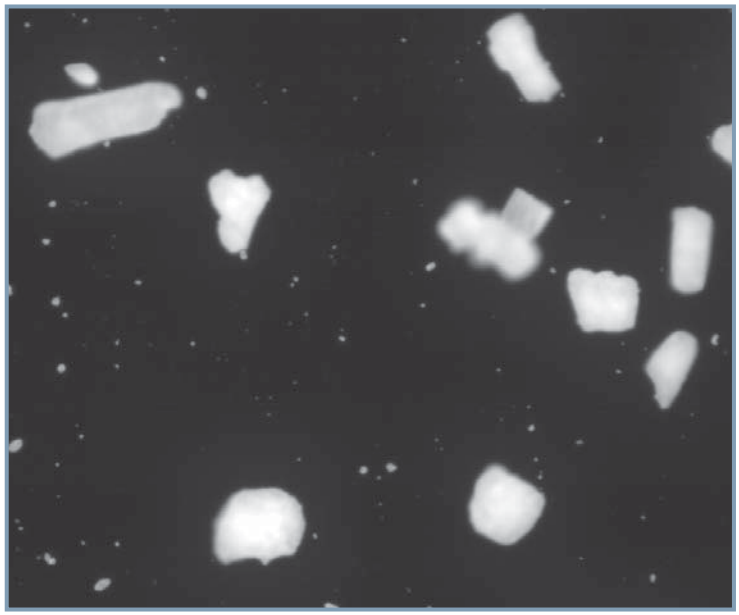
CLEMEX

intelligent microscopy

842

Particle Size and Shape Analysis



Prepared by Myriam Savard Eng.
Clemex Technologies Inc.
For KooSur

Particle Size Analysis

Image Analysis Report # 842 - For KooSur
Written by Myriam Savard Engineer

Sample Description

Two composite powder samples were submitted for analysis.

Purpose of Analysis

To demonstrate that the Clemex Vision image analysis system can correctly distinguish the particles and perform size and shape measurements on them. A minimum resolution of 1 micron is requested.

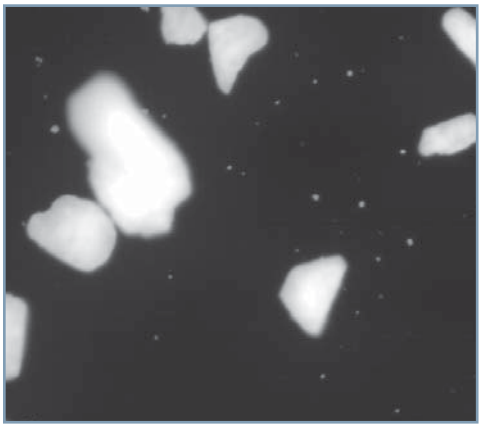


Figure 1: Part of one field of view of sample 2 at 50x (1.6424 microns/pixel).

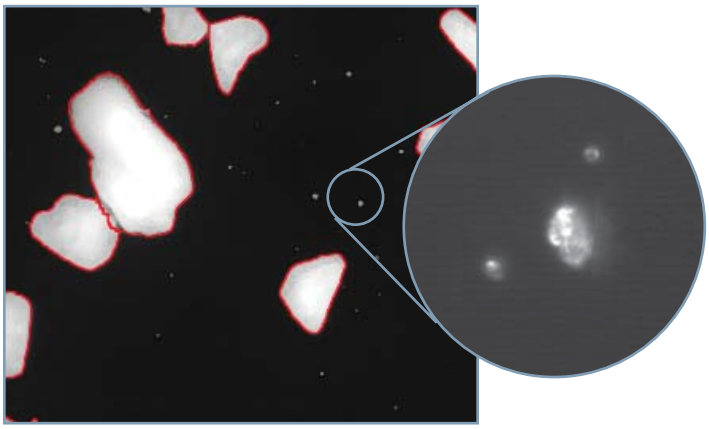


Figure 2: Outline of particles as measured at 50x, with a view of particles measured at 500x (0.1632 microns/pixel), all inside the same run.

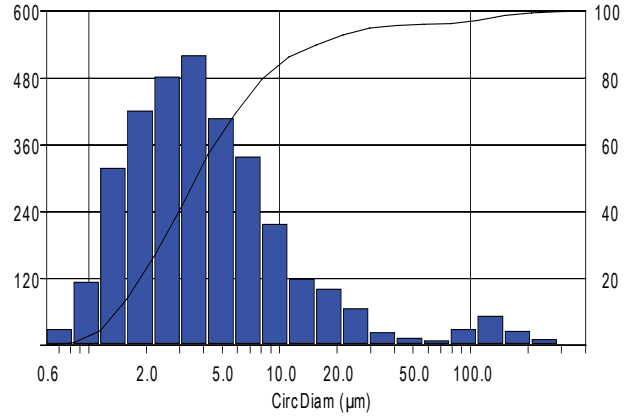
Procedure[1]

A f rst pass is performed at 50x to binarize and measure features being longer than 14 microns. Features shorter than that are binarized and measured at 500x.

Particle clusters are processed to separate individual particles as shown in f gures 1 and 2. Small artifacts are eliminated prior to measurements.

Results[2]

Area, Length, Diameter, Roundness, Aspect Ratio, Width and Volume measurements are performed on each feature. Automated statistics and graphs are generated. Final results can be printed directly from Clemex Vision and saved for further use. A customized report is built using the Report Generator module. Raw data is linked to their respective objects for validation purposes. Raw data are also exported in Excel format.



Minimum:	0.6 microns
Maximum:	331.7 microns
Mean:	10.7 microns
Std Dev.:	28.5 microns

Figure 3: Sample 2 particles diameter distribution and corresponding statistics. Diameter to volume graph is available in the results section. Graphs and statistics for both magnifications can also be expressed separately.

Equipment

Image Analysis System:	Clemex Vision PE V6
Microscope:	Leica DM 6000 M
Objective/Magnif cation:	5x / 50x and 50x / 500x
Illumination:	Dark Field
Calibration:	1.64 micron/pixel at 50x and 0.163 micron/pixel at 500x
Camera:	Clemex L 1.3M
Motorized Stage:	Marzhauser EK32IM 75x50mm
Stage Controller:	Clemex ST-2000
Disperser:	Clemex Powder disperser (S1 only)

Discussion

The main diff culty of this analysis resides in the large size distribution of the particles. To see down to 1 micron as requested, 500x magnif cation is necessary. However, at such high magnif cation, the large particles cannot be properly measured. A 50x magnif cation is a good choice to measure features over 250 microns without creating a shadow effect which increases their size. However, at this magnif cation, the smallest particles cannot be measured. The problem was overcome by performing a two magnif cation analysis.

1 *Images taken during the procedure are available in appendix A*

2 *Complete results are available in appendix B.*

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Appendix A: Image Analysis Steps

Image Analysis Steps

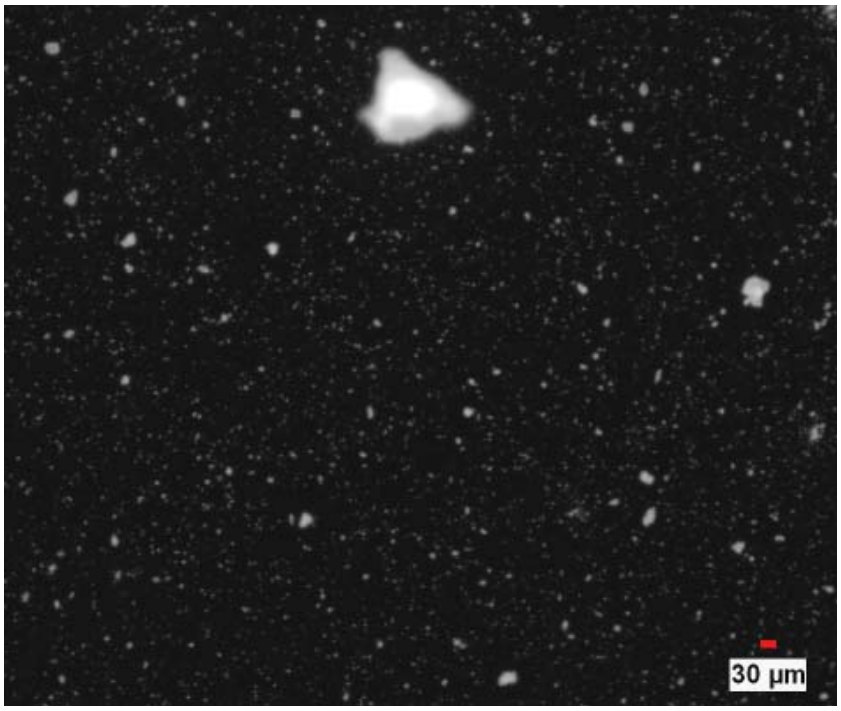

Image 1: Original image captured at 50x (1.64 mic/pix) from sample 1 as dispersed using the Clemex powder disperser. This field shows the largest feature found for sample 1 analysis.

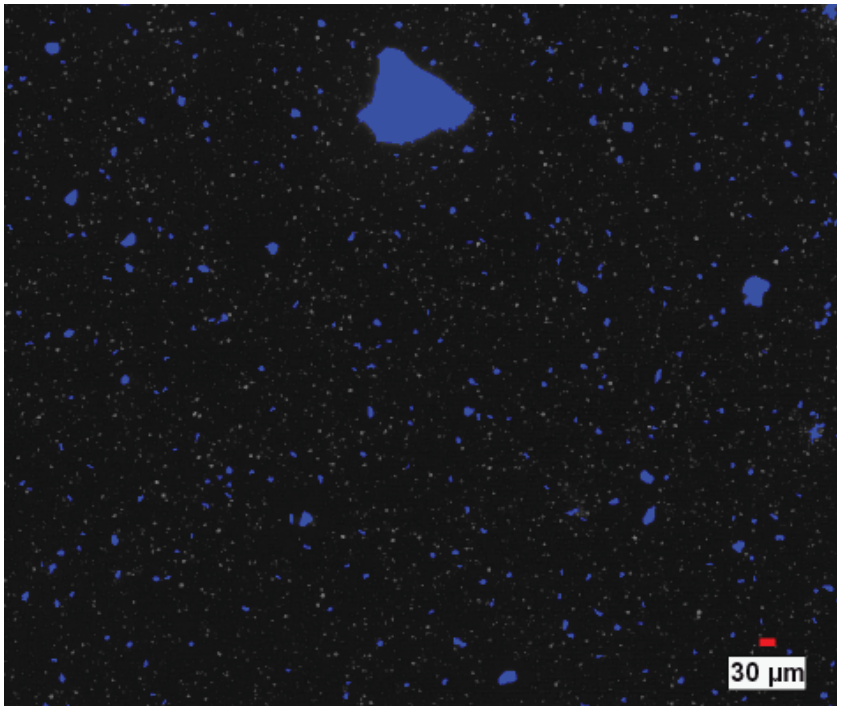

Image 2: Same as previous as binarized and measured. Only particles longer than 14 microns are considered here.

Image Analysis Steps

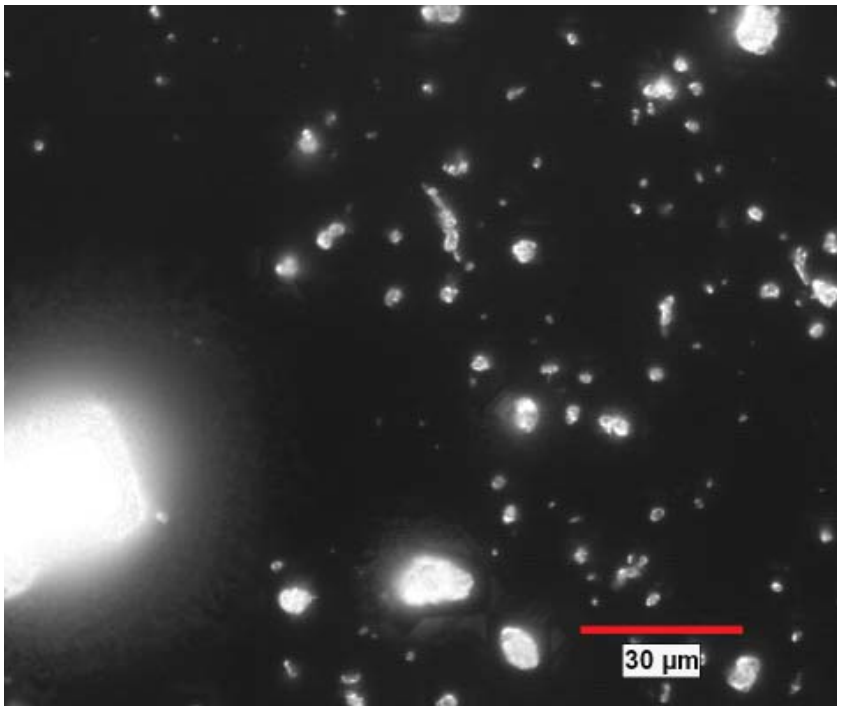

Image 3: Typical field of view at 500x (0.1632 mic/pix) from the same sample. We can see a particle above 30 microns that shows an evident halo effect.

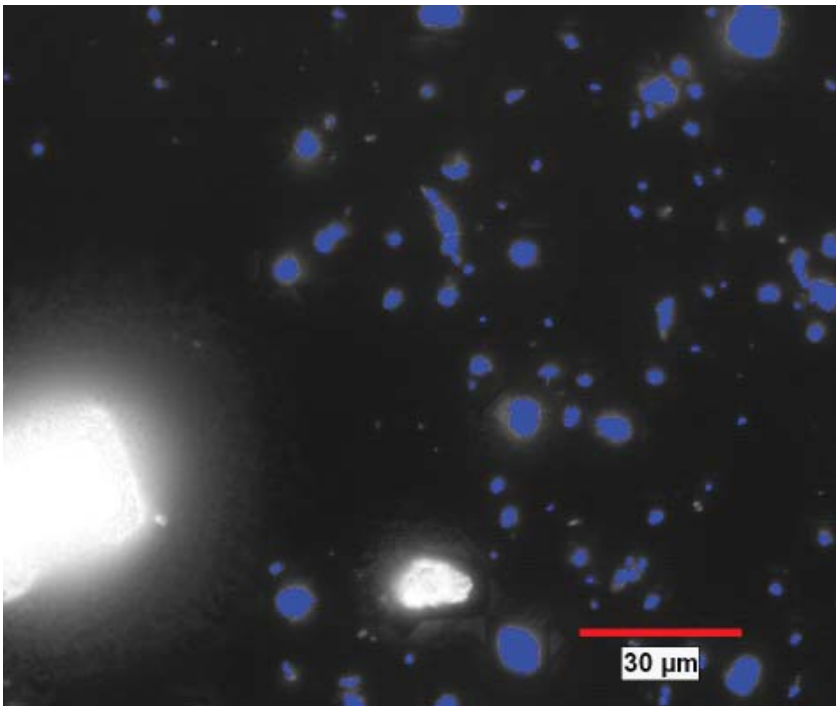

Image 4: Same as image 3 as binarized and measured. Particles longer than 14 microns are not considered here.

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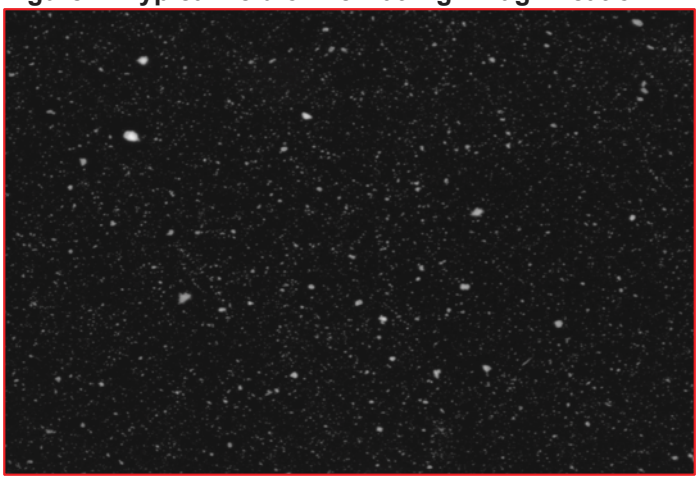
Appendix B: Results

Sample # 1

Particle Size and Shape Analysis

Date:	2009-Dec-15, 5:36:43 PM -05'00'	**User Name:**	Myriam Savard
Company:	Clemex	**Sample ID:**	1
Department:	Laboratory	**Units:**	microns

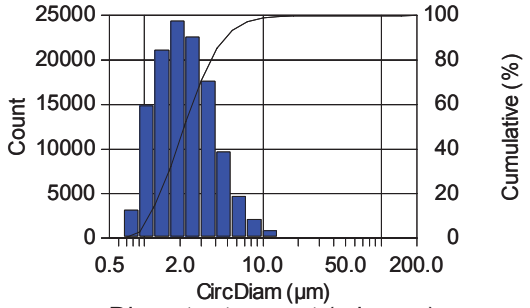
Figure 1: Typical field of view at high magnification.



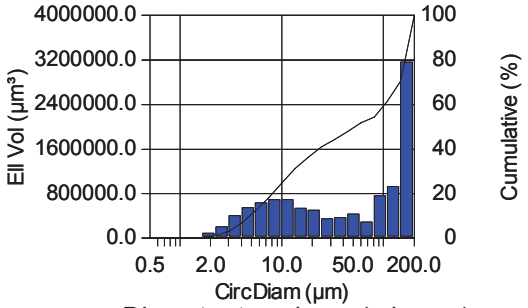
1st pass
Magnification: 50x
Calibration factor: 1.6424 µm/pixel
Particles: 1155

2nd pass
Magnification: 500x
Calibration factor: 0.1632 µm/pixel
Particles: 120543

Total particles: 121698
Fields analyzed: 1033



Diameter to count (microns)



Diameter to volume (microns)

Min.:	0.45	0.45
Max.:	168.90	168.90
Mean:	2.69	77.54
Std Dev.:	2.09	72.33
D10:	1.10	4.88
D50:	2.16	53.34
D90:	4.75	153.26

	Length (microns)	Width (mircrons)	Area (microns^2)
Min.:	0.98	0.16	0.16
Max.:	219.26	165.88	22405.25
Mean:	3.48	2.37	9.12
Std Dev.:	2.85	1.90	82.64
D10:	1.35	0.96	0.94
D50:	2.73	1.91	3.66
D90:	6.25	4.23	17.70

	Aspect Ratio	Sphericity	Roundness
Min.:	1.03	0.18	0.09
Max.:	7.17	1	0.93
Mean:	1.50	0.90	0.63
Std Dev.:	0.33	0.13	0.13
D10:	1.19	0.70	0.45
D50:	1.41	0.95	0.64
D90:	1.90	1.00	0.78

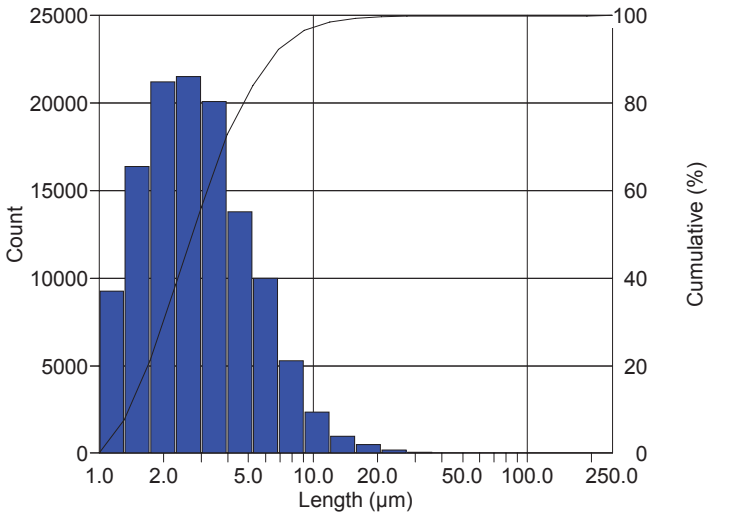
Results printed directly form Clemex Vision

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:52:26 AM**
Department:	**Laboratory**	Sample:	**1**
User:	**Myriam Savard**		

OBJM1 Count - Length

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Length Intervals (µm)		Count	%	Cumul%
1	- 1.3	9282	7.63	7.63
1.3	- 1.7	16378	13.46	21.08
1.7	- 2.3	21218	17.43	38.52
2.3	- 3.0	21526	17.69	56.21
3.0	- 4	20117	16.53	72.74
4	- 5.2	13801	11.34	84.08
5.2	- 6.9	10000	8.22	92.30
6.9	- 9.1	5274	4.33	96.63
9.1	- 12	2352	1.93	98.56
12	- 15.8	983	0.81	99.37
15.8	- 20.8	479	0.39	99.76
20.8	- 27.5	175	0.14	99.91
27.5	- 36	64	0.05	99.96
36	- 48	29	0.02	99.98
48	- 63	11	9.04e-03	99.99
63	- 83	3	2.47e-03	100.00
83	- 109	2	1.65e-03	100.00
109	- 144	2	1.64e-03	100.00
144	- 190	1	822.54e-06	100.00
190	- 250	1	822.54e-06	100

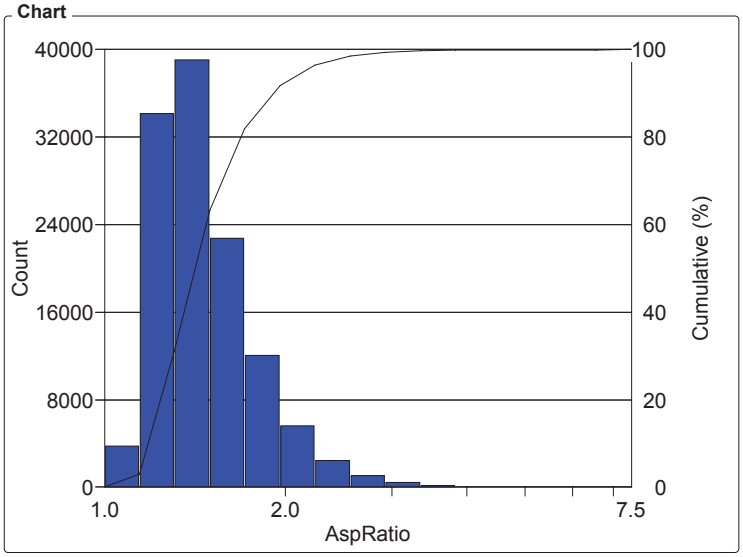
Statistics

Minimum:	1.0	µm
Maximum:	219.3	µm
Mean:	3.5	µm
Std Dev.:	2.9	µm
Sum:	424065.4	µm
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.4	µm
D50:	2.7	µm
D90:	6.2	µm

OBJM1 Count - AspRatio

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

AspRatio Intervals		Count	%	Cumul%
1	- 1.14	3751	3.08	3.08
1.14	- 1.31	34176	28.08	31.16
1.31	- 1.50	39048	32.09	63.25
1.50	- 1.71	22772	18.71	81.96
1.71	- 1.96	12049	9.90	91.86
1.96	- 2.24	5637	4.63	96.50
2.24	- 2.56	2478	2.04	98.53
2.56	- 2.93	1052	0.86	99.40
2.93	- 3.35	457	0.38	99.77
3.35	- 3.83	169	0.14	99.91
3.83	- 4.38	63	0.05	99.96
4.38	- 5.01	29	0.02	99.99
5.01	- 5.73	9	7.40e-03	99.99
5.73	- 6.56	5	4.11e-03	100.00
6.56	- 7.50	3	2.47e-03	100

Statistics

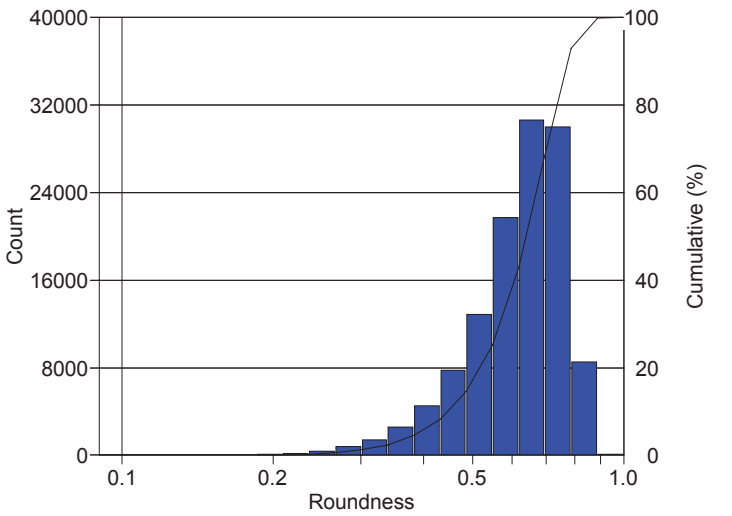
Minimum:	1.0	
Maximum:	7.2	
Mean:	1.5	
Std Dev.:	0.3	
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.2	
D50:	1.4	
D90:	1.9	

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:52:26 AM**
Department:	**Laboratory**	Sample:	**1**
User:	**Myriam Savard**		

OBJM1 Count - Roundness

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Roundness Intervals		Count	%	Cumul%
0.09	- 0.10	2	1.64e-03	1.64e-03
0.10	- 0.12	2	1.64e-03	3.29e-03
0.12	- 0.13	4	3.29e-03	6.57e-03
0.13	- 0.15	7	5.75e-03	0.01
0.15	- 0.16	14	0.01	0.02
0.16	- 0.19	38	0.03	0.06
0.19	- 0.21	70	0.06	0.11
0.21	- 0.24	199	0.16	0.28
0.24	- 0.27	381	0.31	0.59
0.27	- 0.30	814	0.67	1.26
0.30	- 0.34	1402	1.15	2.41
0.34	- 0.38	2620	2.15	4.56
0.38	- 0.43	4496	3.69	8.26
0.43	- 0.49	7750	6.37	14.63
0.49	- 0.55	12851	10.56	25.19
0.55	- 0.62	21760	17.88	43.07
0.62	- 0.70	30648	25.18	68.25
0.70	- 0.79	30023	24.67	92.92
0.79	- 0.89	8511	6.99	99.91
0.89	- 1	106	0.09	100

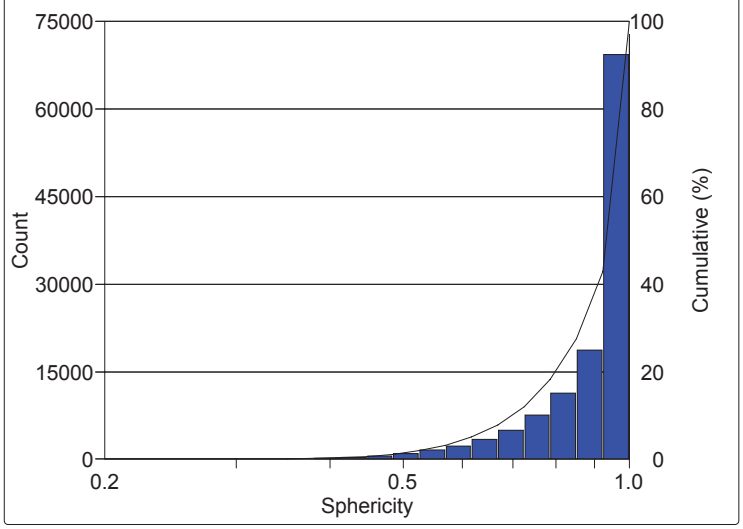
Statistics

Minimum:	0.1	
Maximum:	0.9	
Mean:	0.6	
Std Dev.:	0.1	
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	0.4	
D50:	0.6	
D90:	0.8	

OBJM1 Count - Sphericity

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Sphericity Intervals		Count	%	Cumul%
0.20	- 0.22	2	1.64e-03	1.64e-03
0.22	- 0.23	4	3.29e-03	4.93e-03
0.23	- 0.25	1	821.71e-06	5.75e-03
0.25	- 0.28	7	5.75e-03	0.01
0.28	- 0.30	16	0.01	0.02
0.30	- 0.32	27	0.02	0.05
0.32	- 0.35	56	0.05	0.09
0.35	- 0.38	105	0.09	0.18
0.38	- 0.41	228	0.19	0.37
0.41	- 0.45	370	0.30	0.67
0.45	- 0.49	607	0.50	1.17
0.49	- 0.52	927	0.76	1.93
0.52	- 0.57	1568	1.29	3.22
0.57	- 0.62	2289	1.88	5.10
0.62	- 0.67	3412	2.80	7.90
0.67	- 0.73	5029	4.13	12.04
0.73	- 0.79	7593	6.24	18.28
0.79	- 0.85	11358	9.33	27.61
0.85	- 0.92	18671	15.34	42.95
0.92	- 1	69428	57.05	100

Statistics

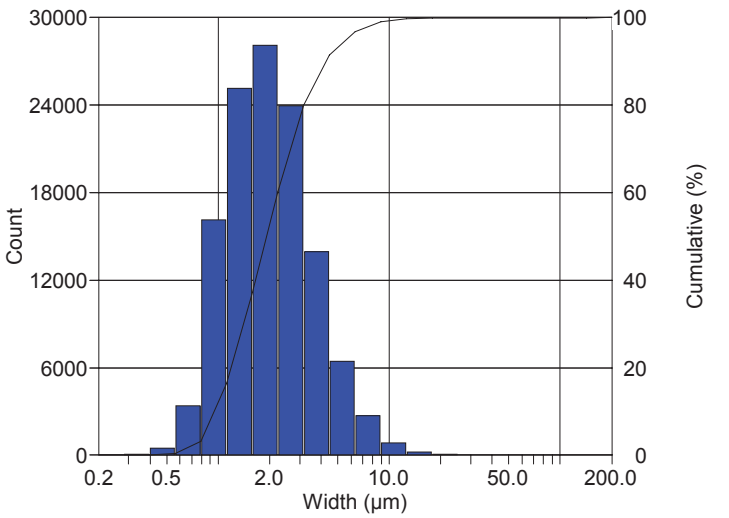
Minimum:	0.2	
Maximum:	1.0	
Mean:	0.9	
Std Dev.:	0.1	
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	0.7	
D50:	1.0	
D90:	1.0	

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:52:26 AM**
Department:	**Laboratory**	Sample:	**1**
User:	**Myriam Savard**		

OBJM1 Count - Width

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Width Intervals (µm)		Count	%	Cumul%
0.2	- 0.3	4	3.29e-03	3.29e-03
0.3	- 0.4	102	0.08	0.09
0.4	- 0.6	470	0.39	0.47
0.6	- 0.8	3393	2.79	3.26
0.8	- 1.1	16140	13.26	16.52
1.1	- 1.6	25140	20.66	37.18
1.6	- 2.2	28134	23.12	60.30
2.2	- 3.2	23985	19.71	80.01
3.2	- 4.5	13940	11.45	91.46
4.5	- 6.3	6457	5.31	96.77
6.3	- 8.9	2731	2.24	99.01
8.9	- 12.6	838	0.69	99.70
12.6	- 17.8	248	0.20	99.90
17.8	- 25	80	0.07	99.97
25	- 36	23	0.02	99.99
36	- 50	6	4.93e-03	99.99
50	- 71	2	1.65e-03	100.00
71	- 100	3	2.46e-03	100.00
100	- 142	1	822.54e-06	100.00
142	- 200	1	822.54e-06	100

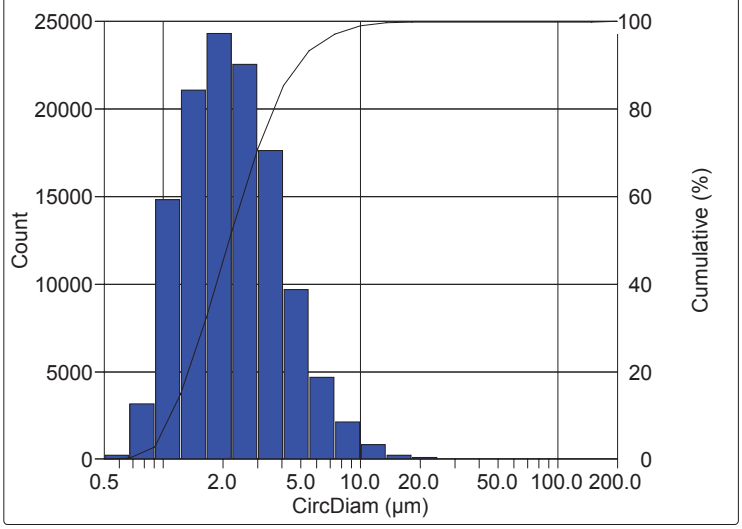
Statistics

Minimum:	0.2	µm
Maximum:	165.9	µm
Mean:	2.4	µm
Std Dev.:	1.9	µm
Sum:	288347.1	µm
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.0	µm
D50:	1.9	µm
D90:	4.2	µm

OBJM1 Count - CircDiam

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

CircDiam Intervals (µm)		Count	%	Cumul%
0.5	- 0.7	248	0.20	0.20
0.7	- 0.9	3155	2.59	2.80
0.9	- 1.2	14839	12.19	14.99
1.2	- 1.7	21102	17.34	32.33
1.7	- 2.2	24341	20.00	52.33
2.2	- 3	22582	18.56	70.89
3	- 4.1	17637	14.49	85.38
4.1	- 5.5	9713	7.98	93.36
5.5	- 7.4	4699	3.86	97.22
7.4	- 10	2124	1.75	98.97
10	- 13.5	855	0.70	99.67
13.5	- 18.2	258	0.21	99.88
18.2	- 24.6	94	0.08	99.96
24.6	- 33	29	0.02	99.98
33	- 45	12	9.86e-03	99.99
45	- 60	5	4.11e-03	100.00
60	- 81	1	822.54e-06	100.00
81	- 110	2	1.64e-03	100.00
110	- 148	1	822.54e-06	100.00
148	- 200	1	822.54e-06	100

Statistics

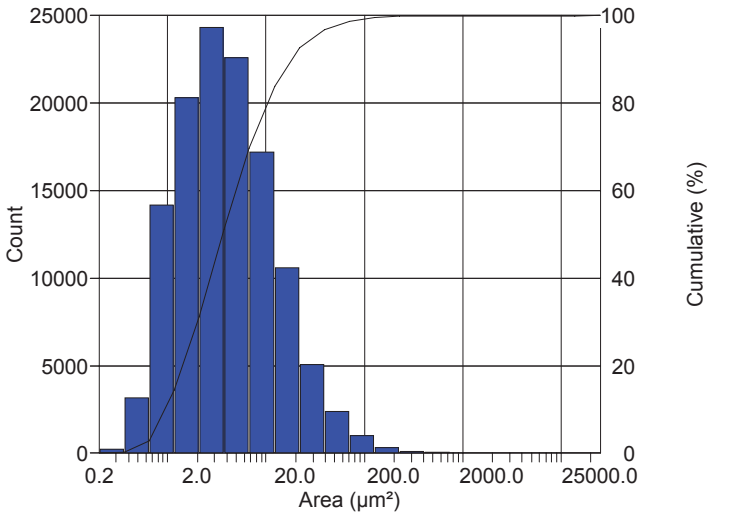
Minimum:	0.5	µm
Maximum:	168.9	µm
Mean:	2.7	µm
Std Dev.:	2.1	µm
Sum:	327103.4	µm
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.1	µm
D50:	2.2	µm
D90:	4.7	µm

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:52:26 AM**
Department:	**Laboratory**	Sample:	**1**
User:	**Myriam Savard**		

OBJM1 Count - Area

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Area Intervals (µm²)		Count	%	Cumul%
0.2	- 0.4	248	0.20	0.20
0.4	- 0.6	3155	2.59	2.80
0.6	- 1.2	14199	11.67	14.46
1.2	- 2.1	20334	16.71	31.17
2.1	- 3.8	24325	19.99	51.16
3.8	- 6.8	22595	18.57	69.73
6.8	- 12.2	17227	14.16	83.88
12.2	- 22	10618	8.72	92.61
22	- 39	5077	4.17	96.78
39	- 71	2407	1.98	98.76
71	- 127	1019	0.84	99.59
127	- 229	309	0.25	99.85
229	- 411	113	0.09	99.94
411	- 739	45	0.04	99.98
739	- 1330	15	0.01	99.99
1330	- 2391	5	4.11e-03	99.99
2391	- 4299	2	1.65e-03	100.00
4299	- 7731	3	2.46e-03	100.00
7731	- 13903	1	822.54e-06	100.00
13903	- 25000	1	822.54e-06	100

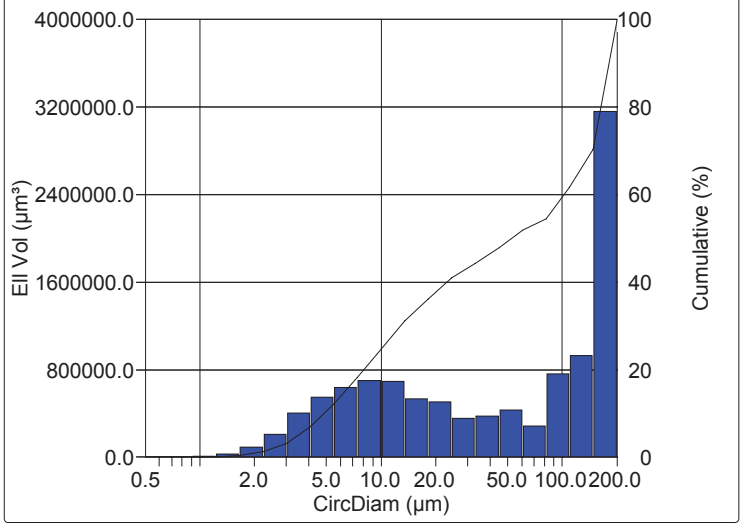
Statistics

Minimum:	0.2	µm²
Maximum:	22405.3	µm²
Mean:	9.1	µm²
Std Dev.:	82.6	µm²
Sum:	1109847.9	µm²
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	0.9	µm²
D50:	3.7	µm²
D90:	17.7	µm²

OBJM1 Ell Vol - CircDiam

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

CircDiam Intervals (µm)		Ell Vol (µm³)	%	Cumul%
0.5	- 0.7	27.0	252.92e-06	252.92e-06
0.7	- 0.9	868.9	8.14e-03	8.39e-03
0.9	- 1.2	9095.1	0.09	0.09
1.2	- 1.7	32805.8	0.31	0.40
1.7	- 2.2	93835.6	0.88	1.28
2.2	- 3	210852.0	1.98	3.26
3	- 4.1	406540.4	3.81	7.06
4.1	- 5.5	548423.6	5.14	12.20
5.5	- 7.4	636996.7	5.97	18.17
7.4	- 10	699283.3	6.55	24.72
10	- 13.5	694389.7	6.51	31.23
13.5	- 18.2	537188.9	5.03	36.26
18.2	- 24.6	505160.3	4.73	40.99
24.6	- 33	353609.5	3.31	44.31
33	- 45	379466.7	3.56	47.86
45	- 60	429379.2	4.02	51.89
60	- 81	286271.7	2.68	54.57
81	- 110	763418.9	7.15	61.72
110	- 148	926528.5	8.68	70.40
148	- 200	3159071.5	29.60	100

Statistics

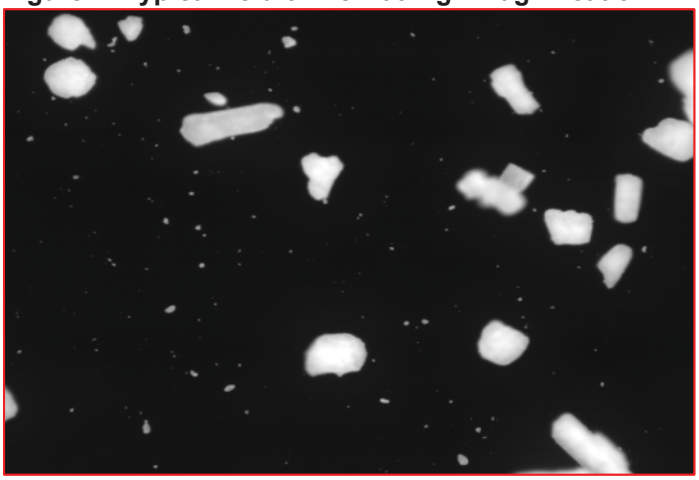
Minimum:	0.5	µm
Maximum:	168.9	µm
Mean:	77.5	µm
Std Dev.:	72.3	µm
Sum:	827553343.8	µm
Count:	121698	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	4.9	µm
D50:	53.3	µm
D90:	153.3	µm

Sample # 2

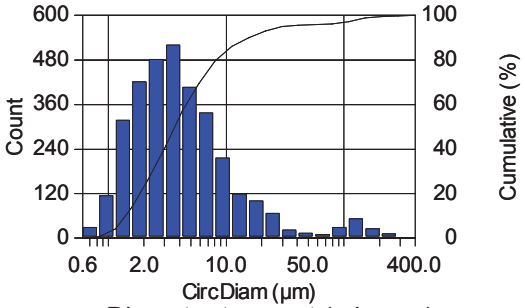
Particle Size and Shape Analysis

Date:	2009-Dec-15, 12:51:25 PM -05'00	**User Name:**	Myriam Savard
Company:	Clemex	**Sample ID:**	2
Department:	Laboratory	**Units:**	microns

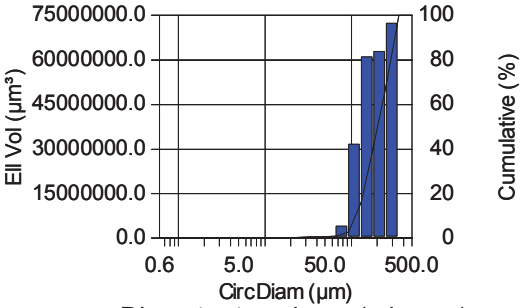
Figure 1: Typical field of view at high magnification.



1st pass	
Magnification:	50x
Calibration factor:	1.6424 µm/pixel
Particles:	443
2nd pass	
Magnification:	500x
Calibration factor:	0.1632 µm/pixel
Particles:	2854
Total particles:	3297
Fields analyzed:	1033



Diameter to count (microns)



Diameter to volume (microns)

Min.:	0.64	0.64
Max.:	331.65	331.65
Mean:	10.68	203.29
Std Dev.:	28.52	73.54
D10:	1.41	115.96
D50:	3.60	192.08
D90:	15.51	304.69

	Length (microns)	Width (mircrons)	Area (microns^2)
Min.:	0.88	0.33	0.32
Max.:	483.48	269.56	86389.42
Mean:	13.97	9.02	728.37
Std Dev.:	38.59	23.13	4404.43
D10:	1.88	1.25	1.56
D50:	4.46	3.24	10.17
D90:	19.76	13.06	188.98

	Aspect Ratio	Sphericity	Roundness
Min.:	1.06	0.11	0.10
Max.:	4.50	1	0.91
Mean:	1.48	0.85	0.62
Std Dev.:	0.33	0.14	0.13
D10:	1.17	0.66	0.45
D50:	1.40	0.88	0.64
D90:	1.87	1.00	0.78

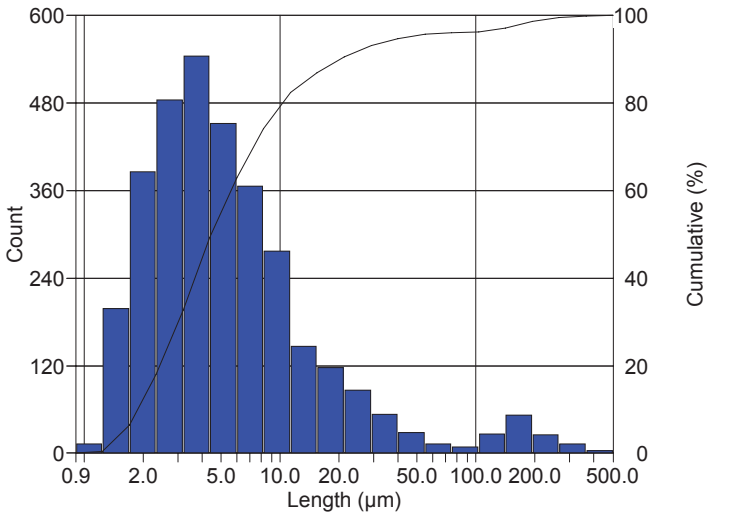
Results printed directly form Clemex Vision

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:54:37 AM**
Department:	**Laboratory**	Sample:	**2**
User:	**Myriam Savard**		

OBJM1 Count - Length

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Length Intervals (µm)		Count	%	Cumul%
0.9	- 1.2	13	0.39	0.39
1.2	- 1.7	198	6.01	6.40
1.7	- 2.3	386	11.71	18.11
2.3	- 3.2	484	14.68	32.79
3.2	- 4.4	545	16.53	49.32
4.4	- 6	452	13.71	63.03
6	- 8.2	366	11.10	74.13
8.2	- 11.3	277	8.40	82.53
11.3	- 15.5	147	4.46	86.99
15.5	- 21.2	118	3.58	90.57
21.2	- 29	87	2.64	93.21
29	- 40	53	1.61	94.81
40	- 55	29	0.88	95.69
55	- 75	13	0.39	96.09
75	- 103	9	0.27	96.36
103	- 141	26	0.79	97.15
141	- 194	52	1.58	98.73
194	- 266	25	0.76	99.48
266	- 365	13	0.39	99.88
365	- 500	4	0.12	100

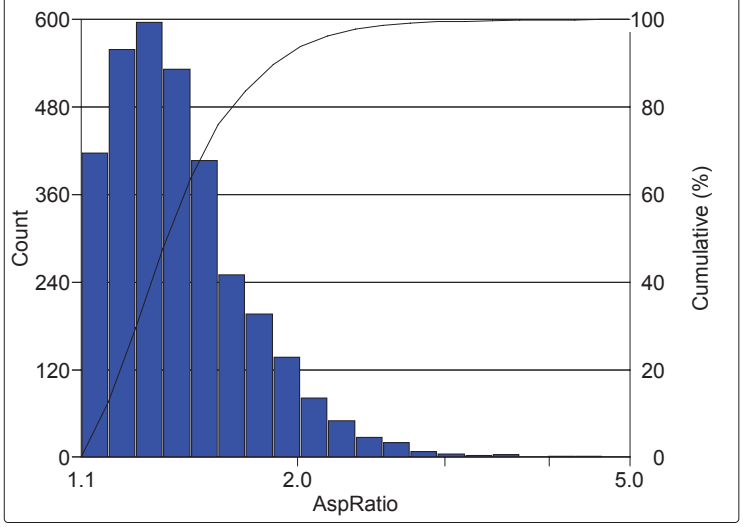
Statistics

Minimum:	0.9	µm
Maximum:	483.5	µm
Mean:	14.0	µm
Std Dev.:	38.6	µm
Sum:	46048.4	µm
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.9	µm
D50:	4.5	µm
D90:	19.8	µm

OBJM1 Count - AspRatio

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

AspRatio Intervals		Count	%	Cumul%
1.10	- 1.19	417	12.65	12.65
1.19	- 1.28	559	16.95	29.60
1.28	- 1.38	596	18.08	47.68
1.38	- 1.49	532	16.14	63.82
1.49	- 1.61	407	12.34	76.16
1.61	- 1.73	250	7.58	83.74
1.73	- 1.87	196	5.94	89.69
1.87	- 2.02	137	4.16	93.84
2.02	- 2.17	81	2.46	96.30
2.17	- 2.35	50	1.52	97.82
2.35	- 2.53	27	0.82	98.64
2.53	- 2.73	20	0.61	99.24
2.73	- 2.94	8	0.24	99.48
2.94	- 3.17	5	0.15	99.64
3.17	- 3.42	3	0.09	99.73
3.42	- 3.69	4	0.12	99.85
3.69	- 3.98	1	0.03	99.88
3.98	- 4.30	2	0.06	99.94
4.30	- 4.64	2	0.06	100
4.64	- 5	0	0	100

Statistics

Minimum:	1.1	
Maximum:	4.5	
Mean:	1.5	
Std Dev.:	0.3	
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.2	
D50:	1.4	
D90:	1.9	

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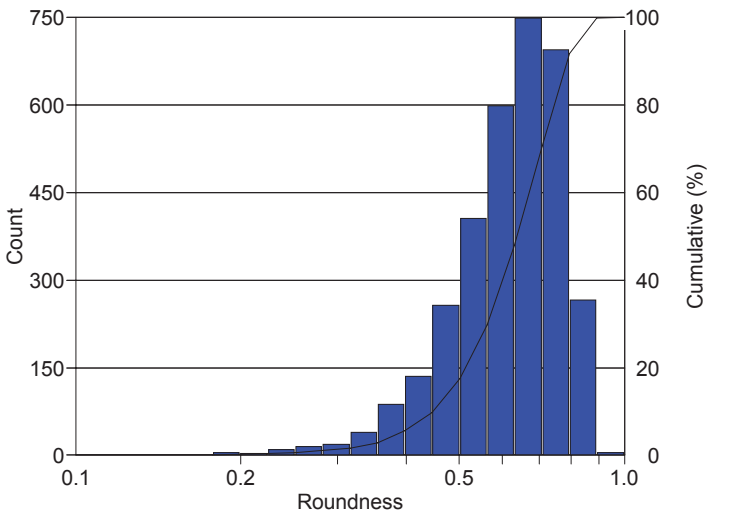
Organization:	**Clemex**	Date & Time:	**12/17/2009 9:54:38 AM**
Department:	**Laboratory**	Sample:	**2**
User:	**Myriam Savard**		

OBJM1 Count - Roundness

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Roundness Intervals		Count	%	Cumul%
0.10	- 0.11	1	0.03	0.03
0.11	- 0.13	0	0	0.03
0.13	- 0.14	1	0.03	0.06
0.14	- 0.16	1	0.03	0.09
0.16	- 0.18	1	0.03	0.12
0.18	- 0.20	5	0.15	0.27
0.20	- 0.22	3	0.09	0.36
0.22	- 0.25	10	0.30	0.67
0.25	- 0.28	15	0.45	1.12
0.28	- 0.32	19	0.58	1.70
0.32	- 0.35	40	1.21	2.91
0.35	- 0.40	88	2.67	5.58
0.40	- 0.45	136	4.12	9.71
0.45	- 0.50	257	7.79	17.50
0.50	- 0.56	406	12.31	29.81
0.56	- 0.63	599	18.17	47.98
0.63	- 0.71	749	22.72	70.70
0.71	- 0.79	695	21.08	91.78
0.79	- 0.89	266	8.07	99.85
0.89	- 1	5	0.15	100

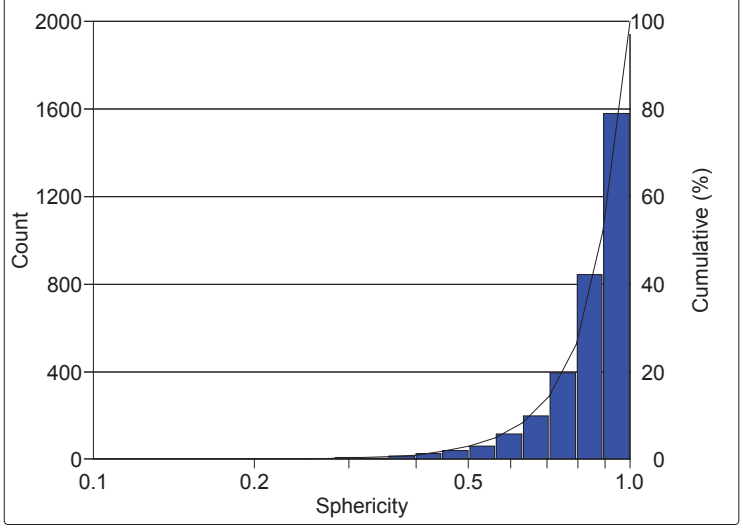
Statistics

Minimum:	0.1	
Maximum:	0.9	
Mean:	0.6	
Std Dev.:	0.1	
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	0.4	
D50:	0.6	
D90:	0.8	

OBJM1 Count - Sphericity

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Sphericity Intervals		Count	%	Cumul%
0.10	- 0.11	0	0	0
0.11	- 0.13	1	0.03	0.03
0.13	- 0.14	2	0.06	0.09
0.14	- 0.16	0	0	0.09
0.16	- 0.18	0	0	0.09
0.18	- 0.20	1	0.03	0.12
0.20	- 0.22	0	0	0.12
0.22	- 0.25	0	0	0.12
0.25	- 0.28	3	0.09	0.21
0.28	- 0.32	8	0.24	0.45
0.32	- 0.35	4	0.12	0.58
0.35	- 0.40	14	0.42	1.00
0.40	- 0.45	27	0.82	1.82
0.45	- 0.50	39	1.18	3.00
0.50	- 0.56	61	1.85	4.85
0.56	- 0.63	114	3.46	8.31
0.63	- 0.71	200	6.07	14.38
0.71	- 0.79	396	12.01	26.39
0.79	- 0.89	846	25.66	52.05
0.89	- 1	1581	47.95	100

Statistics

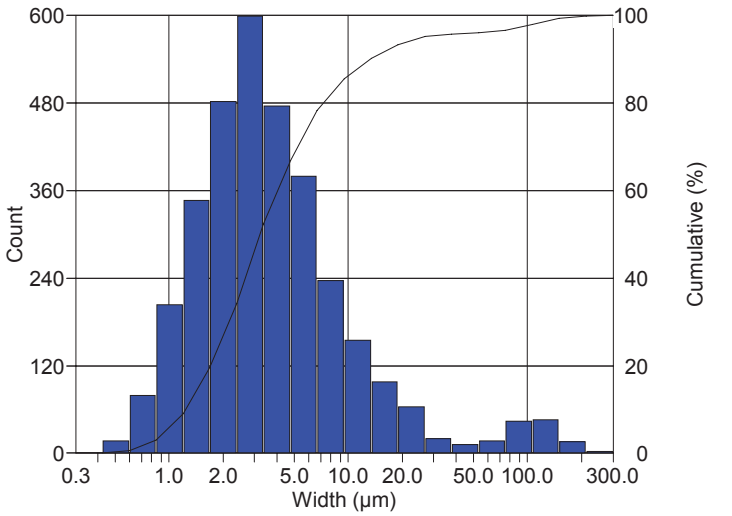
Minimum:	0.1	
Maximum:	1.0	
Mean:	0.9	
Std Dev.:	0.1	
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	0.7	
D50:	0.9	
D90:	1.0	

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:54:38 AM**
Department:	**Laboratory**	Sample:	**2**
User:	**Myriam Savard**		

OBJM1 Count - Width

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Width Intervals (µm)		Count	%	Cumul%
0.3	- 0.4	1	0.03	0.03
0.4	- 0.6	17	0.52	0.55
0.6	- 0.9	79	2.40	2.94
0.9	- 1.2	204	6.19	9.13
1.2	- 1.7	347	10.52	19.65
1.7	- 2.4	482	14.62	34.27
2.4	- 3.4	599	18.17	52.44
3.4	- 4.8	476	14.44	66.88
4.8	- 6.7	380	11.53	78.40
6.7	- 9.5	237	7.19	85.59
9.5	- 13.4	155	4.70	90.29
13.4	- 18.9	98	2.97	93.27
18.9	- 27	64	1.94	95.21
27	- 38	20	0.61	95.81
38	- 53	12	0.36	96.18
53	- 75	17	0.52	96.69
75	- 106	44	1.33	98.03
106	- 150	46	1.40	99.42
150	- 212	16	0.49	99.91
212	- 300	3	0.09	100

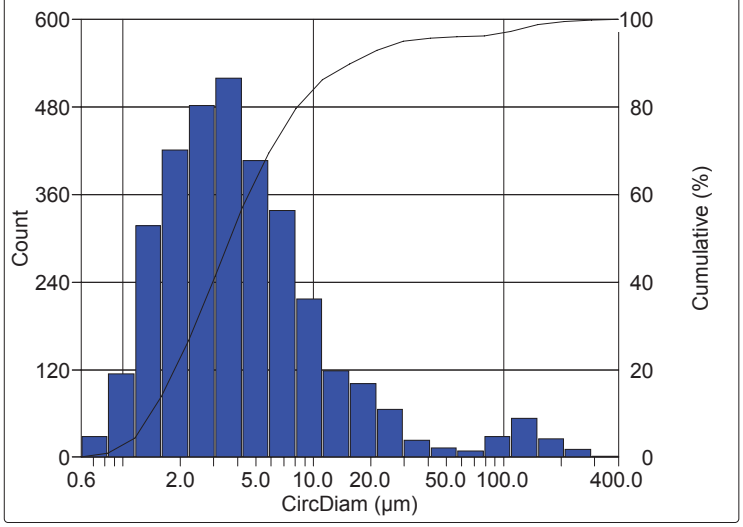
Statistics

Minimum:	0.3	µm
Maximum:	269.6	µm
Mean:	9.0	µm
Std Dev.:	23.1	µm
Sum:	29740.0	µm
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.3	µm
D50:	3.2	µm
D90:	13.1	µm

OBJM1 Count - CircDiam

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

CircDiam Intervals (µm)		Count	%	Cumul%
0.6	- 0.8	29	0.88	0.88
0.8	- 1.1	114	3.46	4.34
1.1	- 1.6	318	9.65	13.98
1.6	- 2.2	421	12.77	26.75
2.2	- 3	482	14.62	41.37
3	- 4.2	520	15.77	57.14
4.2	- 5.8	407	12.34	69.49
5.8	- 8.1	338	10.25	79.74
8.1	- 11.2	217	6.58	86.32
11.2	- 15.5	119	3.61	89.93
15.5	- 21.4	101	3.06	92.99
21.4	- 30	66	2.00	95.00
30	- 41	23	0.70	95.69
41	- 57	13	0.39	96.09
57	- 79	9	0.27	96.36
79	- 109	29	0.88	97.24
109	- 151	53	1.61	98.85
151	- 209	25	0.76	99.61
209	- 289	11	0.33	99.94
289	- 400	2	0.06	100

Statistics

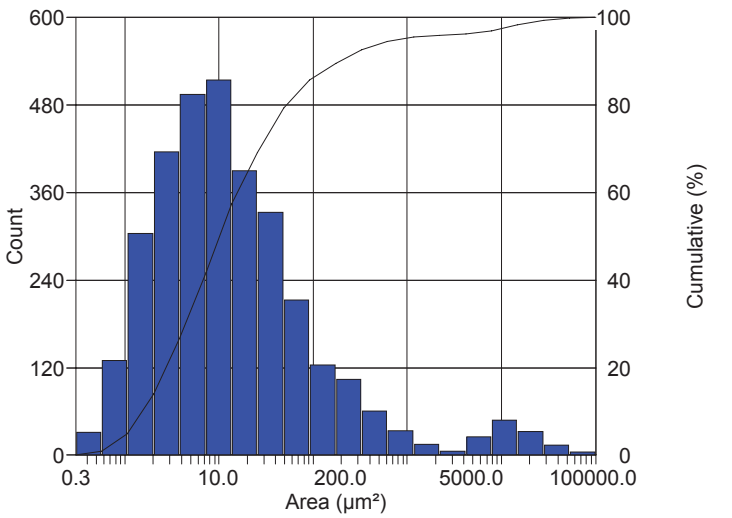
Minimum:	0.6	µm
Maximum:	331.7	µm
Mean:	10.7	µm
Std Dev.:	28.5	µm
Sum:	35204.0	µm
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.4	µm
D50:	3.6	µm
D90:	15.5	µm

Organization:	**Clemex**	Date & Time:	**12/17/2009 9:54:38 AM**
Department:	**Laboratory**	Sample:	**2**
User:	**Myriam Savard**		

OBJM1 Count - Area

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

Area Intervals (µm²)		Count	%	Cumul%
0.3	- 0.6	32	0.97	0.97
0.6	- 1.1	130	3.94	4.91
1.1	- 2	304	9.22	14.13
2	- 3.8	416	12.62	26.75
3.8	- 7.2	495	15.01	41.77
7.2	- 14	515	15.62	57.39
14	- 26	390	11.83	69.21
26	- 49	333	10.10	79.31
49	- 92	213	6.46	85.77
92	- 173	124	3.76	89.54
173	- 327	104	3.15	92.69
327	- 618	61	1.85	94.54
618	- 1167	34	1.03	95.57
1167	- 2204	15	0.45	96.03
2204	- 4162	6	0.18	96.21
4162	- 7860	25	0.76	96.97
7860	- 14845	48	1.46	98.42
14845	- 28036	33	1.00	99.42
28036	- 52949	14	0.42	99.85
52949	- 100000	5	0.15	100

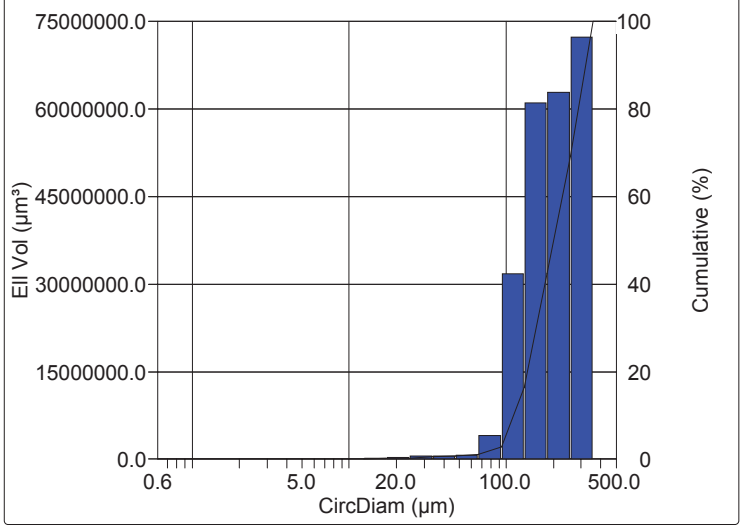
Statistics

Minimum:	0.3	µm²
Maximum:	86389.4	µm²
Mean:	728.4	µm²
Std Dev.:	4404.4	µm²
Sum:	2401422.5	µm²
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	1.6	µm²
D50:	10.2	µm²
D90:	189.0	µm²

OBJM1 Ell Vol - CircDiam

Magn.: 50x Calib.: 1.6424 µm/pixel Bitplane: All Mag

Chart



Values

CircDiam Intervals (µm)		Ell Vol (µm³)	%	Cumul%
0.6	- 0.8	7.9	3.37e-06	3.37e-06
0.8	- 1.2	96.0	40.86e-06	44.23e-06
1.2	- 1.6	536.0	228.14e-06	272.37e-06
1.6	- 2.3	1930.4	821.70e-06	1.09e-03
2.3	- 3.2	5984.6	2.55e-03	3.64e-03
3.2	- 4.5	15415.2	6.56e-03	0.01
4.5	- 6.3	34300.6	0.01	0.02
6.3	- 8.8	66889.4	0.03	0.05
8.8	- 12.4	97112.5	0.04	0.09
12.4	- 17.3	206091.3	0.09	0.18
17.3	- 24.2	356223.3	0.15	0.33
24.2	- 34	629496.7	0.27	0.60
34	- 47	555280.6	0.24	0.84
47	- 66	669252.1	0.28	1.12
66	- 93	4132910	1.76	2.88
93	- 130	31.8e+06	13.54	16.42
130	- 182	61.0e+06	25.99	42.41
182	- 255	62.9e+06	26.79	69.20
255	- 357	72.4e+06	30.80	100
357	- 500	0	0	100

Statistics

Minimum:	0.6	µm
Maximum:	331.7	µm
Mean:	203.3	µm
Std Dev.:	73.5	µm
Sum:	47756848644.2	µm
Count:	3297	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	1033	
Field Area:	48409.4	µm²
Total Area:	50006888.0	µm²
D10:	116.0	µm
D50:	192.1	µm
D90:	304.7	µm

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