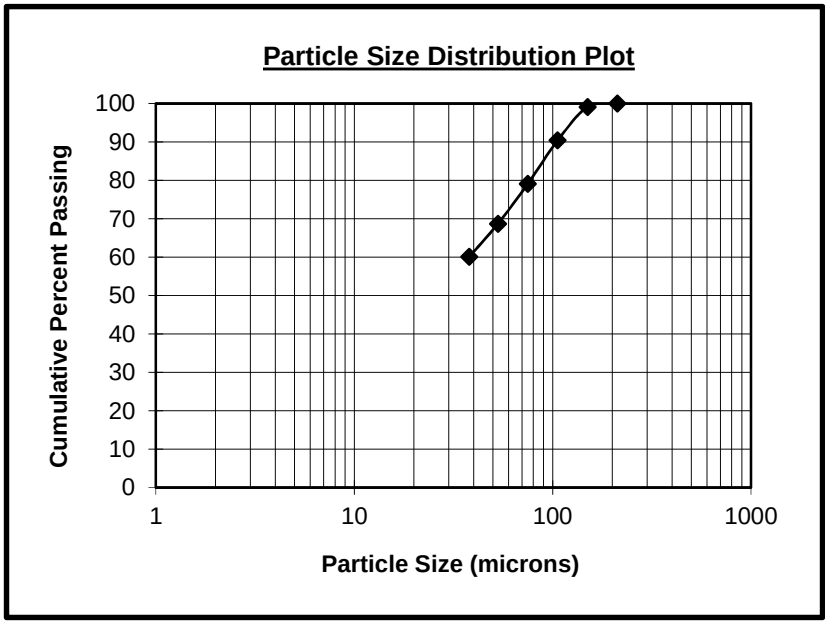


TABLE III-5
SCREEN ANALYSIS
KM5841-43 Copper Rougher Concentrate

Product	Particle Size µm	Weight % Retained	Cumulative % Passing
65 Mesh	212	0.00	100.0
100 Mesh	150	0.90	99.1
150 Mesh	106	8.70	90.4
200 Mesh	75	11.30	79.1
270 Mesh	53	10.40	68.7
400 Mesh	38	8.60	60.1
TOTAL		100.00	**

K80= 77µm



ALS Metallurgy

ISO9001:2008
Certificate No. FS63170

Result Analysis Report

Project and Test number:
KM5841-44

Measured by:
Pierce

Measured:
Wednesday, January 23, 2019 2:43:14 PM

Sample Name:
Copper Regrind Discharge - Average

Edited by:
Pierce

Analysed:
Wednesday, January 23, 2019 2:43:15 PM

Particle Name:
Silica 0.1

Accessory Name:
Hydro 2000MU (A)

