

THE MINERAL DRESSING LABORATORY

REPORT

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Availability

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ABSTRACT: <p>The davidite ore sample we received in 1987 has been used for further tests with wet high intensity magnetic separation (WHIMS) and flotation at different grind finenesses. Owing to the fine size of the davidite mineral grains, final grinding to 80% finer than 40 microns is necessary to get good liberation.</p> <p>In the WHIMS tests we have obtained cleaned concentrates with up to 900 ppm Sc, but only 60% recovery due to losses of fine davidite.</p> <p>Batch flotation tests have given rougher concentrate with 500 ppm Sc at about 90% recovery. After regrinding and reflation we obtained cleaned concentrate with 1050 ppm Sc at 75% recovery. We expect that the flotation results can be improved by further test work.</p>
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Davidite ore
Beneficiation study
Scandium recovery

"MINERAL DRESSING STUDY OF BIGGEJAVRI DAVIDITE ORE"

Contents

	Page no. -----
1 . Summary	1
2 . Introduction	3
3 . Sample Material	3
4 . Beneficiation Studies	4
5 . Conclusions	12
13 Enclosures	

Trondheim, March 1988

1 . SUMMARY

After the conference 9.12.1986 on our earlier report 26/86 we have done further testing on the sample material from Biggejavri deposit, for investigating the possibility of providing concentrates with higher scandium grade and recovery. In enclosure 1 we have presented the results from the best tests graphically.

In our former testwork with high intensity magnetic separation (WHIMS) we obtained cleaned concentrates with up to 635 ppm Sc at 69% recovery, at a grinding fineness of 80% finer than 90 micron (d80=90 micron). See curve "former test" in enclosure 1.

In the first test in this study, the same WHIMS procedure was applied at a finer grind size with d80=70 micron, and cleaned concentrates of 700 ppm with 62% recovery were achieved. See test "A2" in enclosure 1.

Batch flotation of the scavenger type WHIMS concentrate 2 with 291 ppm Sc gave combined products of 650 to 900 ppm scandium with 64 to 60% recoveries.

In the next tests we tried various all flotation schemes in batch scale. Rougher and cleaner flotation of original feed ground to d80=70 micron gave cleaned concentrates with 625 to 780 ppm Sc at 71 to 64% recoveries.

Flotation of deslimed feed gave cleaner concentrates with up to 1150 ppm scandium but only at 35% recovery due to high losses of fine davidite.

A three-step procedure, rougher flotation at $d_{80}=70$ micron, regrind of rougher concentrate to $d_{80}=37$ micron, and cleaner flotation gave much better results.

The rougher concentrate contained 491 ppm Sc at 91% recovery. In the cleaner flotation we improved the reground concentrate stepwise to first 626 ppm scandium at 89% recovery, then 916 ppm at 85% recovery and finally to 1060 ppm scandium at 75% recovery. The best flotation results are presented as "test 2" and "test 11" in enclosure 1.

Our conclusion is that owing to the fine liberation size of the davidite, flotation is the best alternative for recovering davidite from this ore sample.

Even the best flotation concentrates contain substantial amounts of other minerals than davidite, mainly feldspar, and further upgrading ought to be possible.

From the pilot scale WHIMS tests we have the following products at hand :

5 kg cleaner concentrates with about 900 ppm Sc,
40 kg intermediate concentrates with about 300 ppm Sc.

2 . INTRODUCTION

In addition to the previous beneficiation study on Biggejavri davidite ore, further testing has been carried out in our laboratories both for confirming the initial findings in a bigger scale and for investigating the suitability of flotation as an alternative method. The aim of this study was to achieve as high as possible scandium content with a reasonably high recovery.

3 . SAMPLE MATERIAL

For this purpose, approximately 325 kg of sample material from the Biggejavri deposit was sent to us in 1987.

The sample contained about 140 ppm Sc on average and it was in the form of rock pieces ranging from 100 mm to 500 mm size .

This material is composed of mainly albite (>90%), davidite, calcite, muscovite, chromite, rutile and minor amounts of some other accessory minerals.

The scandium content was found to be due to mainly davidite , as well as to brannerite, rutile and thortveitite inclusions in minor amounts (S.Olerud, NGU Rap.nr.: 85.159).

