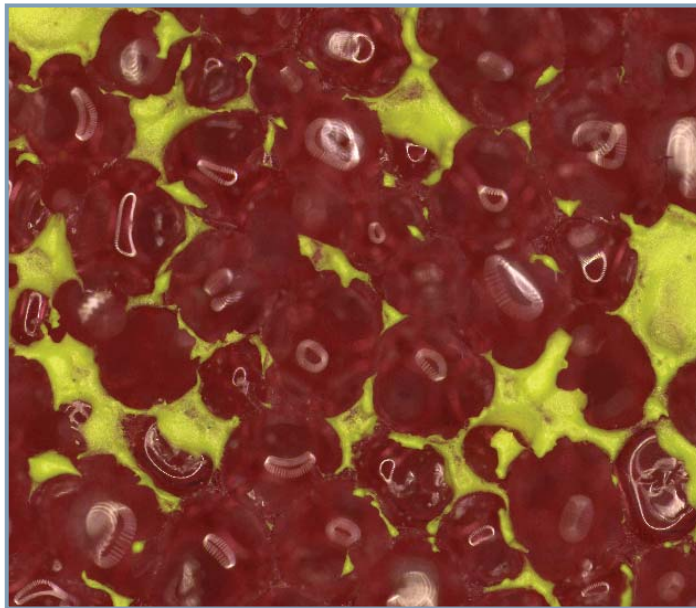


**CLEMEX**  
intelligent microscopy

**# 766**

## **Cell Size Analysis in Foam**



Prepared by Myriam Savard Eng.  
Clemex Technologies Inc.  
For Baker Hugues / Baker Oil Tools

### Sample Description

Four filtration foam samples were submitted for analysis.

### Purpose of Analysis

To demonstrate that the Clemex Vision image analysis system can distinguish the cells and perform size measurements on them.

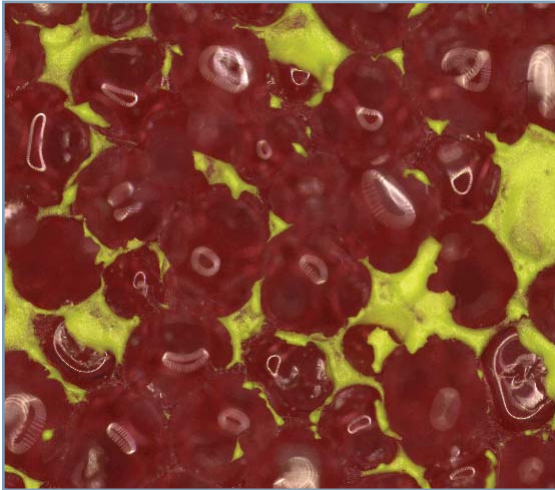


Figure 1: Part of the original image (2.6 microns/pixel).

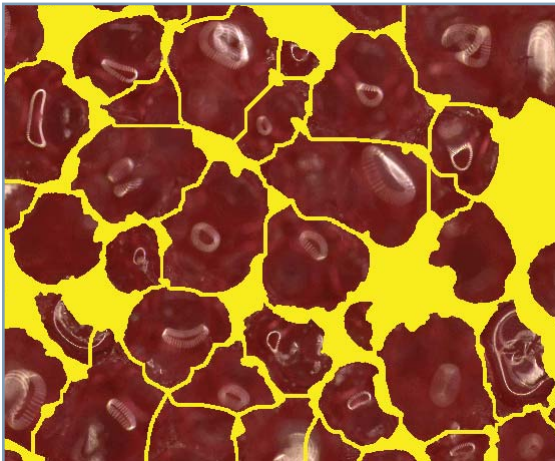


Figure 2: Outline of cells as they were measured.

### Procedure<sup>1</sup>

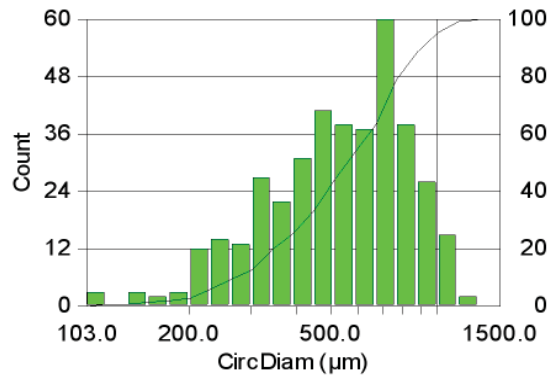
The analysis was performed on 2 mosaics of 7 x 6 fields captured on each sample. The cross sections were binarized into the green bitplane using color thresholding based on yellow detection.

Small artifacts were eliminated from the original detection. The green bitplane was inverted to obtain the network of interconnected cells. An automated separation tool was applied on this network isolating the cells prior to measurements.

<sup>1</sup> Images taken during the procedure are available in appendix A

### Results<sup>2</sup>

Area, Length, Circular Diameter, Roundness, and Width measurements were performed on each feature. Automated statistics and graphs were generated. Final results were printed directly from Clemex Vision and saved for further use. A customized report was built using the Report Generator module, so a customized page was produced for each sample and added to this report. Raw data is linked to their respective objects for validation purposes. Raw data could also be exported in Excel format.



Minimum:	102.8 microns
Maximum:	1239.1 microns
Mean:	573.0 microns
Std Dev.:	233.9 microns

Figure 3: Diameter distribution of cells and corresponding statistics.

### Equipment

Image Analysis System:	Clemex Vision PE
Microscope:	Leica Z6
Magnification:	36x
Illumination:	Reflected Light
Calibration:	2.6019 microns/pixel
Camera:	Clemex L 1.4C
Motorized Stage:	Marzhauser EK32IM 75x50mm
Stage Controller:	Clemex ST-2000

### Discussion

The main difficulty of this analysis was to obtain enough contrast to distinguish the foam cross sections and to isolate the cells. To overcome this problem, the top of each sample was covered with yellow paint, so the sectioned portions could be easily distinguished from the sample.

Since the cells were large and some sectioned walls very thin, a mosaic image was created for each sample. This allows a large covering area while still conserving a good resolution.

Results are reproducible.

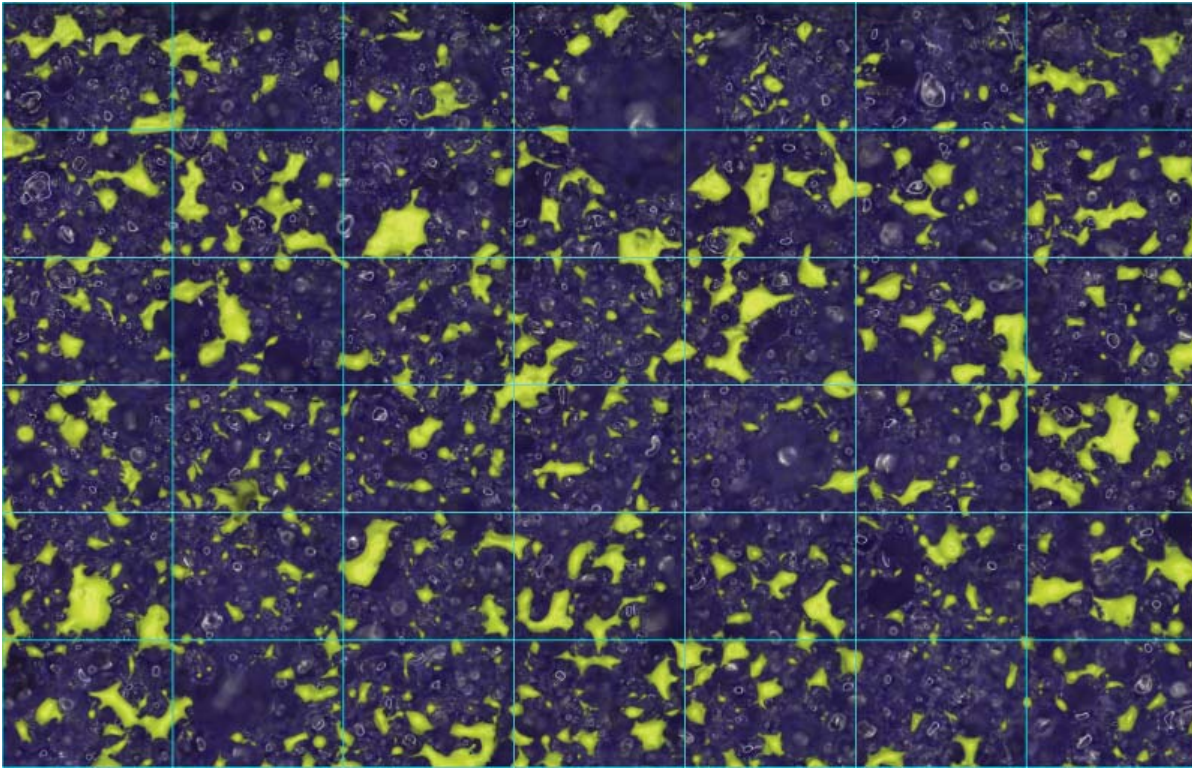
<sup>2</sup> Complete results are available in appendix B.



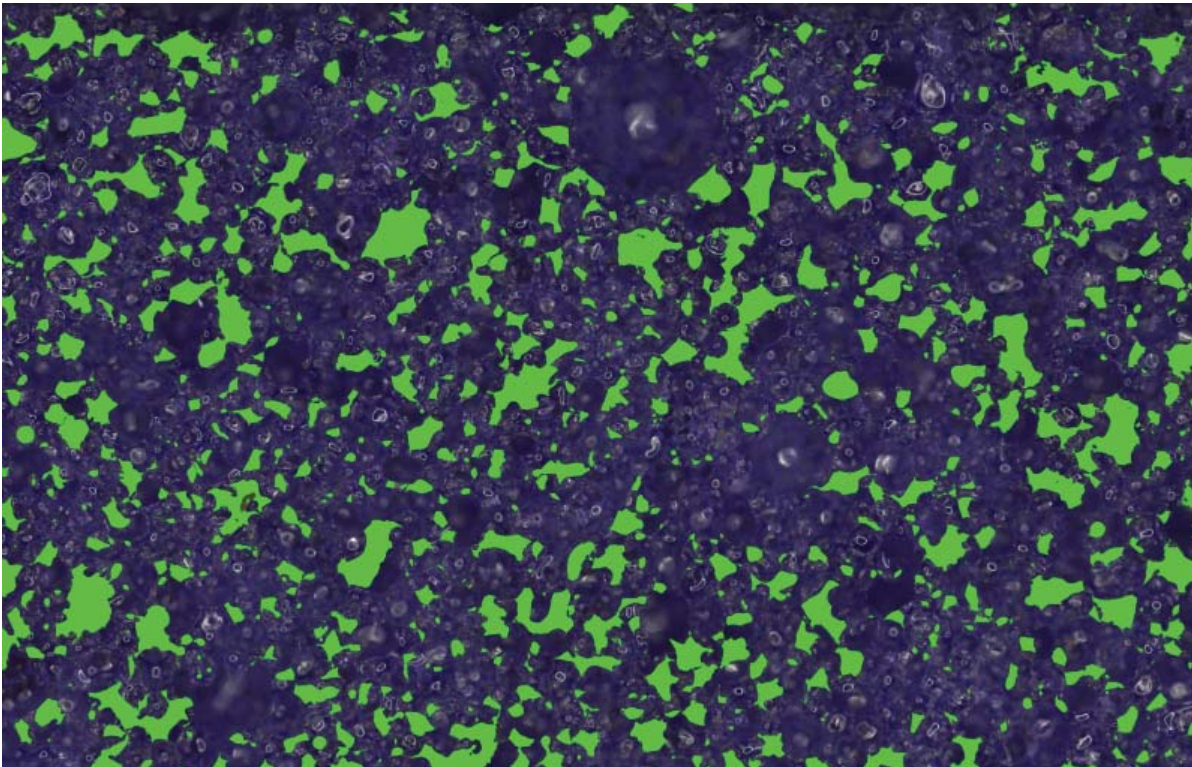
## **Appendix A: Image Analysis Steps**



## Image Analysis Steps

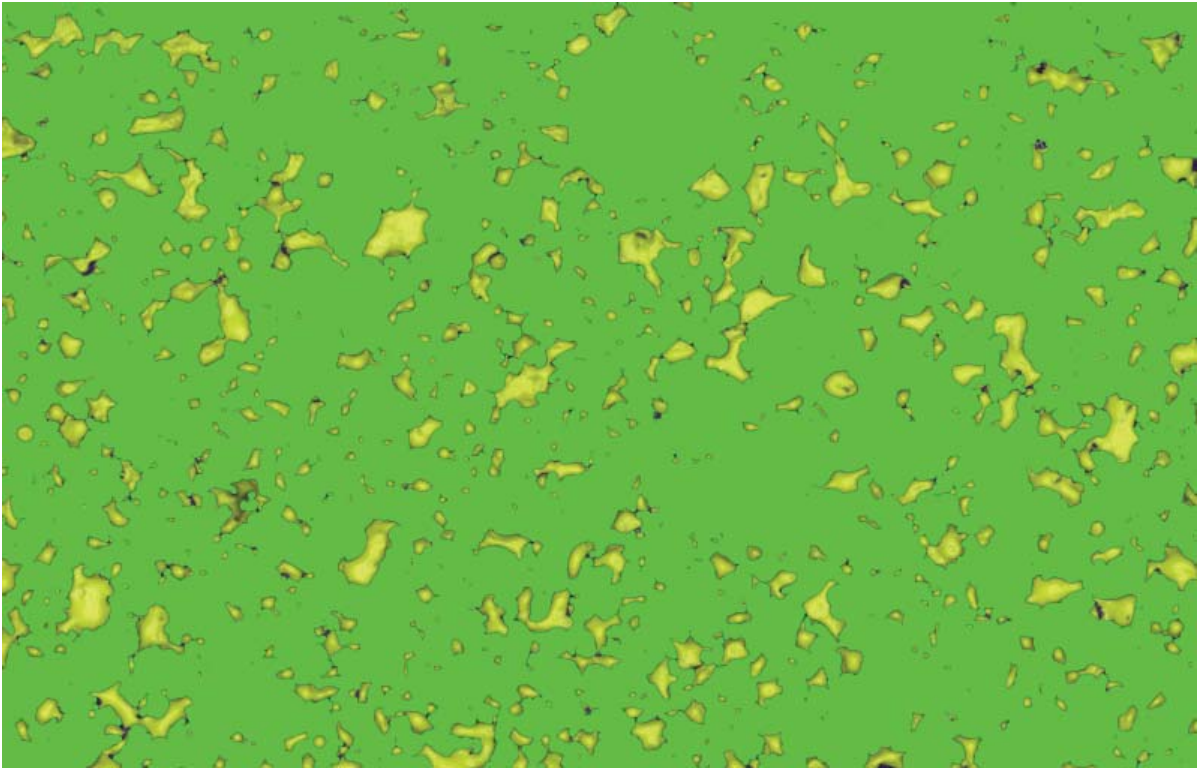


*Image 1: Shows one 7 x 6 mosaic image created from sample 02. A binary grid is overlaid against the original image to show the images stitching.*



*Image 2: Original image as binarized using the Color Thresholding tool based on yellow coloring. Small artifacts were eliminated.*

## Image Analysis Steps

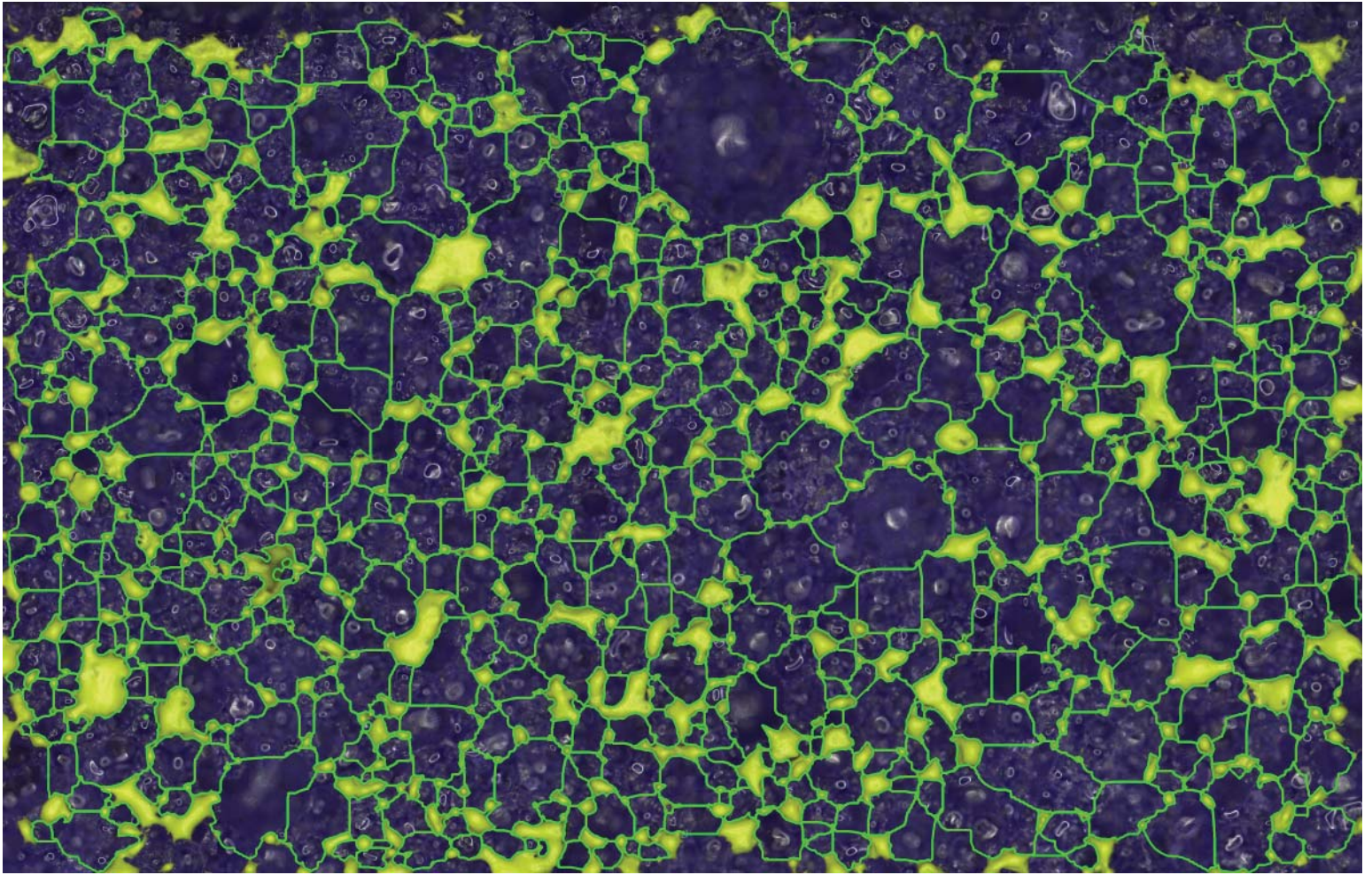


*Image 3: The binary plane was inverted to obtain the network of interconnected cells.*



*Image 4: Labelling view of the cells as automatically separated using the Bridge Removal tool. The labelling view attribute a different color to each separated feature, so we can easily see those that remained connected, if any.*

## Image Analysis Steps



*Image 5: Same bitplane as previous but inverted to allow the observation of the image through the bitplane. Cells were ready for the measurement step.*



## **Appendix B: Results**



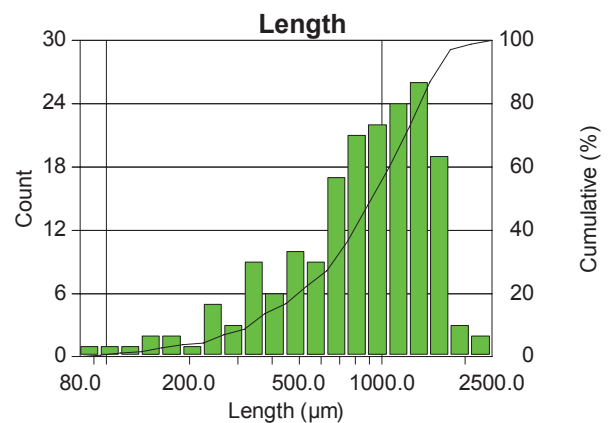
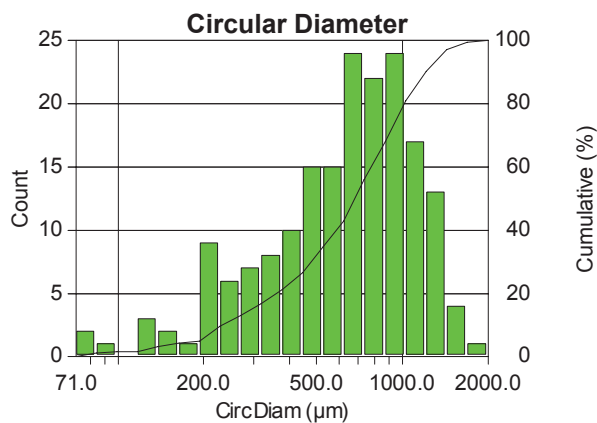
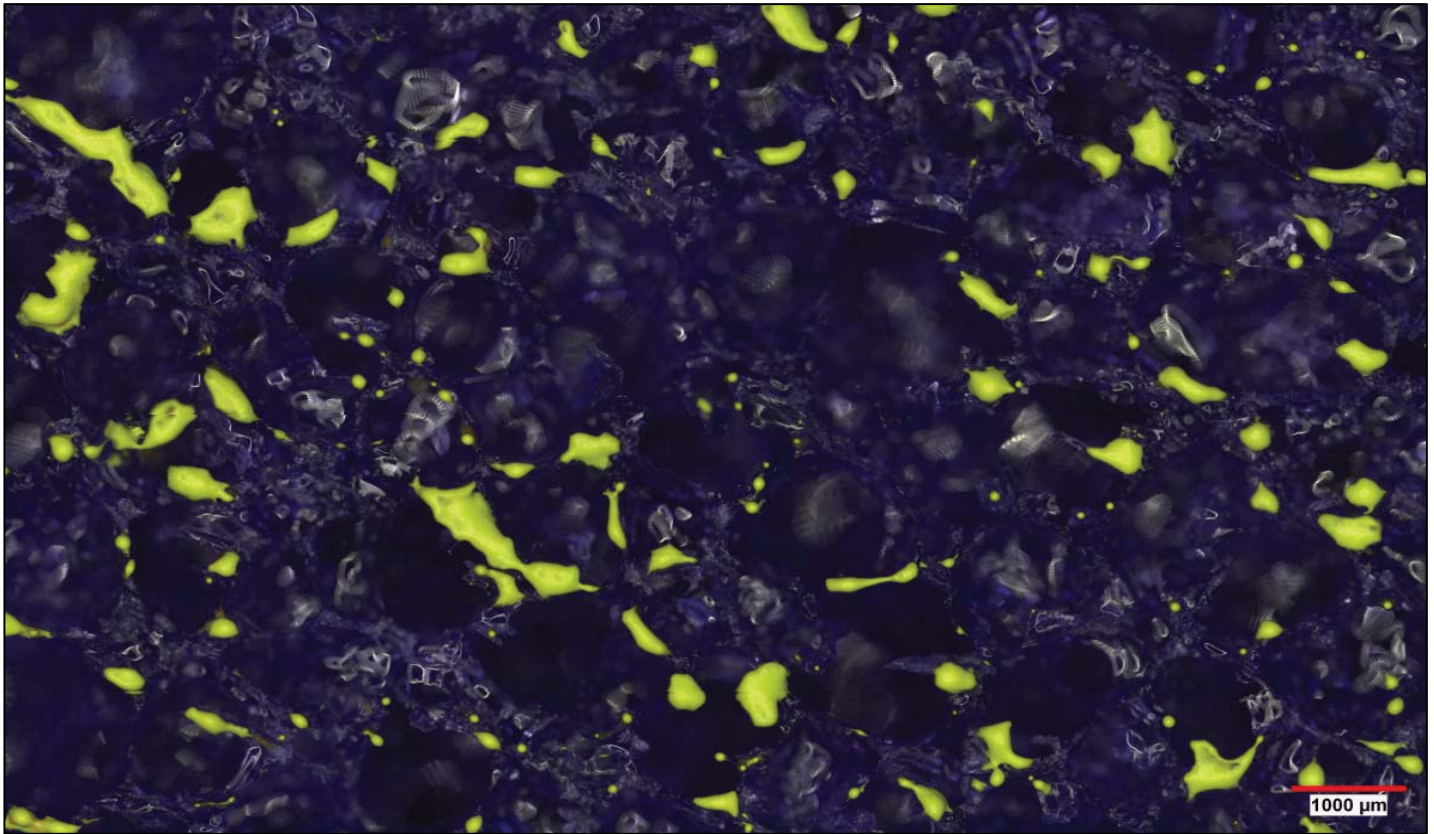
**Sample # 1 - Thick Purple Foam**

# Cells Size Analysis

**Date:** 2008-Mar-19, 2:39:04 PM -04'00'  
**Company:** Clemex  
**Department:** Laboratory  
**User Name:** Generic User Name (s...)  
**Sample ID:** 1

**Magnification:** 36x  
**Calibration:** 2.6046  $\mu\text{m}/\text{pixel}$   
**Units:** microns  
**# Fields:** 2  
**Cells Count:** 184

Figure 1: First of the two 7 x 6 mosaic images.



<b>Min:</b>	70.72	79.77
<b>Max.:</b>	1711.78	2211.93
<b>Mean:</b>	705.60	936.80
<b>Std. Dev.:</b>	363.54	455.34

# Printed Results

## 766 large cells purple Foam 01

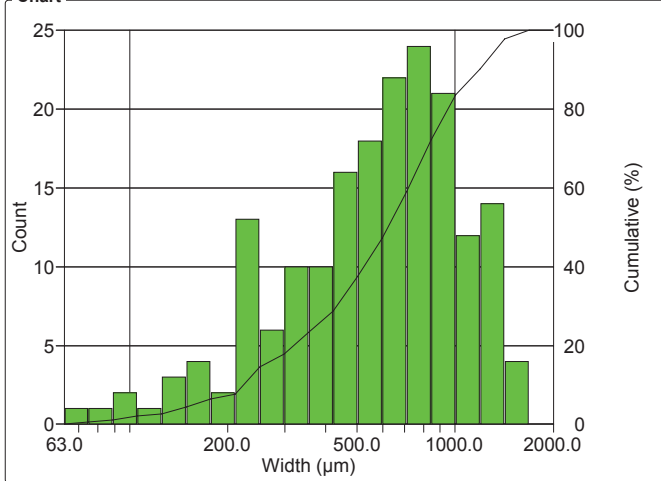
Organization: **Clemex**  
 Department:  
 User: **Generic User Name (signed on 2008-Mar-19 14:45:14 -04'00')**

Date & Time: **24/03/2008 14:04:49 PM**  
 Sample: **01#####**

### OBJM1 Count - Width

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

Chart



Values

Width Intervals (µm)	Count	%	Cumul%
63 - 75	1	0.54	0.54
75 - 89	1	0.54	1.09
89 - 106	2	1.09	2.17
106 - 126	1	0.54	2.72
126 - 150	3	1.63	4.35
150 - 178	4	2.17	6.52
178 - 211	2	1.09	7.61
211 - 251	13	7.07	14.67
251 - 299	6	3.26	17.93
299 - 355	10	5.43	23.37
355 - 422	10	5.43	28.80
422 - 502	16	8.70	37.50
502 - 596	18	9.78	47.28
596 - 709	22	11.96	59.24
709 - 843	24	13.04	72.28
843 - 1002	21	11.41	83.70
1002 - 1191	12	6.52	90.22
1191 - 1415	14	7.61	97.83
1415 - 1682	4	2.17	100
1682 - 2000	0	0	100

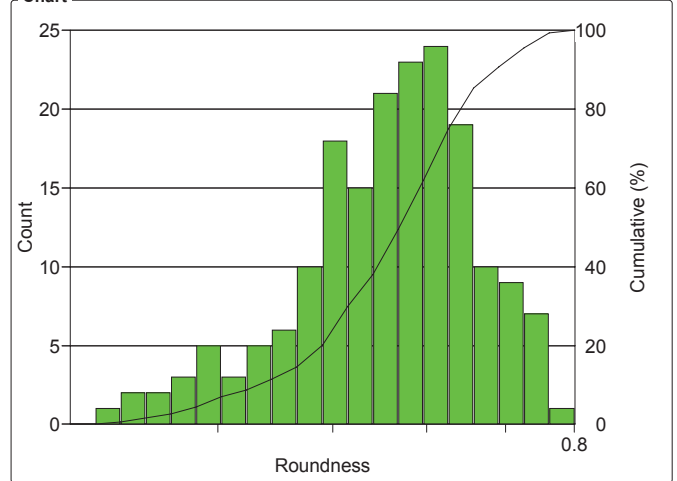
Statistics

Minimum: 62.5 µm  
 Maximum: 1584.0 µm  
 Mean: 655.8 µm  
 Std Dev.: 352.9 µm  
 Sum: 120664.3 µm  
 Count: 184  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 97971638.6 µm<sup>2</sup>  
 Total Area: 195943277.2 µm<sup>2</sup>  
 D10: 219.6 µm  
 D50: 616.3 µm  
 D90: 1172.8 µm

### OBJM1 Count - Roundness

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

Chart



Values

Roundness Intervals	Count	%	Cumul%
0.30 - 0.31	0	0	0
0.31 - 0.33	1	0.54	0.54
0.33 - 0.35	2	1.09	1.63
0.35 - 0.37	2	1.09	2.72
0.37 - 0.38	3	1.63	4.35
0.38 - 0.40	5	2.72	7.07
0.40 - 0.42	3	1.63	8.70
0.42 - 0.44	5	2.72	11.41
0.44 - 0.47	6	3.26	14.67
0.47 - 0.49	10	5.43	20.11
0.49 - 0.51	18	9.78	29.89
0.51 - 0.54	15	8.15	38.04
0.54 - 0.57	21	11.41	49.46
0.57 - 0.60	23	12.50	61.96
0.60 - 0.63	24	13.04	75
0.63 - 0.66	19	10.33	85.33
0.66 - 0.69	10	5.43	90.76
0.69 - 0.73	9	4.89	95.65
0.73 - 0.76	7	3.80	99.46
0.76 - 0.80	1	0.54	100

Statistics

Minimum: 0.3  
 Maximum: 0.8  
 Mean: 0.6  
 Std Dev.: 0.1  
 Count: 184  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 97971638.6 µm<sup>2</sup>  
 Total Area: 195943277.2 µm<sup>2</sup>  
 D10: 0.4  
 D50: 0.6  
 D90: 0.7

## 766 large cells purple Foam 01

Organization: **Clemex**  
 Department:  
 User:

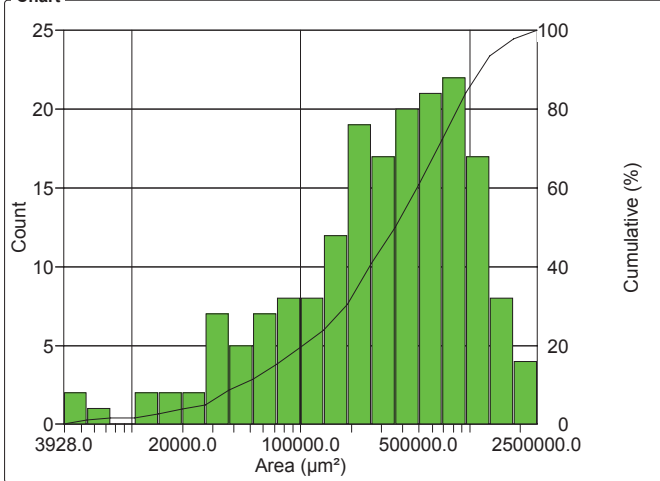
Date & Time: **24/03/2008 14:04:50 PM**  
 Sample: **01#####**

**Generic User Name (signed on 2008-Mar-19 14:45:14 -04'00')**

### OBJM1 Count - Area

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

#### Chart



#### Values

Area Intervals (µm <sup>2</sup> )	Count	%	Cumul%
3928 - 5425	2	1.09	1.09
5425 - 7491	1	0.54	1.63
7491 - 10345	0	0	1.63
10345 - 14286	2	1.09	2.72
14286 - 19729	2	1.09	3.80
19729 - 27246	2	1.09	4.89
27246 - 37626	7	3.80	8.70
37626 - 51961	5	2.72	11.41
51961 - 71758	7	3.80	15.22
71758 - 99096	8	4.35	19.57
99096 - 136850	8	4.35	23.91
136850 - 188987	12	6.52	30.43
188987 - 260988	19	10.33	40.76
260988 - 360420	17	9.24	50
360420 - 497735	20	10.87	60.87
497735 - 687363	21	11.41	72.28
687363 - 949237	22	11.96	84.24
949237 - 1310881	17	9.24	93.48
1310881 - 1810304	8	4.35	97.83
1810304 - 2500000	4	2.17	100

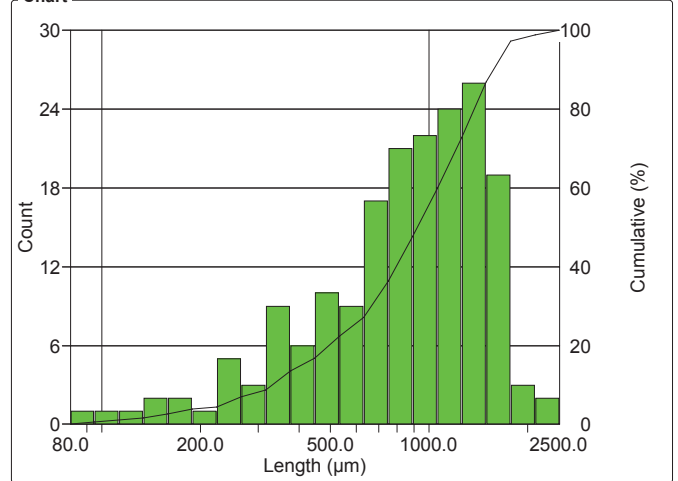
#### Statistics

Minimum: 3928.0 µm<sup>2</sup>  
 Maximum: 2301357.0 µm<sup>2</sup>  
 Mean: 494258.2 µm<sup>2</sup>  
 Std Dev.: 458235.9 µm<sup>2</sup>  
 Sum: 90943515.6 µm<sup>2</sup>  
 Count: 184  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 97971638.6 µm<sup>2</sup>  
 Total Area: 195943277.2 µm<sup>2</sup>  
 D10: 39962.0 µm<sup>2</sup>  
 D50: 355429.8 µm<sup>2</sup>  
 D90: 1141960.5 µm<sup>2</sup>

### OBJM1 Count - Length

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

#### Chart



#### Values

Length Intervals (µm)	Count	%	Cumul%
80 - 95	1	0.54	0.54
95 - 113	1	0.54	1.09
113 - 134	1	0.54	1.63
134 - 159	2	1.09	2.72
159 - 189	2	1.09	3.80
189 - 225	1	0.54	4.35
225 - 267	5	2.72	7.07
267 - 317	3	1.63	8.70
317 - 377	9	4.89	13.59
377 - 447	6	3.26	16.85
447 - 531	10	5.43	22.28
531 - 631	9	4.89	27.17
631 - 749	17	9.24	36.41
749 - 890	21	11.41	47.83
890 - 1057	22	11.96	59.78
1057 - 1256	24	13.04	72.83
1256 - 1492	26	14.13	86.96
1492 - 1772	19	10.33	97.28
1772 - 2105	3	1.63	98.91
2105 - 2500	2	1.09	100

#### Statistics

Minimum: 79.8 µm  
 Maximum: 2211.9 µm  
 Mean: 936.8 µm  
 Std Dev.: 455.3 µm  
 Sum: 172372.0 µm  
 Count: 184  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 97971638.6 µm<sup>2</sup>  
 Total Area: 195943277.2 µm<sup>2</sup>  
 D10: 338.7 µm  
 D50: 920.5 µm  
 D90: 1524.0 µm

## 766 large cells purple Foam 01

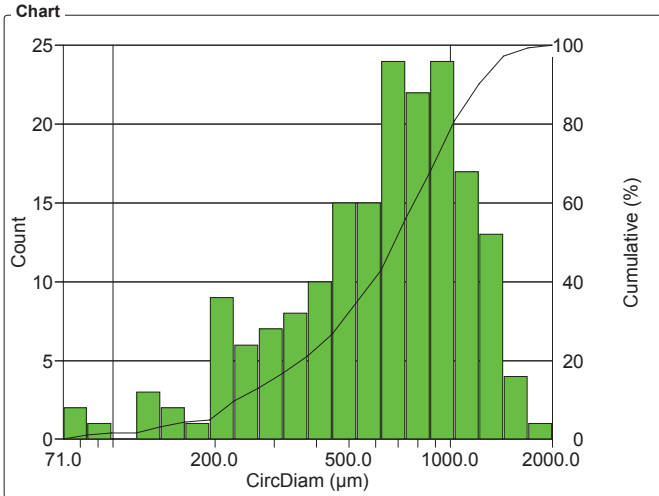
Organization: **Clemex**  
 Department:  
 User:

Date & Time: **24/03/2008 14:04:50 PM**  
 Sample: **01#####**

Generic User Name (signed on 2008-Mar-19 14:45:14 -04'00')

### OBJM1 Count - CircDiam

Magn.: 36x    Calib.: 2.6046 µm/pixel    Bitplane: All Rings



### Values

CircDiam Intervals (µm)	Count	%	Cumul%
71 - 84	2	1.09	1.09
84 - 99	1	0.54	1.63
99 - 117	0	0	1.63
117 - 138	3	1.63	3.26
138 - 164	2	1.09	4.35
164 - 193	1	0.54	4.89
193 - 228	9	4.89	9.78
228 - 270	6	3.26	13.04
270 - 319	7	3.80	16.85
319 - 377	8	4.35	21.20
377 - 445	10	5.43	26.63
445 - 526	15	8.15	34.78
526 - 622	15	8.15	42.93
622 - 735	24	13.04	55.98
735 - 868	22	11.96	67.93
868 - 1026	24	13.04	80.98
1026 - 1212	17	9.24	90.22
1212 - 1432	13	7.07	97.28
1432 - 1693	4	2.17	99.46
1693 - 2000	1	0.54	100

### Statistics

Minimum:	70.7	µm
Maximum:	1711.8	µm
Mean:	705.6	µm
Std Dev.:	363.5	µm
Sum:	129829.6	µm
Count:	184	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	97971638.6	µm <sup>2</sup>
Total Area:	195943277.2	µm <sup>2</sup>
D10:	225.6	µm
D50:	672.7	µm
D90:	1205.8	µm

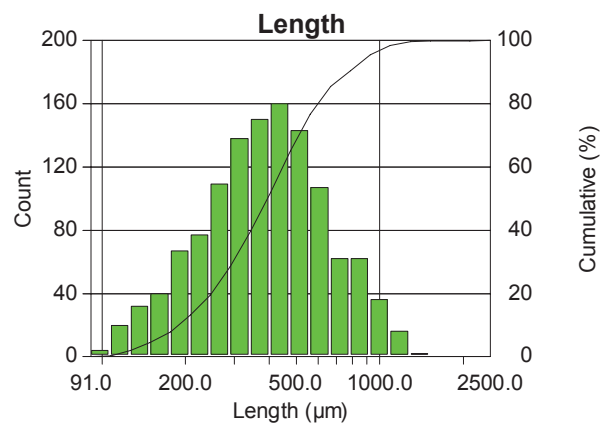
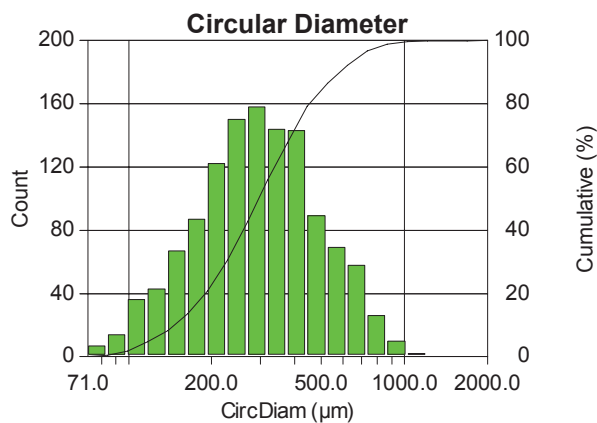
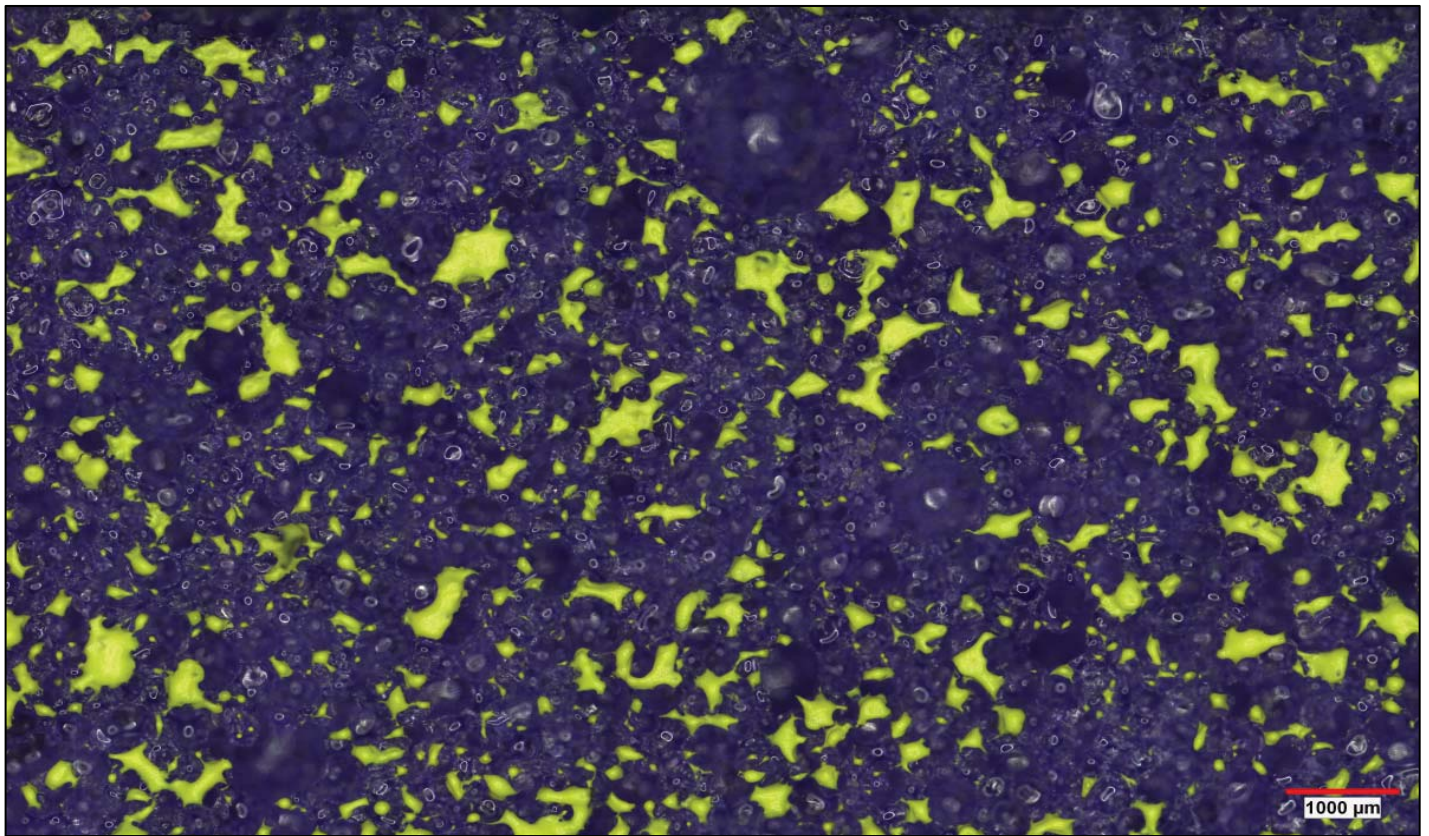
**Sample # 2 - Medium Purple Foam**

# Cells Size Analysis

**Date:** 2008-Mar-19, 2:17:47 PM -04'00'  
**Company:** Clemex  
**Department:** Laboratory  
**User Name:** Generic User Name (s ...)  
**Sample ID:** 2

**Magnification:** 36x  
**Calibration:** 2.6046  $\mu\text{m}/\text{pixel}$   
**Units:** microns  
**# Fields:** 2  
**Cells Count:** 1226

Figure 1: First of the two 7 x 6 mosaic images.



<b>Min:</b>	71.24	91.49
<b>Max.:</b>	1864.89	2237.70
<b>Mean:</b>	334.48	438.63
<b>Std. Dev.:</b>	177.26	230.57

# Printed Results

## 766 small cells purple Foam 02

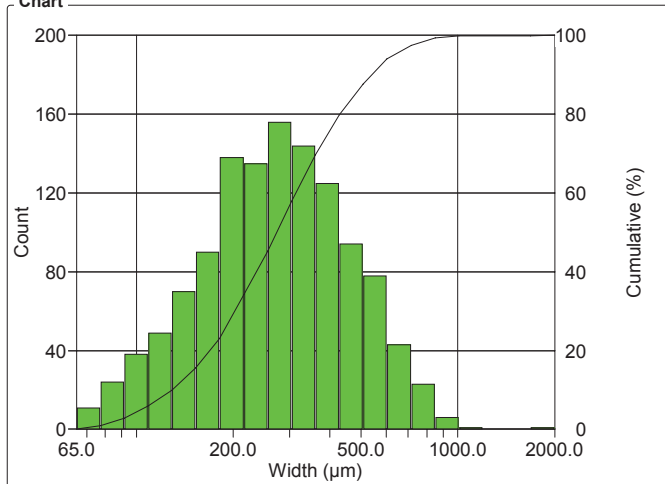
Organization: **Clemex**  
 Department:  
 User: **Generic User Name (signed on 2008-Mar-19 14:22:24 -04'00')**

Date & Time: **24/03/2008 14:06:58 PM**  
 Sample: **02#####**

### OBJM1 Count - Width

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

Chart



Values

Width Intervals (µm)	Count	%	Cumul%
65 - 77	11	0.90	0.90
77 - 92	24	1.96	2.85
92 - 109	38	3.10	5.95
109 - 129	49	4.00	9.95
129 - 153	70	5.71	15.66
153 - 182	90	7.34	23.00
182 - 216	138	11.26	34.26
216 - 256	135	11.01	45.27
256 - 304	156	12.72	57.99
304 - 361	144	11.75	69.74
361 - 428	125	10.20	79.93
428 - 508	94	7.67	87.60
508 - 603	78	6.36	93.96
603 - 715	43	3.51	97.47
715 - 849	23	1.88	99.35
849 - 1008	6	0.49	99.84
1008 - 1196	1	0.08	99.92
1196 - 1420	0	0	99.92
1420 - 1685	0	0	99.92
1685 - 2000	1	0.08	100

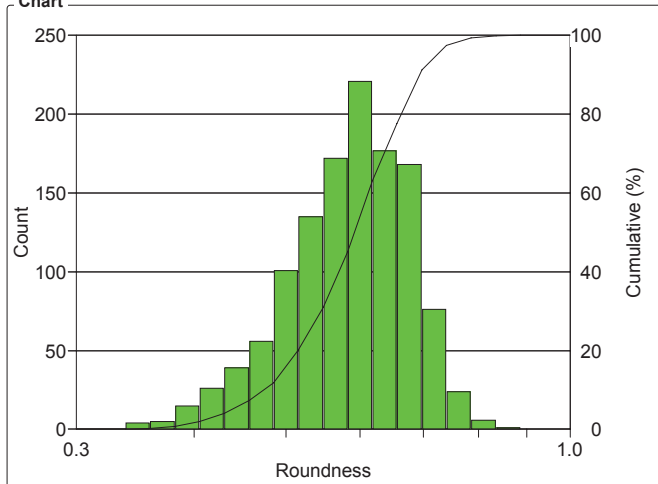
Statistics

Minimum:	64.8	µm
Maximum:	1910.8	µm
Mean:	308.2	µm
Std Dev.:	169.1	µm
Sum:	377828.3	µm
Count:	1226	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98716664.1	µm <sup>2</sup>
Total Area:	197433328.2	µm <sup>2</sup>
D10:	129.0	µm
D50:	272.5	µm
D90:	532.6	µm

### OBJM1 Count - Roundness

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

Chart



Values

Roundness Intervals	Count	%	Cumul%
0.30 - 0.32	0	0	0
0.32 - 0.34	0	0	0
0.34 - 0.36	4	0.33	0.33
0.36 - 0.38	5	0.41	0.73
0.38 - 0.41	15	1.22	1.96
0.41 - 0.43	26	2.12	4.08
0.43 - 0.46	39	3.18	7.26
0.46 - 0.49	56	4.57	11.83
0.49 - 0.52	101	8.24	20.07
0.52 - 0.55	135	11.01	31.08
0.55 - 0.58	172	14.03	45.11
0.58 - 0.62	221	18.03	63.13
0.62 - 0.66	177	14.44	77.57
0.66 - 0.70	168	13.70	91.27
0.70 - 0.74	76	6.20	97.47
0.74 - 0.79	24	1.96	99.43
0.79 - 0.83	6	0.49	99.92
0.83 - 0.89	1	0.08	100
0.89 - 0.94	0	0	100
0.94 - 1	0	0	100

Statistics

Minimum:	0.3	
Maximum:	0.8	
Mean:	0.6	
Std Dev.:	0.1	
Count:	1226	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98716664.1	µm <sup>2</sup>
Total Area:	197433328.2	µm <sup>2</sup>
D10:	0.5	
D50:	0.6	
D90:	0.7	

## 766 small cells purple Foam 02

Organization: **Clemex**  
 Department:  
 User:

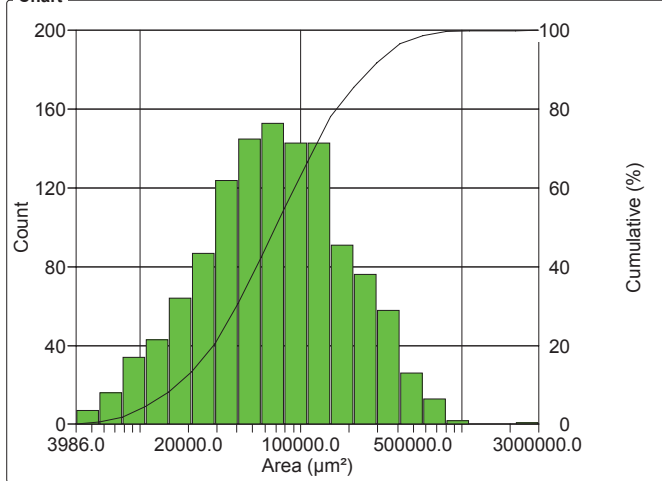
Date & Time: **24/03/2008 14:06:58 PM**  
 Sample: **02#####**

Generic User Name (signed on 2008-Mar-19 14:22:24 -04'00')

### OBJM1 Count - Area

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

Chart



Values

Area Intervals (µm²)	Count	%	Cumul%
3986 - 5551	7	0.57	0.57
5551 - 7730	16	1.31	1.88
7730 - 10765	34	2.77	4.65
10765 - 14992	43	3.51	8.16
14992 - 20878	64	5.22	13.38
20878 - 29075	87	7.10	20.47
29075 - 40489	124	10.11	30.59
40489 - 56386	145	11.83	42.41
56386 - 78524	153	12.48	54.89
78524 - 109353	143	11.66	66.56
109353 - 152285	143	11.66	78.22
152285 - 212074	91	7.42	85.64
212074 - 295336	76	6.20	91.84
295336 - 411288	58	4.73	96.57
411288 - 572763	26	2.12	98.69
572763 - 797635	13	1.06	99.76
797635 - 1110794	2	0.16	99.92
1110794 - 1546902	0	0	99.92
1546902 - 2154230	0	0	99.92
2154230 - 3000000	1	0.08	100

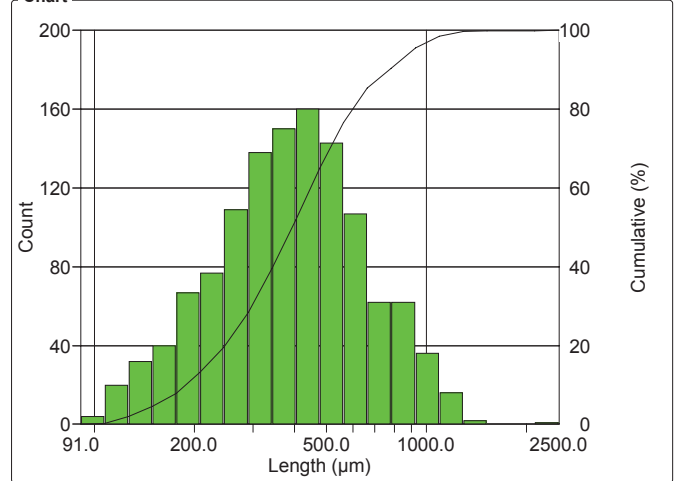
Statistics

Minimum: 3985.7 µm²  
 Maximum: 2731478.5 µm²  
 Mean: 112526.2 µm²  
 Std Dev.: 141520.1 µm²  
 Sum: 137957157.6 µm²  
 Count: 1226  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 98716664.1 µm²  
 Total Area: 197433328.2 µm²  
 D10: 16523.1 µm²  
 D50: 69051.9 µm²  
 D90: 260043.3 µm²

### OBJM1 Count - Length

Magn.: 36x Calib.: 2.6046 µm/pixel Bitplane: All Rings

Chart



Values

Length Intervals (µm)	Count	%	Cumul%
91 - 107	4	0.33	0.33
107 - 127	20	1.63	1.96
127 - 150	32	2.61	4.57
150 - 177	40	3.26	7.83
177 - 208	67	5.46	13.30
208 - 246	77	6.28	19.58
246 - 290	109	8.89	28.47
290 - 342	138	11.26	39.72
342 - 404	150	12.23	51.96
404 - 477	160	13.05	65.01
477 - 563	143	11.66	76.67
563 - 664	107	8.73	85.40
664 - 784	62	5.06	90.46
784 - 925	62	5.06	95.51
925 - 1092	36	2.94	98.45
1092 - 1289	16	1.31	99.76
1289 - 1521	2	0.16	99.92
1521 - 1795	0	0	99.92
1795 - 2118	0	0	99.92
2118 - 2500	1	0.08	100

Statistics

Minimum: 91.5 µm  
 Maximum: 2237.7 µm  
 Mean: 438.6 µm  
 Std Dev.: 230.6 µm  
 Sum: 537757.6 µm  
 Count: 1226  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 98716664.1 µm²  
 Total Area: 197433328.2 µm²  
 D10: 188.6 µm  
 D50: 390.9 µm  
 D90: 762.2 µm

## 766 small cells purple Foam 02

Organization: **Clemex**  
 Department:  
 User:

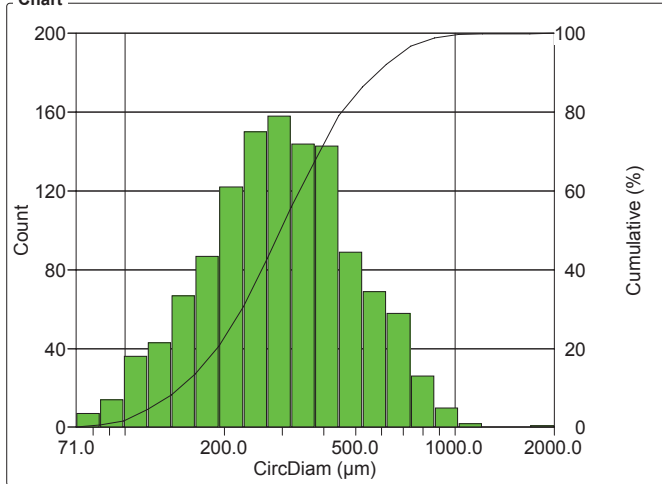
Date & Time: **24/03/2008 14:06:58 PM**  
 Sample: **02#####**

Generic User Name (signed on 2008-Mar-19 14:22:24 -04'00')

### OBJM1 Count - CircDiam

Magn.: 36x    Calib.: 2.6046 µm/pixel    Bitplane: All Rings

#### Chart



#### Values

CircDiam Intervals (µm)	Count	%	Cumul%
71 - 84	7	0.57	0.57
84 - 99	14	1.14	1.71
99 - 117	36	2.94	4.65
117 - 138	43	3.51	8.16
138 - 164	67	5.46	13.62
164 - 193	87	7.10	20.72
193 - 228	122	9.95	30.67
228 - 270	150	12.23	42.90
270 - 319	158	12.89	55.79
319 - 377	144	11.75	67.54
377 - 445	143	11.66	79.20
445 - 526	89	7.26	86.46
526 - 622	69	5.63	92.09
622 - 735	58	4.73	96.82
735 - 868	26	2.12	98.94
868 - 1026	10	0.82	99.76
1026 - 1212	2	0.16	99.92
1212 - 1432	0	0	99.92
1432 - 1693	0	0	99.92
1693 - 2000	1	0.08	100

#### Statistics

Minimum: 71.2 µm  
 Maximum: 1864.9 µm  
 Mean: 334.5 µm  
 Std Dev.: 177.3 µm  
 Sum: 410072.1 µm  
 Count: 1226  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 98716664.1 µm<sup>2</sup>  
 Total Area: 197433328.2 µm<sup>2</sup>  
 D10: 145.0 µm  
 D50: 296.5 µm  
 D90: 575.4 µm

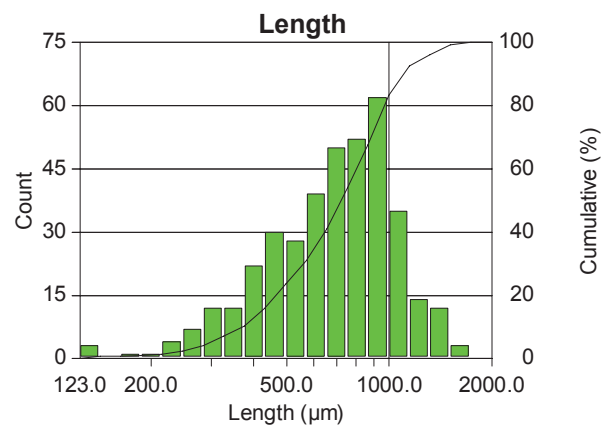
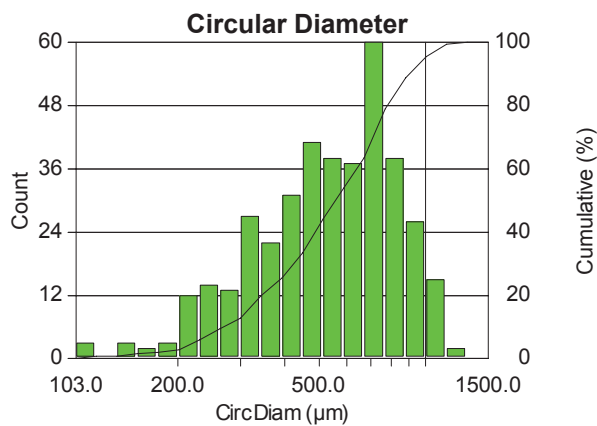
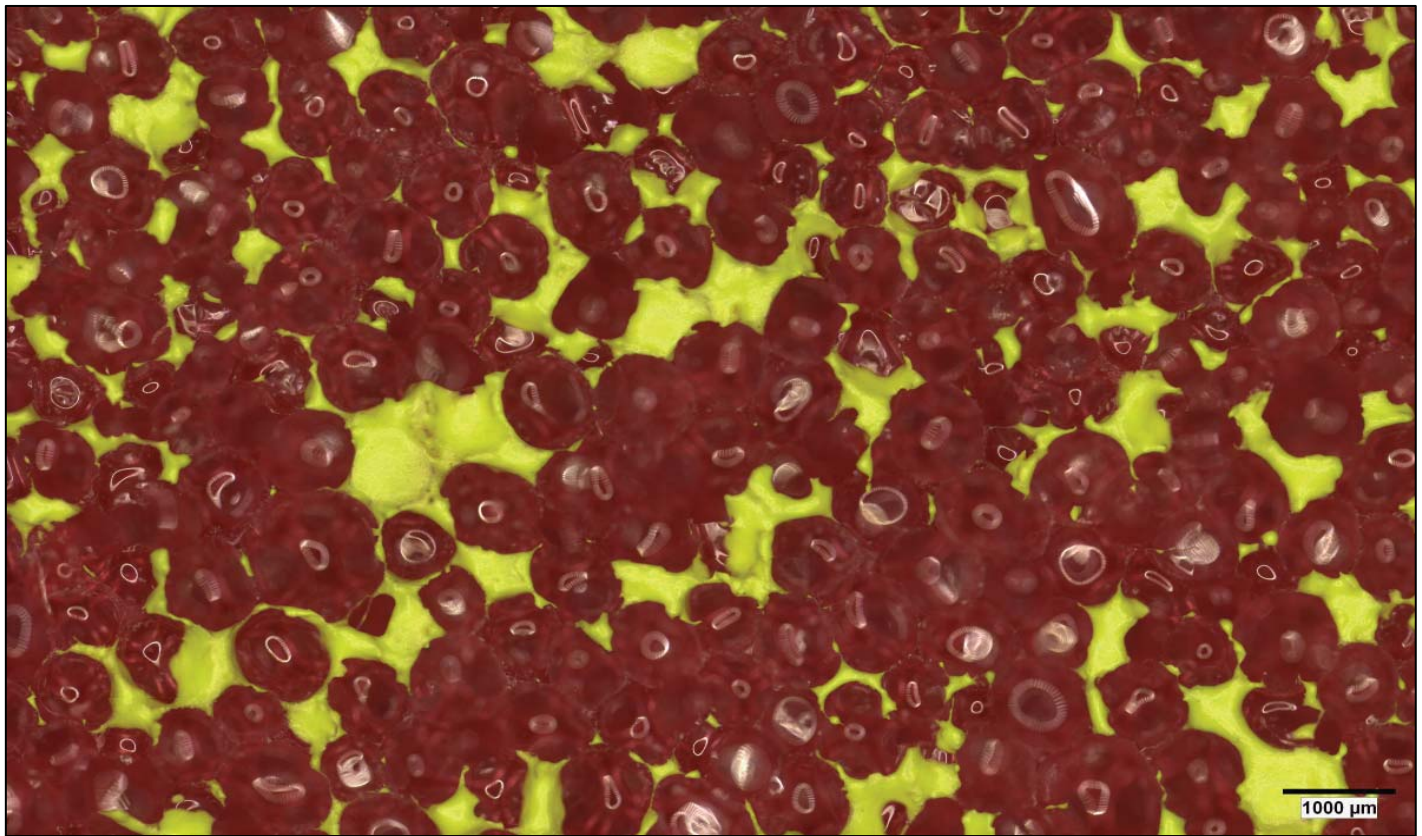
**Sample # 3 - Thick Red Foam**

# Cells Size Analysis

**Date:** 2008-Mar-19, 1:54:40 PM -04'00'  
**Company:** Clemex  
**Department:** Laboratory  
**User Name:** Generic User Name (s...)  
**Sample ID:** 3

**Magnification:** 36x  
**Calibration:** 2.6046  $\mu\text{m}/\text{pixel}$   
**Units:** microns  
**# Mosaics:** 2  
**Cells Count:** 387

Figure 1: First of the two 7 x 6 mosaic images.



**Min:** 102.82  
**Max.:** 1239.12  
**Mean:** 572.95  
**Std. Dev.:** 233.90

**Min:** 123.39  
**Max.:** 1666.32  
**Mean:** 735.77  
**Std. Dev.:** 289.34

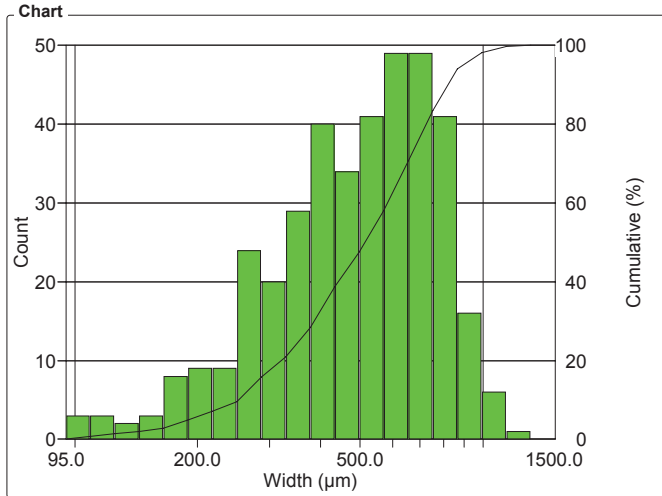
# Printed Results

## 766 large cells red Foam 03

Organization: <b>Clemex</b>	Date & Time: <b>24/03/2008 12:05:52 PM</b>
Department:	Sample: <b>03#####</b>
User: <b>Generic User Name (signed on 2008-Mar-19 13:58:43 -04'00')</b>	

### OBJM1 Count - Width

Magn.: 36x Calib.: 2.6025 µm/pixel Bitplane: All Rings

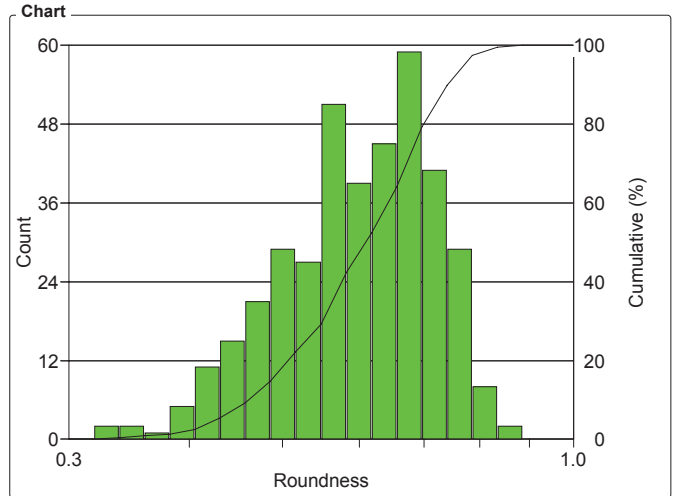


Width Intervals (µm)	Count	%	Cumul%
95 - 109	3	0.78	0.78
109 - 125	3	0.78	1.55
125 - 144	2	0.52	2.07
144 - 165	3	0.78	2.84
165 - 189	8	2.07	4.91
189 - 217	9	2.33	7.24
217 - 250	9	2.33	9.56
250 - 286	24	6.20	15.76
286 - 329	20	5.17	20.93
329 - 377	29	7.49	28.42
377 - 433	40	10.34	38.76
433 - 497	34	8.79	47.55
497 - 571	41	10.59	58.14
571 - 656	49	12.66	70.80
656 - 752	49	12.66	83.46
752 - 864	41	10.59	94.06
864 - 992	16	4.13	98.19
992 - 1138	6	1.55	99.74
1138 - 1307	1	0.26	100
1307 - 1500	0	0	100

Statistics		
Minimum:	95.1	µm
Maximum:	1227.7	µm
Mean:	524.9	µm
Std Dev.:	218.1	µm
Sum:	203147.2	µm
Count:	387	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98821046.0	µm <sup>2</sup>
Total Area:	197642091.9	µm <sup>2</sup>
D10:	249.7	µm
D50:	510.9	µm
D90:	812.6	µm

### OBJM1 Count - Roundness

Magn.: 36x Calib.: 2.6025 µm/pixel Bitplane: All Rings



Roundness Intervals	Count	%	Cumul%
0.30 - 0.32	0	0	0
0.32 - 0.34	2	0.52	0.52
0.34 - 0.36	2	0.52	1.03
0.36 - 0.38	1	0.26	1.29
0.38 - 0.41	5	1.29	2.58
0.41 - 0.43	11	2.84	5.43
0.43 - 0.46	15	3.88	9.30
0.46 - 0.49	21	5.43	14.73
0.49 - 0.52	29	7.49	22.22
0.52 - 0.55	27	6.98	29.20
0.55 - 0.58	51	13.18	42.38
0.58 - 0.62	39	10.08	52.45
0.62 - 0.66	45	11.63	64.08
0.66 - 0.70	59	15.25	79.33
0.70 - 0.74	41	10.59	89.92
0.74 - 0.79	29	7.49	97.42
0.79 - 0.83	8	2.07	99.48
0.83 - 0.89	2	0.52	100
0.89 - 0.94	0	0	100
0.94 - 1	0	0	100

Statistics		
Minimum:	0.3	
Maximum:	0.9	
Mean:	0.6	
Std Dev.:	0.1	
Count:	387	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98821046.0	µm <sup>2</sup>
Total Area:	197642091.9	µm <sup>2</sup>
D10:	0.5	
D50:	0.6	
D90:	0.7	

## 766 large cells red Foam 03

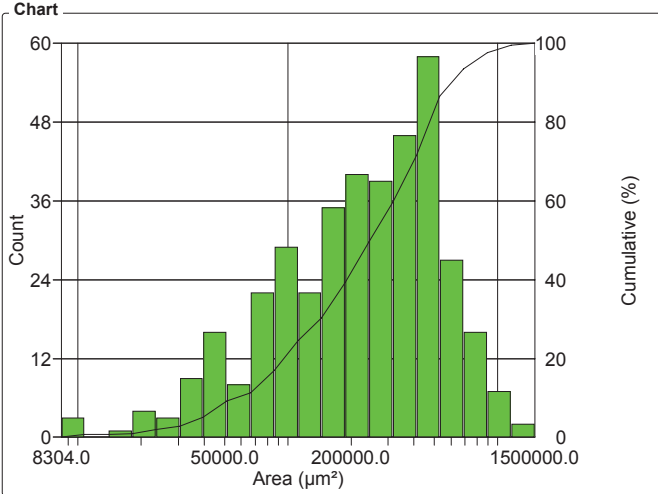
Organization: **Clemex**  
 Department:  
 User:

Date & Time: **24/03/2008 12:05:52 PM**  
 Sample: **03#####**

Generic User Name (signed on 2008-Mar-19 13:58:43 -04'00')

### OBJM1 Count - Area

Magn.: 36x Calib.: 2.6025 µm/pixel Bitplane: All Rings



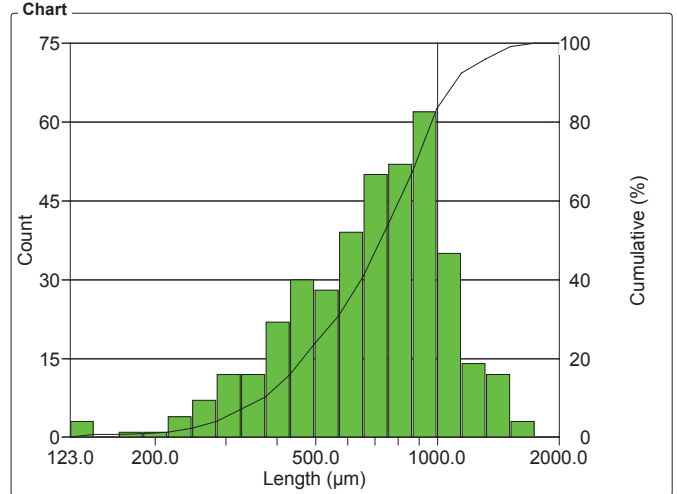
Area Intervals (µm²)	Count	%	Cumul%
8304 - 10768	3	0.78	0.78
10768 - 13963	0	0	0.78
13963 - 18105	1	0.26	1.03
18105 - 23477	4	1.03	2.07
23477 - 30443	3	0.78	2.84
30443 - 39476	9	2.33	5.17
39476 - 51188	16	4.13	9.30
51188 - 66376	8	2.07	11.37
66376 - 86069	22	5.68	17.05
86069 - 111606	29	7.49	24.55
111606 - 144720	22	5.68	30.23
144720 - 187659	35	9.04	39.28
187659 - 243338	40	10.34	49.61
243338 - 315537	39	10.08	59.69
315537 - 409157	46	11.89	71.58
409157 - 530555	58	14.99	86.56
530555 - 687972	27	6.98	93.54
687972 - 892095	16	4.13	97.67
892095 - 1156781	7	1.81	99.48
1156781 - 1500000	2	0.52	100

Statistics

Minimum:	8303.8	µm²
Maximum:	1205909.5	µm²
Mean:	300681.1	µm²
Std Dev.:	228063.1	µm²
Sum:	116363602.1	µm²
Count:	387	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98821046.0	µm²
Total Area:	197642091.9	µm²
D10:	55535.2	µm²
D50:	245036.0	µm²
D90:	628224.4	µm²

### OBJM1 Count - Length

Magn.: 36x Calib.: 2.6025 µm/pixel Bitplane: All Rings



Length Intervals (µm)	Count	%	Cumul%
123 - 141	3	0.78	0.78
141 - 163	0	0	0.78
163 - 187	1	0.26	1.03
187 - 215	1	0.26	1.29
215 - 247	4	1.03	2.33
247 - 284	7	1.81	4.13
284 - 326	12	3.10	7.24
326 - 375	12	3.10	10.34
375 - 431	22	5.68	16.02
431 - 496	30	7.75	23.77
496 - 570	28	7.24	31.01
570 - 656	39	10.08	41.09
656 - 754	50	12.92	54.01
754 - 866	52	13.44	67.44
866 - 996	62	16.02	83.46
996 - 1145	35	9.04	92.51
1145 - 1316	14	3.62	96.12
1316 - 1513	12	3.10	99.22
1513 - 1740	3	0.78	100
1740 - 2000	0	0	100

Statistics

Minimum:	123.4	µm
Maximum:	1666.3	µm
Mean:	735.8	µm
Std Dev.:	289.3	µm
Sum:	284742.9	µm
Count:	387	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98821046.0	µm²
Total Area:	197642091.9	µm²
D10:	369.9	µm
D50:	720.9	µm
D90:	1115.2	µm

## 766 large cells red Foam 03

Organization: **Clemex**  
 Department:  
 User:

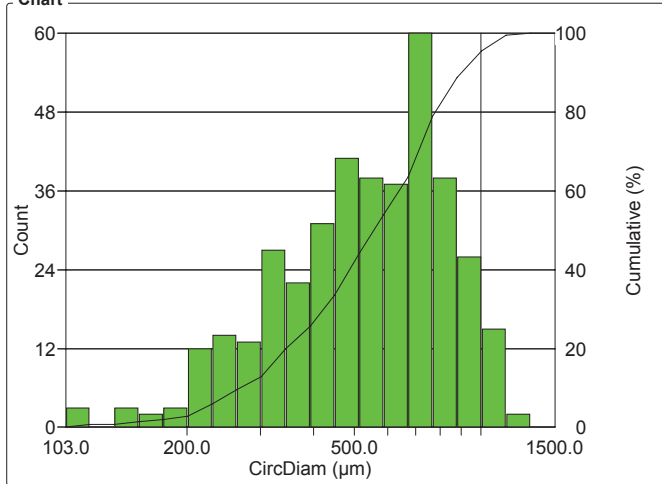
Date & Time: **24/03/2008 12:05:52 PM**  
 Sample: **03#####**

**Generic User Name (signed on 2008-Mar-19 13:58:43 -04'00')**

### OBJM1 Count - CircDiam

Magn.: 36x    Calib.: 2.6025 µm/pixel    Bitplane: All Rings

#### Chart



#### Values

CircDiam Intervals (µm)	Count	%	Cumul%
103 - 118	3	0.78	0.78
118 - 135	0	0	0.78
135 - 154	3	0.78	1.55
154 - 176	2	0.52	2.07
176 - 201	3	0.78	2.84
201 - 230	12	3.10	5.94
230 - 263	14	3.62	9.56
263 - 301	13	3.36	12.92
301 - 344	27	6.98	19.90
344 - 393	22	5.68	25.58
393 - 449	31	8.01	33.59
449 - 514	41	10.59	44.19
514 - 587	38	9.82	54.01
587 - 672	37	9.56	63.57
672 - 768	60	15.50	79.07
768 - 878	38	9.82	88.89
878 - 1004	26	6.72	95.61
1004 - 1148	15	3.88	99.48
1148 - 1312	2	0.52	100
1312 - 1500	0	0	100

#### Statistics

Minimum: 102.8 µm  
 Maximum: 1239.1 µm  
 Mean: 573.0 µm  
 Std Dev.: 233.9 µm  
 Sum: 221732.1 µm  
 Count: 387  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 98821046.0 µm<sup>2</sup>  
 Total Area: 197642091.9 µm<sup>2</sup>  
 D10: 265.9 µm  
 D50: 558.6 µm  
 D90: 894.4 µm

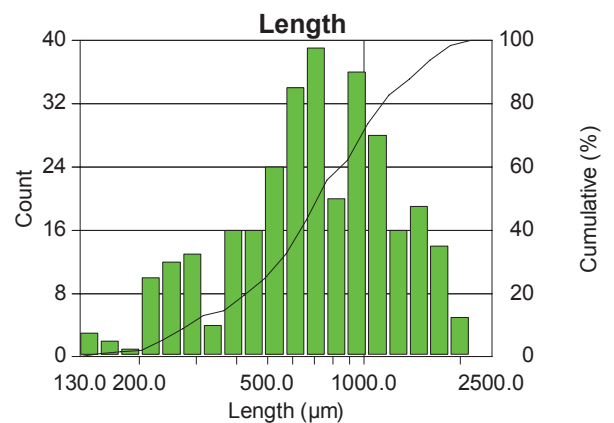
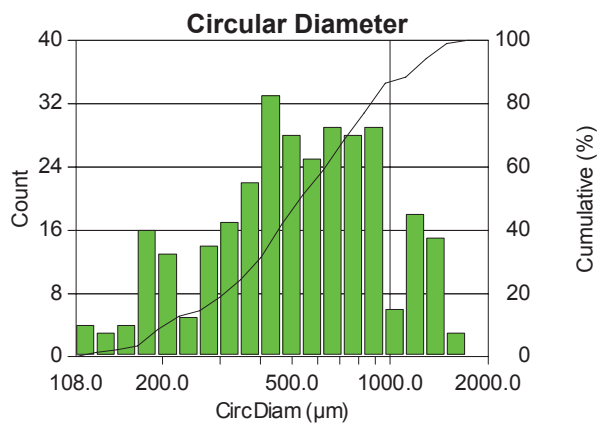
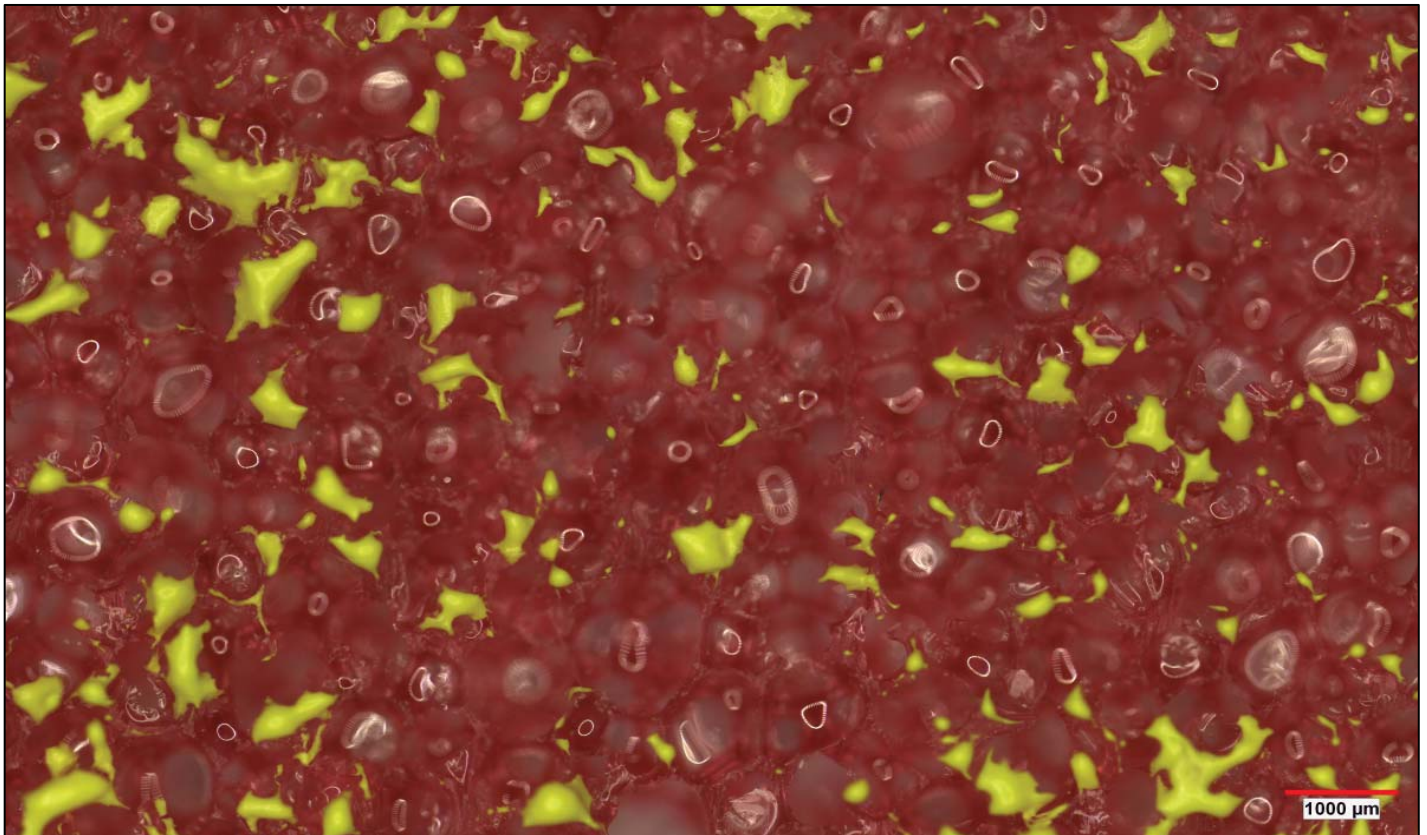
**Sample # 4 - Thin Red Foam**

# Cells Size Analysis

**Date:** 2008-Mar-19, 2:06:06 PM -04'00'  
**Company:** Clemex  
**Department:** Laboratory  
**User Name:** Generic User Name (s ...)  
**Sample ID:** 4

**Magnification:** 36x  
**Calibration:** 2.6025  $\mu\text{m}/\text{pixel}$   
**Units:** microns  
**# Fields:** 2  
**Cells Count:** 312

Figure 1: First of the two 7 x 6 mosaic images.



**Min:** 108.32  
**Max.:** 1662.35  
**Mean:** 604.35  
**Std. Dev.:** 335.00

**Min:** 129.88  
**Max.:** 2144.75  
**Mean:** 805.95  
**Std. Dev.:** 431.34

# Printed Results

## 766 small cells red Foam 04

Organization: **Clemex**

Date & Time: **24/03/2008 12:04:06 PM**

Department:

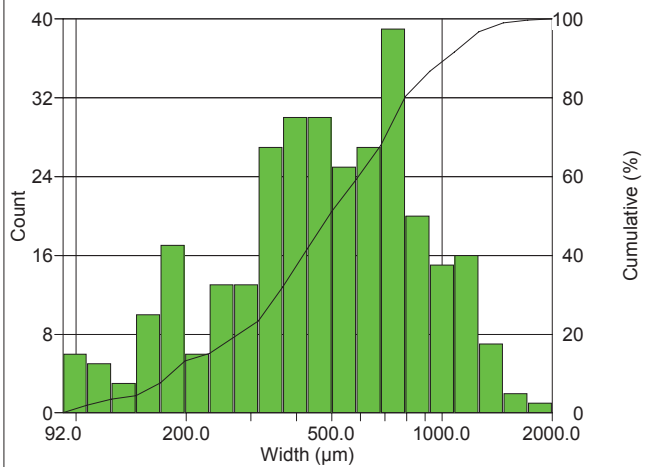
Sample: **04#####**

User: **Generic User Name (signed on 2008-Mar-19 14:11:03 -04'00')**

### OBJM1 Count - Width

Magn.: 36x Calib.: 2.6025 µm/pixel Bitplane: All Rings

Chart



Values

Width Intervals (µm)	Count	%	Cumul%
92 - 107	6	1.92	1.92
107 - 125	5	1.60	3.53
125 - 146	3	0.96	4.49
146 - 170	10	3.21	7.69
170 - 199	17	5.45	13.14
199 - 232	6	1.92	15.06
232 - 270	13	4.17	19.23
270 - 315	13	4.17	23.40
315 - 368	27	8.65	32.05
368 - 429	30	9.62	41.67
429 - 500	30	9.62	51.28
500 - 584	25	8.01	59.29
584 - 681	27	8.65	67.95
681 - 794	39	12.50	80.45
794 - 926	20	6.41	86.86
926 - 1080	15	4.81	91.67
1080 - 1260	16	5.13	96.79
1260 - 1470	7	2.24	99.04
1470 - 1715	2	0.64	99.68
1715 - 2000	1	0.32	100

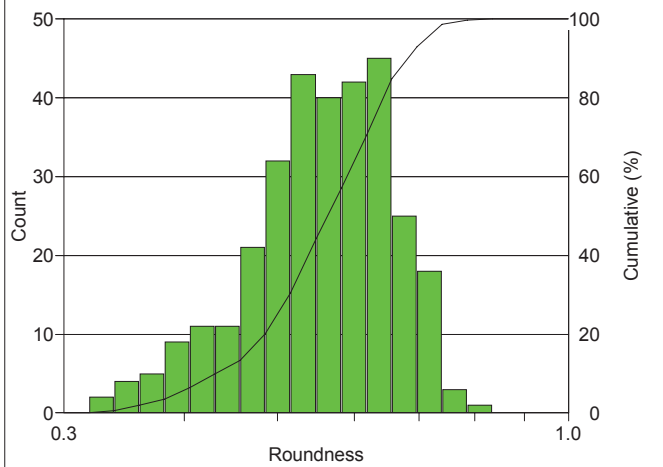
Statistics

Minimum:	91.8	µm
Maximum:	1725.1	µm
Mean:	559.4	µm
Std Dev.:	319.6	µm
Sum:	174520.9	µm
Count:	312	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98931599.6	µm <sup>2</sup>
Total Area:	197863199.2	µm <sup>2</sup>
D10:	185.6	µm
D50:	493.1	µm
D90:	1019.6	µm

### OBJM1 Count - Roundness

Magn.: 36x Calib.: 2.6025 µm/pixel Bitplane: All Rings

Chart



Values

Roundness Intervals	Count	%	Cumul%
0.30 - 0.32	0	0	0
0.32 - 0.34	2	0.64	0.64
0.34 - 0.36	4	1.28	1.92
0.36 - 0.38	5	1.60	3.53
0.38 - 0.41	9	2.88	6.41
0.41 - 0.43	11	3.53	9.94
0.43 - 0.46	11	3.53	13.46
0.46 - 0.49	21	6.73	20.19
0.49 - 0.52	32	10.26	30.45
0.52 - 0.55	43	13.78	44.23
0.55 - 0.58	40	12.82	57.05
0.58 - 0.62	42	13.46	70.51
0.62 - 0.66	45	14.42	84.94
0.66 - 0.70	25	8.01	92.95
0.70 - 0.74	18	5.77	98.72
0.74 - 0.79	3	0.96	99.68
0.79 - 0.83	1	0.32	100
0.83 - 0.89	0	0	100
0.89 - 0.94	0	0	100
0.94 - 1	0	0	100

Statistics

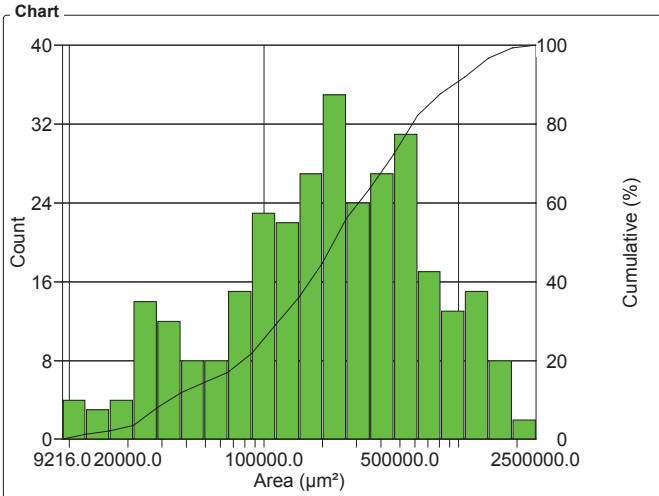
Minimum:	0.3	
Maximum:	0.8	
Mean:	0.6	
Std Dev.:	0.1	
Count:	312	
Under:	0	
Over:	0	
Accepted:	100.0	%
Field Count:	2	
Field Area:	98931599.6	µm <sup>2</sup>
Total Area:	197863199.2	µm <sup>2</sup>
D10:	0.4	
D50:	0.6	
D90:	0.7	

## 766 small cells red Foam 04

Organization: <b>Clemex</b>	Date & Time: <b>24/03/2008 12:04:06 PM</b>
Department:	Sample: <b>04#####</b>
User: <b>Generic User Name (signed on 2008-Mar-19 14:11:03 -04'00')</b>	

### OBJM1 Count - Area

Magn.: 36x    Calib.: 2.6025 µm/pixel    Bitplane: All Rings

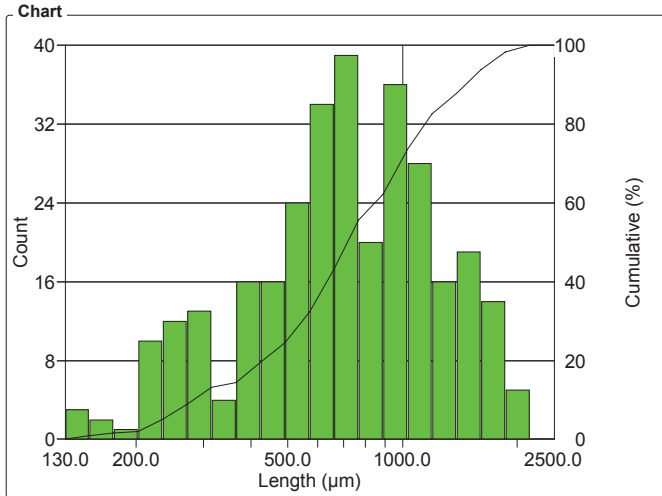


Area Intervals (µm²)	Count	%	Cumul%
9216 - 12196	4	1.28	1.28
12196 - 16139	3	0.96	2.24
16139 - 21358	4	1.28	3.53
21358 - 28263	14	4.49	8.01
28263 - 37402	12	3.85	11.86
37402 - 49495	8	2.56	14.42
49495 - 65499	8	2.56	16.99
65499 - 86677	15	4.81	21.79
86677 - 114702	23	7.37	29.17
114702 - 151789	22	7.05	36.22
151789 - 200868	27	8.65	44.87
200868 - 265816	35	11.22	56.09
265816 - 351764	24	7.69	63.78
351764 - 465501	27	8.65	72.44
465501 - 616014	31	9.94	82.37
616014 - 815193	17	5.45	87.82
815193 - 1078774	13	4.17	91.99
1078774 - 1427579	15	4.81	96.79
1427579 - 1889166	8	2.56	99.36
1889166 - 2500000	2	0.64	100

Statistics	
Minimum:	9215.7 µm²
Maximum:	2170363.5 µm²
Mean:	374711.3 µm²
Std Dev.:	404348.2 µm²
Sum:	116909938.0 µm²
Count:	312
Under:	0
Over:	0
Accepted:	100.0 %
Field Count:	2
Field Area:	98931599.6 µm²
Total Area:	197863199.2 µm²
D10:	32690.7 µm²
D50:	220323.3 µm²
D90:	1026141.5 µm²

### OBJM1 Count - Length

Magn.: 36x    Calib.: 2.6025 µm/pixel    Bitplane: All Rings



Length Intervals (µm)	Count	%	Cumul%
130 - 151	3	0.96	0.96
151 - 175	2	0.64	1.60
175 - 203	1	0.32	1.92
203 - 235	10	3.21	5.13
235 - 272	12	3.85	8.97
272 - 316	13	4.17	13.14
316 - 366	4	1.28	14.42
366 - 424	16	5.13	19.55
424 - 492	16	5.13	24.68
492 - 570	24	7.69	32.37
570 - 661	34	10.90	43.27
661 - 766	39	12.50	55.77
766 - 888	20	6.41	62.18
888 - 1030	36	11.54	73.72
1030 - 1194	28	8.97	82.69
1194 - 1384	16	5.13	87.82
1384 - 1605	19	6.09	93.91
1605 - 1860	14	4.49	98.40
1860 - 2156	5	1.60	100
2156 - 2500	0	0	100

Statistics	
Minimum:	129.9 µm
Maximum:	2144.7 µm
Mean:	805.9 µm
Std Dev.:	431.3 µm
Sum:	251455.1 µm
Count:	312
Under:	0
Over:	0
Accepted:	100.0 %
Field Count:	2
Field Area:	98931599.6 µm²
Total Area:	197863199.2 µm²
D10:	281.4 µm
D50:	720.6 µm
D90:	1454.6 µm

## 766 small cells red Foam 04

Organization: **Clemex**  
 Department:  
 User:

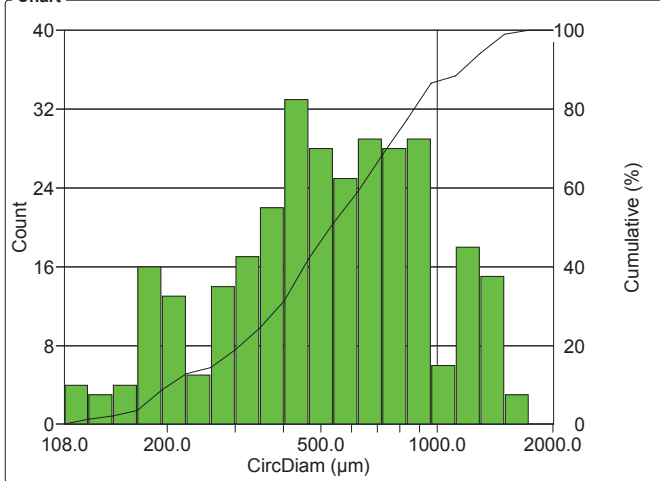
Date & Time: **24/03/2008 12:04:06 PM**  
 Sample: **04#####**

**Generic User Name (signed on 2008-Mar-19 14:11:03 -04'00')**

### OBJM1 Count - CircDiam

Magn.: 36x    Calib.: 2.6025 µm/pixel    Bitplane: All Rings

#### Chart



#### Values

CircDiam Intervals (µm)	Count	%	Cumul%
108 - 125	4	1.28	1.28
125 - 145	3	0.96	2.24
145 - 167	4	1.28	3.53
167 - 194	16	5.13	8.65
194 - 224	13	4.17	12.82
224 - 259	5	1.60	14.42
259 - 300	14	4.49	18.91
300 - 347	17	5.45	24.36
347 - 402	22	7.05	31.41
402 - 465	33	10.58	41.99
465 - 538	28	8.97	50.96
538 - 622	25	8.01	58.97
622 - 720	29	9.29	68.27
720 - 833	28	8.97	77.24
833 - 964	29	9.29	86.54
964 - 1116	6	1.92	88.46
1116 - 1291	18	5.77	94.23
1291 - 1494	15	4.81	99.04
1494 - 1728	3	0.96	100
1728 - 2000	0	0	100

#### Statistics

Minimum: 108.3 µm  
 Maximum: 1662.3 µm  
 Mean: 604.3 µm  
 Std Dev.: 335.0 µm  
 Sum: 188556.2 µm  
 Count: 312  
 Under: 0  
 Over: 0  
 Accepted: 100.0 %  
 Field Count: 2  
 Field Area: 98931599.6 µm<sup>2</sup>  
 Total Area: 197863199.2 µm<sup>2</sup>  
 D10: 204.0 µm  
 D50: 529.6 µm  
 D90: 1143.0 µm

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