Analysis model:
General purpose

Sensitivity:
Normal

Particle RI:
1.544

Absorption:
0.1

Size range:
0.100 to 1000.000 um

Obscuration:
22.18 %

Dispersant Name:
Water

Dispersant RI:
1.330

Weighted Residual:
0.820 %

Result Emulation:
Off

Concentration:
0.0126 %Vol

Span :
3.617

Uniformity:
1.22

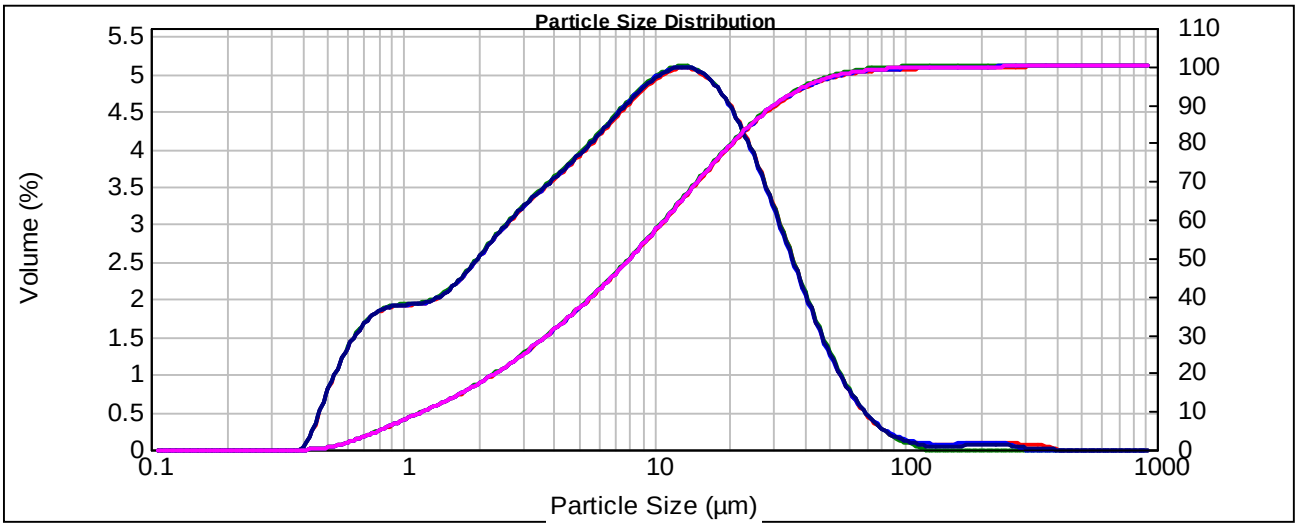
Result units:
Volume

Specific Surface Area:
1.74 m²/g

Surface Weighted Mean D[3,2]:
3.451 um

Vol. Weighted Mean D[4,3]:
13.240 um

d(0.1): 1.212 um d(0.5): 8.061 um **d(0.8): 20.504 um** d(0.9): 30.364 um d(0.98): 56.23 um



Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.100	0.00	0.479	0.46	2.291	1.72	10.965	3.04	52.481	0.60	251.189	0.03
0.110	0.00	0.525	0.65	2.512	1.82	12.023	3.06	57.544	0.46	275.423	0.02
0.120	0.00	0.575	0.81	2.754	1.90	13.183	3.06	63.096	0.34	301.995	0.01
0.132	0.00	0.631	0.94	3.020	1.98	14.454	3.03	69.183	0.25	331.131	0.02
0.145	0.00	0.692	1.04	3.311	2.06	15.849	2.97	75.858	0.18	363.078	0.00
0.158	0.00	0.759	1.10	3.631	2.13	17.378	2.88	83.176	0.12	398.107	0.00
0.174	0.00	0.832	1.14	3.981	2.20	19.055	2.76	91.201	0.08	436.516	0.00
0.191	0.00	0.912	1.16	4.365	2.27	20.893	2.61	100.000	0.06	478.630	0.00
0.209	0.00	1.000	1.16	4.786	2.35	22.909	2.44	109.648	0.04	524.807	0.00
0.229	0.00	1.096	1.17	5.248	2.43	25.119	2.25	120.226	0.03	575.440	0.00
0.251	0.00	1.202	1.18	5.754	2.52	27.542	2.04	131.826	0.03	630.957	0.00
0.275	0.00	1.318	1.21	6.310	2.61	30.200	1.81	144.544	0.03	691.831	0.00
0.302	0.00	1.445	1.27	6.918	2.70	33.113	1.59	158.489	0.03	758.578	0.00
0.331	0.00	1.585	1.34	7.586	2.78	36.308	1.37	173.780	0.03	831.764	0.00
0.363	0.00	1.738	1.43	8.318	2.86	39.811	1.15	190.546	0.03	912.011	0.00
0.398	0.04	1.905	1.53	9.120	2.94	43.652	0.95	208.930	0.03	1000.000	
0.437	0.25	2.089	1.63	10.000	3.00	47.863	0.77	229.087	0.03		
0.479		2.291		10.965		52.481		251.189			

Operator notes:

ALS Metallurgy

ISO9001:2008
Certificate No. FS63170

Result Analysis Report

Project and Test number:
KM5841-45

Sample Name:
Copper Regrind Discharge - Average

Measured by:
Pierce

Edited by:
Pierce

Measured:
Wednesday, January 23, 2019 3:06:12 PM

Analysed:
Wednesday, January 23, 2019 3:06:13 PM

Particle Name: Silica 0.1
Particle RI: 1.544
Dispersant Name: Water

Accessory Name: Hydro 2000MU (A)
Absorption: 0.1
Dispersant RI: 1.330

Analysis model: General purpose
Size range: 0.100 to 1000.000 um
Weighted Residual: 1.358 %