In a later study (Dr.T.Malvik, SINTEF Rap.nr.: STF 36 F86041) , the davidite particles were observed to be very fine sized and always associated with rutile and/or other unidentified phases. According to this study, which was carried out on the same sample material used in our investigation, a very fine grinding will be necessary if a high degree of liberation is required; For example, if 80% of davidite minerals are wanted as free particles, then the grinding should be done to less than 35-40 micron size (400 mesh).

4 . BENEFICIATION STUDIES

Following the previous sample preparation sequence, the sample material was crushed down to -4 mm , in closed circuit with a screen in the final crushing step.

In order to increase the degree of liberation, a finer grind was aimed for this investigation where also the amount of slime fines were tried to be kept as low as possible. This was achieved by using a ball mill of 360 mm diameter and 760 mm length, in closed circuit with a 0.21 mm (65 mesh) screen.

By this continuous grinding application, the sample material was ground to about 80% finer than 70 micron size at a capacity of 18 kg/h , which should also be a suitable feed amount for the successive wet high intensity magnetic separation step.

The particle size analysis of this grind product was carried out both by standard sieve analysis and Cyclosizer, the latter being used for providing submicron size fractions for Sc analyses .

The combined particle size distribution of this grind and its conditions are given in enclosures 2 and 3.

Sc analyses on the sample material and the beneficiation products were carried out with a semi-quantitative XRF analyser in the Geology Institute. The assays give only approximate values for the scandium contents.

According to these analyses on the size fractions of the grind product, there is a slight enrichment of Sc in the fractions coarser than 34 micron size. As can be seen from enclosure 4 , the fractions finer than this size contain more or less the same amount of about 110 ppm, while the coarser ones contain up to 230 ppm Sc out of an average sample value of 140 ppm.

The following beneficiation alternatives were applied in this study in order to compare their suitability as well as their grade and recovery values ;

A - Wet High Intensity Magnetic Separation (Carpco WHIMS) ,

B - WHIMS + Flotation ,

C - Flotation .

A - Wet High Intensity Magnetic Separation

This method was previously tested on Biggejavri ore in batch and pilot scales where grades of 500-600 ppm were achieved with 75 to 70 % overall recovery values, compare our report 26/86.

Aiming to verify these results in a bigger scale, about 200 kg of sample material was treated in a pilot scale Carpco MWL-43 carousel type wet high intensity magnetic separator.

The grind product from the ball mill was first passed through a Sala low intensity drum magnet for removing the strongly magnetic material and then fed into the Carpco separator. In each pass, 4 different products can be obtained from this equipment which are defined as follows ;

Tailing 1 , is the non-magnetic material which directly flows down through the magnet matrix between the magnetic poles. Together with the pulp water, a jet of wash-water was also added in this stage.

Tailing 2 , is the non-magnetic material which is washed out immediately after the magnetic zone, again with an additional flush of wash-water.

Concentrate 1 , is the final magnetic product which is obtained after successive cleaning steps using two or more water flushes.

Concentrate 2 , is the magnetic product which is obtained from a point between the Tailing 2 and Concentrate 1 outlets, after one additional water flush.

Depending on their grades, these four products can be either collected separately or combined in various ways for further treatment.

A1 - Primary WHIMS separation (Rougher)

For this application, 200 kg of sample material is processed through the Carpcos WHIMS at the average capacity of 15 kg/h , where the feed rate was kept at 12 - 18 kg/h parallel to the ball milling rate .

After this single step rougher separation, a combined magnetic product (Concentrate 1+2) of 364 ppm was obtained with a recovery of about 66 % . Concentrate 1 had a grade of over 800 ppm and Concentrate 2 had about 300 ppm.

The details of this application are given in enclosure 5.

A2 - Full WHIMS separation (Rougher + Scavenger + Cleaner)

In order to compare the grade and recovery values of this finer grinding (80% -70 micron) with the previously applied grinding (80% -90 micron), 4 kg of sample material was processed following the same former flowsheet which consisted of rougher, scavenger and cleaning steps. The feed rate was also kept same as the former which was 8 kg/h .

This application gave a combined final concentrate of 688 ppm with 61.9% overall recovery.

The stepwise details of this application are given in enclosure 6.

B - Wet High Intensity Magnetic Separation + Flotation

In order to investigate the possibility of further upgrading the magnetic concentrate from Carpco , flotation was applied as an alternative cleaning step.

As the Concentrate 1 from the rougher WHIMS separation step contained a reasonably high Sc grade (821 ppm), only the Concentrate 2 (291 ppm) was treated by this initial flotation testing.

Flotation was carried out in acidic media, having preferably less than 4 - 4.5 pH value, and using petroleum sulphonate as collector. Collector addition was applied stepwise and three flotation concentrates were provided.

This flotation achieved a very selective separation of scandium bearing dark minerals from the light coloured tailing, mainly being albite. The flotation Concentrate 1 with 935 ppm Sc alone contained about 85% of the scandium which entered this step.

When this concentrate is considered to be blended with the rich Concentrate 1 of the magnetic separation step, then the combined grade will be about 900 ppm and the recovery from the original feed will be about 60% .

If the Concentrate 2 from flotation should also be included to this final product, then the overall recovery will increase to 64% and the grade will be over 650 ppm .

The details of this flotation test and its combination with the magnetic separation results are given in enclosure 7.

C - Flotation Tests

In this part of our investigation four groups of testing have been applied, representing either different modes of feed material (deslimed or un-deslimed feeds) or various flotation flowsheets (with or without cleaning step and regrinding step). In all tests the original grind fineness was $d_{80}=70$ micron. The tests are coded as follows ;

C1 - Flotation tests on intermediate CarpcO product (Concentrate 2)
(Test no: 1,4,5)

C2 - Flotation tests on original "deslimed" material
(Test no: 3,6,10)

C3 - Flotation tests on original "un-deslimed" material
(Test no: 2,7,8,)

C4 - Flotation tests on original "un-deslimed" material with
regrinding and refloating
(Test no: 11)

C1 - Flotation tests on intermediate CarpcO product

The procedures and the results are given in the preceding section "B" and in enclosure 7.

C2 - Flotation tests on original "deslimed" material

In this group of flotation testing the grind material was deslimed at various particle sizes by settling and decantation prior to flotation. The aim was to investigate the advantages of removing very fine material which could otherwise effect the selectivity of flotation.

As expected, this resulted in achieving very high grade scandium concentrates without further regrinding and refloating but at the expense of high recoveries due to fine material loss.

The highest grade was achieved when the grind material was deslimed at about 25-30 micron size and floated stepwise (Test 3); The Concentrate 1 from this application reached 1150 ppm Sc with about 35% recovery. The overall combined grade of the first two concentrates was 673 ppm Sc with 58.66 % recovery.

If Concentrate 3 is also included in the final concentrate, then the recovery reaches 62% with about 550 ppm Sc content.

In order to increase the total recovery, desliming size was lowered to about 15 micron and additional cleaning steps were included in one other test of this group (Test 10) ;

Following the same stepwise collector addition and floating in three steps, about 1/4 of the total feed material was collected as a combined rougher concentrate. This was cleaned in two steps and two cleaner concentrates were provided, discarding about half of the total feed material as a tailing of 10 ppm scandium. The grade of the combined concentrates was 625 ppm and the overall recovery was 71.49% .

This combined concentrate corresponds well with the former and present full magnetic separation results both on grade and recovery basis. This indicated that a full flotation sequence of rougher and cleaner steps can be a good alternative for a WHIMS application of rougher and cleaner steps, regarding the same grinding size. The details of this group of flotation testing are given in enclosure 8.

C3 - Flotation tests on original "un-deslimed" material

A similar flotation testing was applied also on the original sample material with d80=70 micron without any desliming prior to flotation.

After 4 steps of rougher flotation a combined concentrate of 334 ppm Sc with a total recovery of 92.33% was achieved (Test 2). None of the rougher concentrates exceeded 500 ppm grade where it was observed that fine gangue material was following the Sc bearing dark minerals although they were mostly liberated.

This again led to the necessity of adding cleaner steps and such a sequence of rougher and cleaner steps was applied on the sample material (Test 7) ;

After 3 steps of rougher and 2 steps of cleaner flotation steps a combined final concentrate of 779 ppm scandium with 64.56 % recovery was achieved.

When compared with the general grade-recovery trend of the former beneficiation study (Appendix 10, Oppredningslab. Rap.no: 26/86), this application also corresponds well with the best full magnetic separation results, again indicating the suitability of flotation as an alternative method.

The details of this group of testing on un-deslimed original sample material are given in enclosure 9.

Evaluating all these flotation tests on the grind material of approximately 80% minus 70 micron size, it can be seen that partial concentrates reached quite high values such as 1150 ppm scandium on the deslimed material (Test 3) but with rather low recoveries. High overall recoveries over 90% were also possible to achieve on the un-deslimed material but in this case the grade was on the lower side.

This conclusion indicates that a higher degree of particle liberation should be provided if both of these aims are to be satisfied simultaneously.

C4 - Flotation tests on "un-deslimed" material, with regrinding

Considering the difficulties of floating very fine material selectively, especially in a silicate minerals media, a flowsheet of rougher flotation - regrinding the primary concentrate - and re-floating was considered for this application, rather than grinding the material directly to the required fineness. This also provides the advantage of grinding less material as well.

Rougher flotation was performed in three steps by stepwise addition of petroleum sulphonate collector and keeping the pH of the pulp not exceeding 4 - 4.5 .

The combined concentrates from this three step rougher flotation, representing about 1/4 of the total feed material, was re-ground to a fineness of 80% minus 37 micron (400 M) .

This particle size distribution corresponds to approximately 80% liberation of davidite mineral, according to the mineralogical observations of Dr.T.Malvik (Rap.nr.: STF F86041) .

Cleaner flotation was also carried out stepwise where initially two steps were applied with no collector addition in the former and collector addition in the latter. .

This yielded two concentrates with a combined grade of above 600 ppm with 90% recovery.

After washing and re-pulping this combined Cleaner 1 concentrate, the same sequence was applied again yielding two concentrates of 1060 and 446 ppm scandium respectively.

This combined final concentrate from the Cleaner 2 step contains over 900 ppm scandium with a total recovery of about 85% and represents approximately 1/8 weight ratio of the total feed.

The overall product distribution of this application, its flowsheet and stepwise product distribution details are given in enclosures 10, 11 and 12.

The particle size analyses on primary grind, regrind and final combined concentrate are given in enclosure 13.

5 . CONCLUSIONS

According to the NGU report nr.85.159 the Biggejavri davidite ore has a very complex composition containing a host of accessory oxidic and sulphidic minerals.

The davidite mineral which essentially is an iron titanate with high contents of Cr and V, is the main bearer of Scandium, carrying in the order of 3000 ppm Sc.

It is about as magnetic as ilmenite, and will be recovered by high intensity magnetic separation together with the other Fe-containing minerals.

Also flotation with oxide collectors will collect the davidite together with diverse oxides, sulphides and carbonates.

The davidite mineral has a density about 4.5, but owing to the fine grain size, gravity separation is not attractive.

Dr.Malvik's mineralogical study, SINTEF report STF 36 F 86041, shows that the davidite is much more fine-grained than the samples NGU has investigated, and to a large extent intimately intergrown with albite feldspar which is the main gangue constituent. 80% of the davidite mineral should be liberated at a grain size of 40 micron.

The WHIMS tests have given concentrates with up to 1000 ppm Sc, but at low recoveries. The losses are partly very fine davidite grains which are flushed out in the WHIMS separator and partly albite grains with small davidite inclusions which also will go to the tailings.

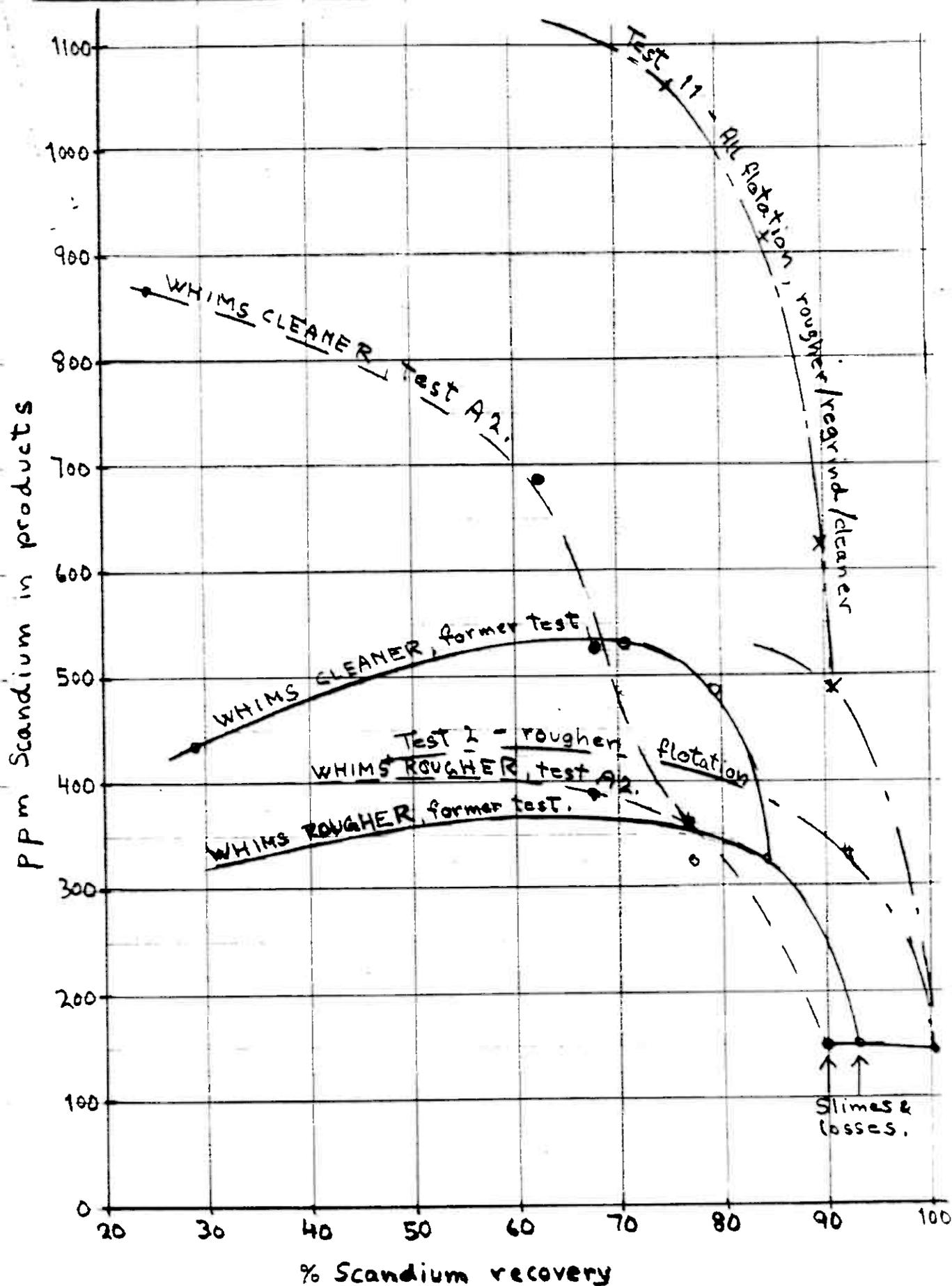
For these reasons, WHIMS is not well suited for the fine-grained ore sample we have tested.

Our flotation tests have given concentrates of similar scandium contents as the WHIMS tests but with considerably higher recoveries, showing that this method is effective also for the fine davidite grains.

The concentrate grades around 1000 ppm Sc are low, indicating 30-35% davidite grade. The main contamination is albite feldspar intergrown with davidite.

We expect that additional cleaning procedures together with further regrinding should improve scandium grade with acceptable recoveries in the final concentrates.

BIGGEJAVRI DAVIDITE ORE - CONCENTRATING TESTS,
Comparison of WHIMS and flotation results.



Grinding in pilot scale : Moment Mill (360 X 760 mm), 67% solids, 42 RPM , 18 kg/h , in closed circuit with Sweco Screen (0.21 mm).

Size analysis of the grind product : Tyler Sieves down to 400 M (37 micron) and Warman Cyclosizer on -200 M (-74 micron) material;

Size fraction	Weight %	Cumulative passing %
-----	-----	-----
<u>Screening with Tyler Sieves</u>		
- 210 + 147 micron	2.81	97.19
- 147 + 104 "	5.05	92.14
- 104 + 74 "	8.53	83.61

- 74 + 53 "	14.26	69.35
- 53 + 44 "	7.45	61.90
- 44 + 37 "	5.50	56.40
- 37 "	56.40	

Sum	100.00	

Centrifugal sedimentation in Warman Cyclosizer

+ 74 Micron	16.39	83.61
- 74 + 46 "	11.04	72.57
- 46 + 34 "	12.27	60.30
- 34 + 25 "	14.40	45.90
- 25 + 17 "	13.15	32.75
- 17 + 14 "	4.80	27.95
- 14 "	27.95	

Sum	100.00	

Scandium distributions in the Cyclosizer size fractions ;

Size fraction	Weight %	Scandium ppm
+ 74 Micron	16.39	170
- 74 + 46 "	11.04	230
- 46 + 34 "	12.27	150
- 34 + 25 "	14.40	110
- 25 + 17 "	13.15	120
- 17 + 14 "	4.80	110
- 14 "	27.95	112 (Calc.)
Total feed	100.00	140

A1 - WHIMS Testing : 200 kg - Rougher separation in pilot scale,
 15 kg/h capacity on average,
 Grind to d80 = 70 micron

Product	Weight %	Sc ppm	Sc Recovery %
Concentrate 1	3.6	821	20.67
Concentrate 2	22.4	291	45.58
Tailing 1	24.5	42	7.20
Tailing 2	22.7	37	5.87
Slime + Losses	26.8	110 (Calc.)	20.68 (Calc.)
Total Feed	100.0	143	100.00
Concentrate 1+2	26.0	364 ppm	66.25 %

* - Tailings will be scavenged and the magnetic product of this step will be combined with the main magnetic concentrates prior to final cleaning step.

A2 - WHIMS Testing : 4 kg - Full separation,
 8 kg/h capacity,
 Grind to d80 = 70 micron

Product	Weight %	Sc ppm	Sc Recovery %
<u>Rougher</u>			
Concentrate	24.0	391	67.2
Tailing	69.5	50	24.9
Slime	6.5	170 (Calc.)	7.9 (Calc.)

Total Feed	100.0	140	100.0
<u>Scavenger</u>			
Concentrate	6.2	210	9.4
Tailing	60.6	30	13.1
Slime	2.7	130 (Calc.)	2.4 (Calc.)

Rougher Tailing	69.5	50	24.9
<u>Cleaner</u>			
Concentrate 1	4.0	870	24.5
Concentrate 2	8.8	605	37.4
Tailing 1	12.1	110	9.3
Tailing 2	5.3	145	5.4

Cleaner Feed =			
Concentrates from	30.2	361	76.6
Rougher+Scavenger			
Cl. Conc. 1+2	12.2	688 ppm	61.9 %
Cl. Conc. 1+2			
+ Tailing 2	18.1	529 ppm	67.3 %

B - Batch flotation tests on WHIMS intermediate product (Conc.2)
 Feed : 22.4 Wt.% of total feed, 291 ppm Sc, 45.6% Sc recovery

Stepwise collector addition in 3 steps, no cleaning - Test 4.

Product	Weight %	Sc ppm	Sc Recovery % (of the total feed)
-----	-----	-----	-----
Concentrate 1	5.97	935	38.65
Concentrate 2	4.35	160	4.82
Concentrate 3	1.02	85	0.60
Tailing	11.06	20	1.53
-----	-----	-----	-----
Flotation Feed =			
WHIMS Conc. 2	22.40	291	45.60

Combined Magnetic + Flotation Results :

WHIMS Conc.1			
+ Flot.Conc.1	9.6	892 ppm	59.4 %
WHIMS Conc.1			
+ Flot.Conc.1			
+ Flot.Conc.2	13.9	666 ppm	64.0 %

C2 - Flotation tests on original "deslimed" material

* Without cleaning (3 steps rougher flotation) - Test 3.

Product	Weight %	Sc ppm	Sc Recovery %
Concentrate 1	4.20	1150	34.77
Concentrate 2	7.90	420	23.89
Concentrate 3	3.70	135	3.60
Tailing	40.20	10	2.89
Slime	44.00	110 (Calc.)	34.85 (Calc.)
Total Feed	100.00	139	100.00
Rougher Conc.1+2	12.10	673 ppm	58.66 %
Rougher Conc.1+2+3	15.80	547 ppm	62.26 %

* With cleaning (3 steps rougher + 2 steps cleaner) - Test 10.

Product	Weight %	Sc ppm	Sc Recovery %
Cleaner Conc.1	8.6	910	55.90
Cleaner Conc.2	7.4	295	15.59
Cleaner Tailing	7.6	60	3.25
Rougher Tailing	48.4	10	3.46
Slime + Losses	28.0	110 (Calc.)	21.80 (Calc.)
Total Feed	100.0	140	100.00
Cleaner Conc.1+2	16.0	625 ppm	71.49 %

C3 - Flotation tests on original "un-deslimed" material

* Without cleaning (4 steps rougher flotation) - Test 2.

Product	Weight %	Sc ppm	Sc Recovery %
Concentrate 1	3.83	217	5.44
Concentrate 2	13.44	475	42.17
Concentrate 3	7.51	355	17.61
Concentrate 4	17.10	240	27.11
Tailing	58.12	20	7.67
Total Feed	100.00	151 (Calc.)	100.00
Rougher Conc.1+2	17.27	417	47.61
Rougher Conc.2+3	20.95	432	59.78
Rougher Conc.1+2+3	24.78	398	65.22
Rougher Conc.1+2+3+4	41.88	334	92.33

* With cleaning (3 steps rougher + 2 steps cleaner) - Test 7.

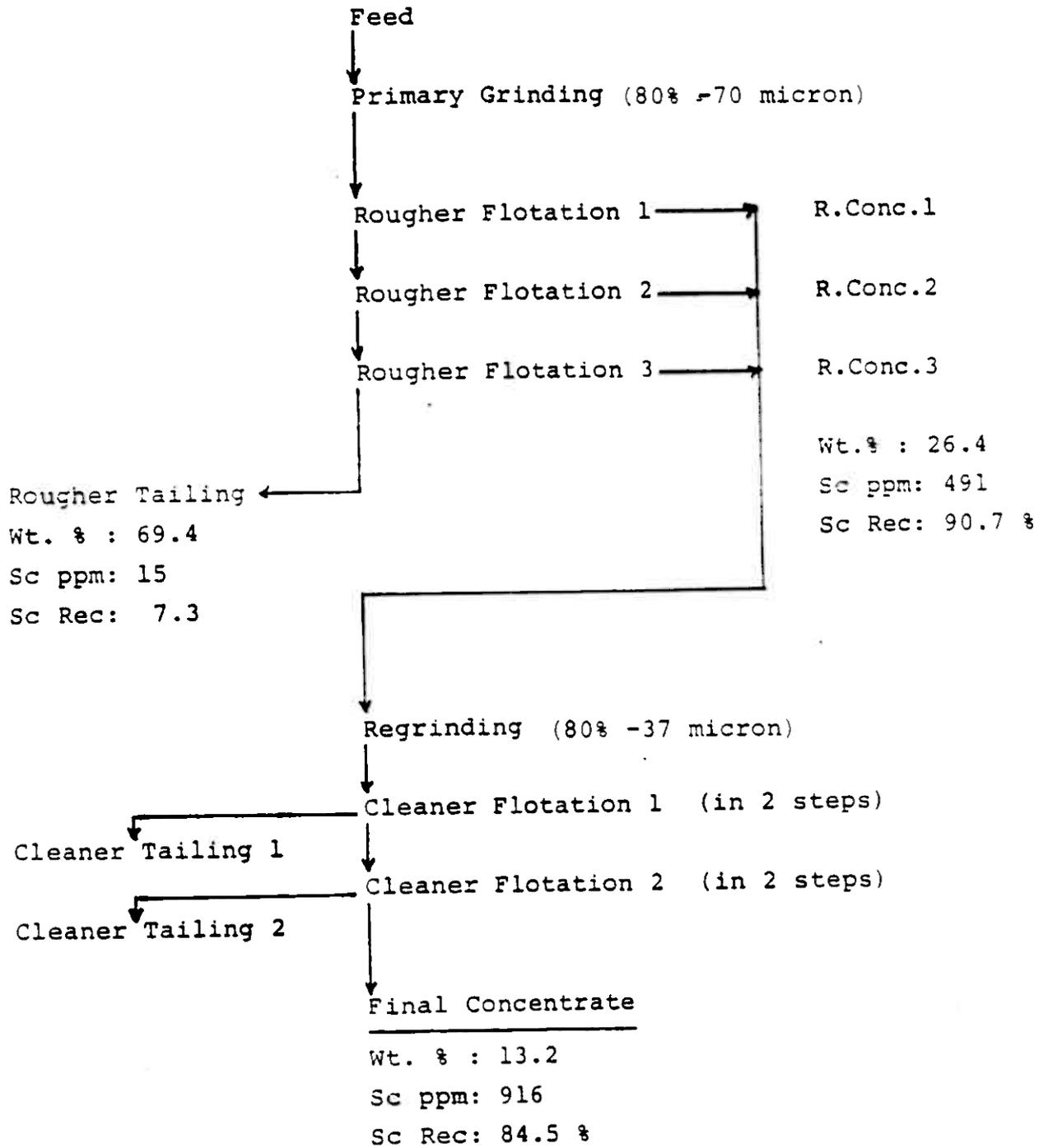
Product	Weight %	Sc ppm	Sc Recovery %
Cleaner Conc.1	8.0	925	52.86
Cleaner Conc.2	3.6	455	11.70
Cleaner Tailing	8.2	135	7.91
Rougher Tailing	71.0	45	22.82
Slime + Losses	9.2	72 (Calc.)	4.71 (Calc.)
Total Feed	100.0	140	100.00
Rougher Conc.	19.8	512	72.47
Cleaner Conc.1+2	11.6	779	64.56

C4 - Flotation tests on original "un-deslimed" material,
 with regrinding and refloating (Flotation Test 11)

- * Flowsheet included in enclosure 11
- * Stepwise product distribution included in enclosure 12

Product	Weight % (of total feed)	Sc ppm	Sc Recovery %
Cl.Flot.2 - Conc.1	10.1	1060	74.8
Cl.Flot.2 - Conc.2	3.1	446	9.7
Cl.Flot.2 - Tailing	7.2	95	4.8
Cl.Flot.1 - Tailing	6.0	34	1.4
Rougher - Tailing	69.4	15	7.3
Slime + Losses	4.2	70 (Calc.)	2.0
Total Feed	100.0	143	100.0
Cleaner Feed = Rougher Concentrate	26.4	491	90.7
Final Concentrate (1+2)	13.2 Wt.%	916 ppm Sc	84.5% Rec.

Flowsheet For Test 11 (Flotation-Regrinding-Flotation)



Flotation Test 11 :

Stepwise product distribution

Product	Weight %	Sc ppm	Sc Recovery %
-----	-----	-----	-----
* Rougher flotation (3 steps)			
Total 3 Conc.	26.4	491	90.7
Tailing	69.4	15	7.3
Slime + Losses	4.2	70 (Calc.)	2.0 (Calc.)
-----	-----	-----	-----
Total Feed	100.0	143	100.0
* Cleaner 1 flotation (after regrinding)			
Total 2 Conc.	20.4	626	89.3
Cl.1 Tailing	6.0	34	1.4
-----	-----	-----	-----
Rougher Conc.	26.4	491	90.7
* Cleaner 2 flotation			
Cl.2 - Conc.1	10.1	1060	74.8
Cl.2 - Conc.2	3.1	446	9.7
Cl.2 Tailing	7.2	95	4.8
-----	-----	-----	-----
Cleaner 1 Conc.	20.4	626	89.3
Cl.2 - Conc.1+2	13.2	916 ppm	84.5 %

Flotation Test 11 :

Particle size analyses on primary grind, regrind and final product

Size fraction	Primary Grind		Regrind		Final Product	
	%	Cum.%	%	Cum.%	%	Cum.%
-----	-----	-----	-----	-----	-----	-----
+ 147 micron	2.81	97.19	0.27	99.73	0.23	99.77
-147 + 74 "	13.58	83.61	5.68	94.05	3.79	95.98
- 74 + 37 "	27.21	56.40	14.55	79.50	18.56	77.42
- 37 "	56.40		79.50		77.42	
-----	-----	-----	-----	-----	-----	-----
Total	100.00		100.00		100.00	