Sensitivity: Normal
Obscuration: 20.53 %
Result Emulation: Off

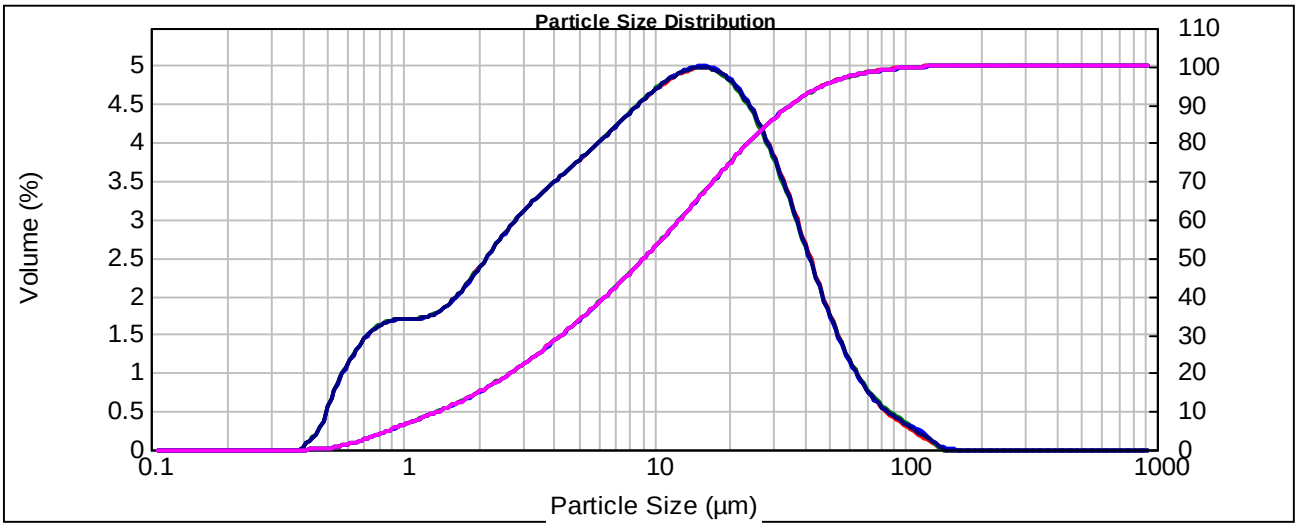
Concentration: 0.0127 %Vol
Specific Surface Area: 1.56 m²/g

Span : 3.678
Surface Weighted Mean D[3,2]: 3.855 um

Uniformity: 1.19
Vol. Weighted Mean D[4,3]: 14.792 um

Result units: Volume

d(0.1): 1.388 um d(0.5): 9.170 um **d(0.8): 23.741 um** d(0.9): 35.116 um d(0.98): 65.39 um



Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.100		0.479	0.29	2.291	1.63	10.965	2.90	52.481	0.86	251.189	0.00
0.110	0.00	0.525	0.52	2.512	1.73	12.023	2.95	57.544	0.69	275.423	0.00
0.120	0.00	0.575	0.66	2.754	1.82	13.183	2.98	63.096	0.55	301.995	0.00
0.132	0.00	0.631	0.79	3.020	1.91	14.454	3.00	69.183	0.44	331.131	0.00
0.145	0.00	0.692	0.90	3.311	1.98	15.849	2.99	75.858	0.35	363.078	0.00
0.158	0.00	0.759	0.96	3.631	2.06	17.378	2.96	83.176	0.28	398.107	0.00
0.174	0.00	0.832	1.00	3.981	2.12	19.055	2.90	91.201	0.23	436.516	0.00
0.191	0.00	0.912	1.02	4.365	2.19	20.893	2.81	100.000	0.18	478.630	0.00
0.209	0.00	1.000	1.02	4.786	2.26	22.909	2.69	109.648	0.12	524.807	0.00
0.229	0.00	1.096	1.03	5.248	2.33	25.119	2.55	120.226	0.08	575.440	0.00
0.251	0.00	1.202	1.04	5.754	2.40	27.542	2.37	131.826	0.01	630.957	0.00
0.275	0.00	1.318	1.07	6.310	2.48	30.200	2.17	144.544	0.00	691.831	0.00
0.302	0.00	1.445	1.13	6.918	2.55	33.113	1.96	158.489	0.00	758.578	0.00
0.331	0.00	1.585	1.21	7.586	2.63	36.308	1.73	173.780	0.00	831.764	0.00
0.363	0.00	1.738	1.30	8.318	2.71	39.811	1.49	190.546	0.00	912.011	0.00
0.398	0.00	1.905	1.41	9.120	2.78	43.652	1.27	208.930	0.00	1000.000	0.00
0.437	0.04	2.089	1.52	10.000	2.84	47.863	1.05	229.087	0.00		
0.479	0.13	2.291		10.965		52.481		251.189	0.00		

Operator notes: