Wollastonite – characterization of needle-shaped crystals with static image analysis

Instrument: CAMSIZER M1

The Mineral Wollatonite

Wollastonite ($CaSiO_3$) is a colorless chain silicate which occurs in metamorphic rocks and forms when an impure limestone is subjected to temperatures > 600 °C. Due to its high melting point at 1540 °C, wollastonite is a suitable raw material for the production of refractory materials, ceramics, insulators, fire-resistant clothing; but it is also used as filler medium in paints, plastics, or friction pads.
Two wollastonite samples have been analyzed with the CAMSIZER M1 static image analyzer to determine the size and shape distribution. The mineral usually forms acicular crystals. The analysis of both width and length is therefore required to thoroughly characterize the material.

Fig. 1: *Milled wollastonite sample for analysis (left) and rock specimen with white crystals of wollastonite (right, source: Wikipedia).*

Static Image Analysis with the CAMSIZER M1

The CAMSIZER M1 uses the principle of static image analysis (ISO 13322-1) to determine the particle size and particle shape in a measuring range from 0.5 µm to 1500 µm. An object slide with sample material is shifted stepwise along a camera system which acquires one image per step. The samples may be dry or wet (powders or suspensions). In contrast to dynamic image analysis, the sample remains stationary during the image acquisition. Hence, the particle images show excellent quality and richness of detail. The CAMSIZER M1 particle size / particle shape analyzer features a powerful illumination unit, a highly precise sample stage and five objectives with magnifications from 2.5x to 50x. Thanks to the wide traversing range of the sample stage, an area corresponding to up to eight standard object slides can be evaluated. The CAMSIZER M1 uses an 18.1 Megapixel color camera for image acquisition which guarantees rapid and accurate particle analysis over the entire measuring range.

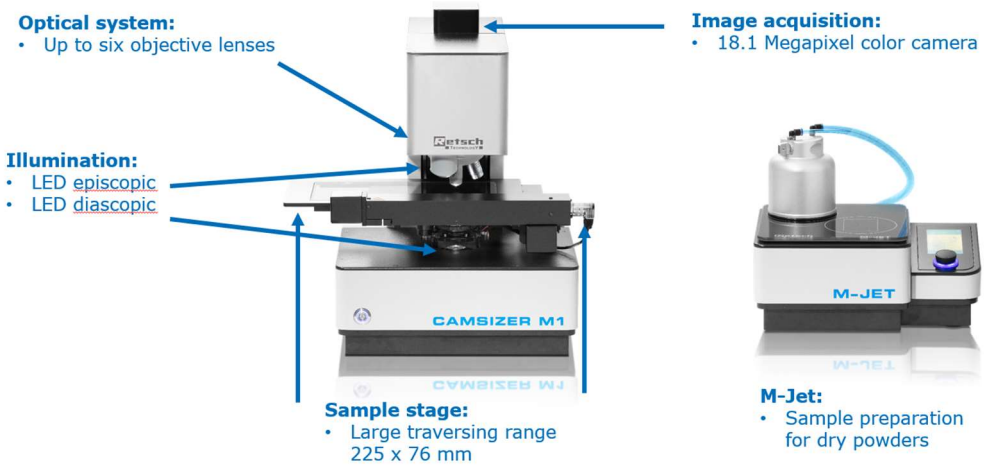


Fig. 2: *CAMSIZER M1 is a powerful static image analyser. For sample preparation of dry powders, the M-Jet module is available*

Sample Preparation

Two powder-like wollastonite samples were analyzed with the CAMSIZER M1. Prior to the measurement, the samples were dispersed on a 76 x 52 mm microscope slide using the M-Jet dry dispersion module. A glass slide is placed under the dispersion chamber of the M-Jet which is subsequently evacuated. As the chamber is flushed with ambient air, the powder from the sample holder is carried into the chamber and is homogeneously distributed onto the glass slide.

The samples were measured with the CAMSIZER M1 with the size definitions $x_{c\,min}$ (**particle width**), and $x_{Fe\,max}$ (**particle length**), the particle shape is detected simultaneously. The instrument was set up for transmitted light and 5 x magnification. Sample 2 was additionally measured with 10 x magnification. An area of 25 x 35 frames was scanned with 5 x magnification and 40 x 50 frames with 10 x magnification. Up to 70 000 particles were analyzed in this way. Analysis time was approx. 5 minutes at 5 x magnification and 12 minutes at 10 x magnification.

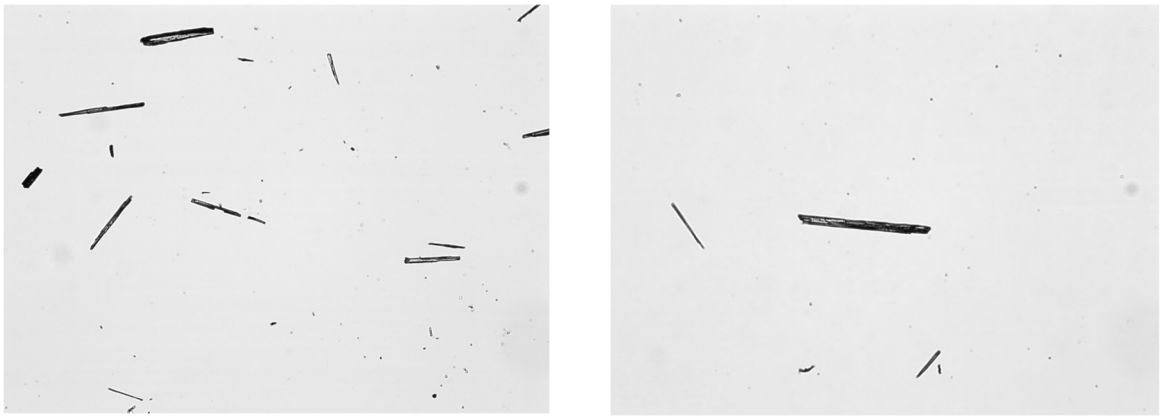


Fig. 3: *Example images of the wollastonite samples taken by the CAMSIZER M1 powders. Left: sample 1, 5 x magnification, right: sample 2, 5 x magnification. The acicular geometry of the particles is evident.*

Fig. 4: *Wollastonite sample 1, overview image of the measurement area, 10 x magnification, transmitted light*

Fig. 3 shows digital images taken of sample 1 and 2 by the CAMSIZER M1. Every image is evaluated in real time and saved for subsequent analysis. An overview image is created which gives the user the opportunity to evaluate dispersion quality and check for contamination (Fig. 4).

Results

In the following diagrams the size distribution is expressed by:

- Cumulative distribution Q_3

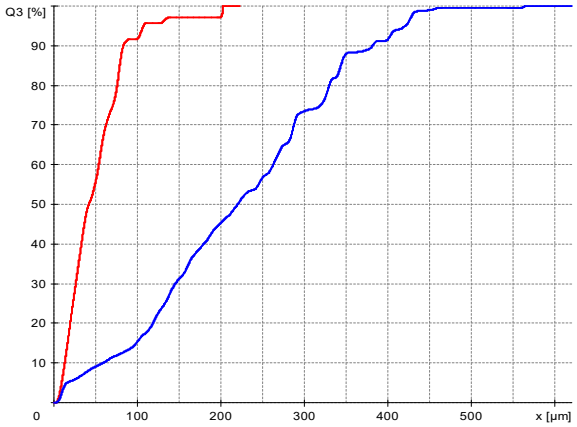


Fig. 5: *Size graphs of Wollastonite Sample 2. Size definition* ***particle width*** *(x c min,* ***red****) and* ***particle length*** *(x Fe max,* ***blue****). CAMSIZER M1, transmitted light, 5 x magnification.*

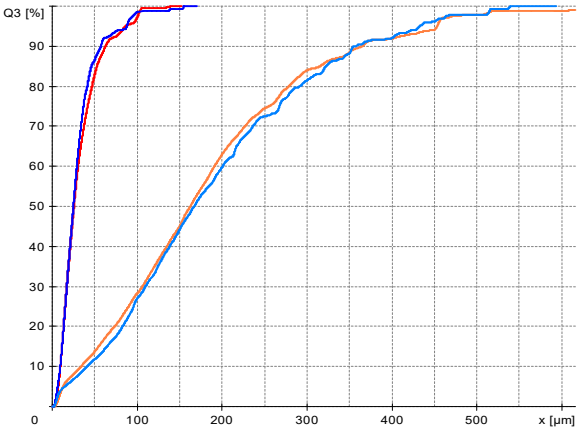


Fig. 6: *Size graphs of Wollastonite Sample 1. Size definition* ***particle width*** *x c min* ***5 x magnification*** *(****red****) and* ***10 x magnification*** *(****blue****) –* ***particle length*** *(x Fe max)* ***5 x magnification*** *(orange) and* ***10 x magnification*** *(light blue) CAMSIZER M1, transmitted light. The results are almost identical, but the measurement with 5x magnification is significantly faster.*

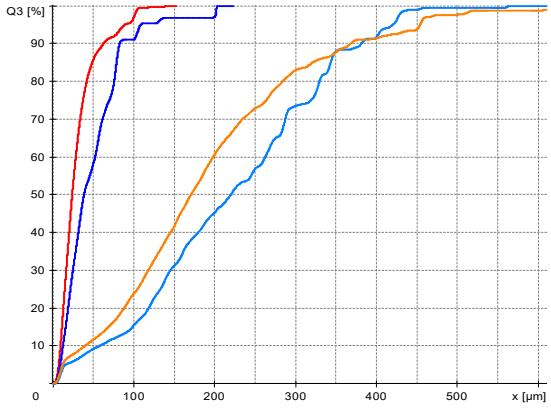


Fig. 7: *Size graphs of Sample 1,* ***x*** *c min (****red****) Sample 2* ***x*** *Fe max (orange), Sample 2* ***x*** *c min (****blue****) and Sample 2* ***x*** *Fe max (light blue) 5 x magnification.*

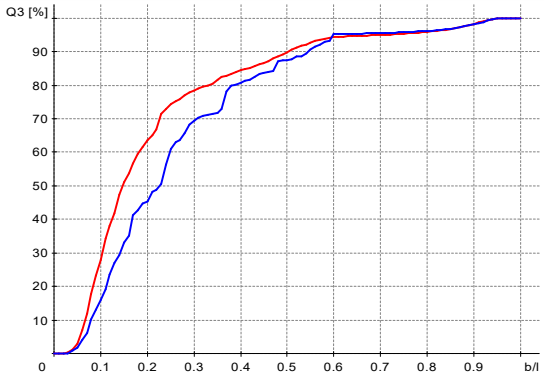
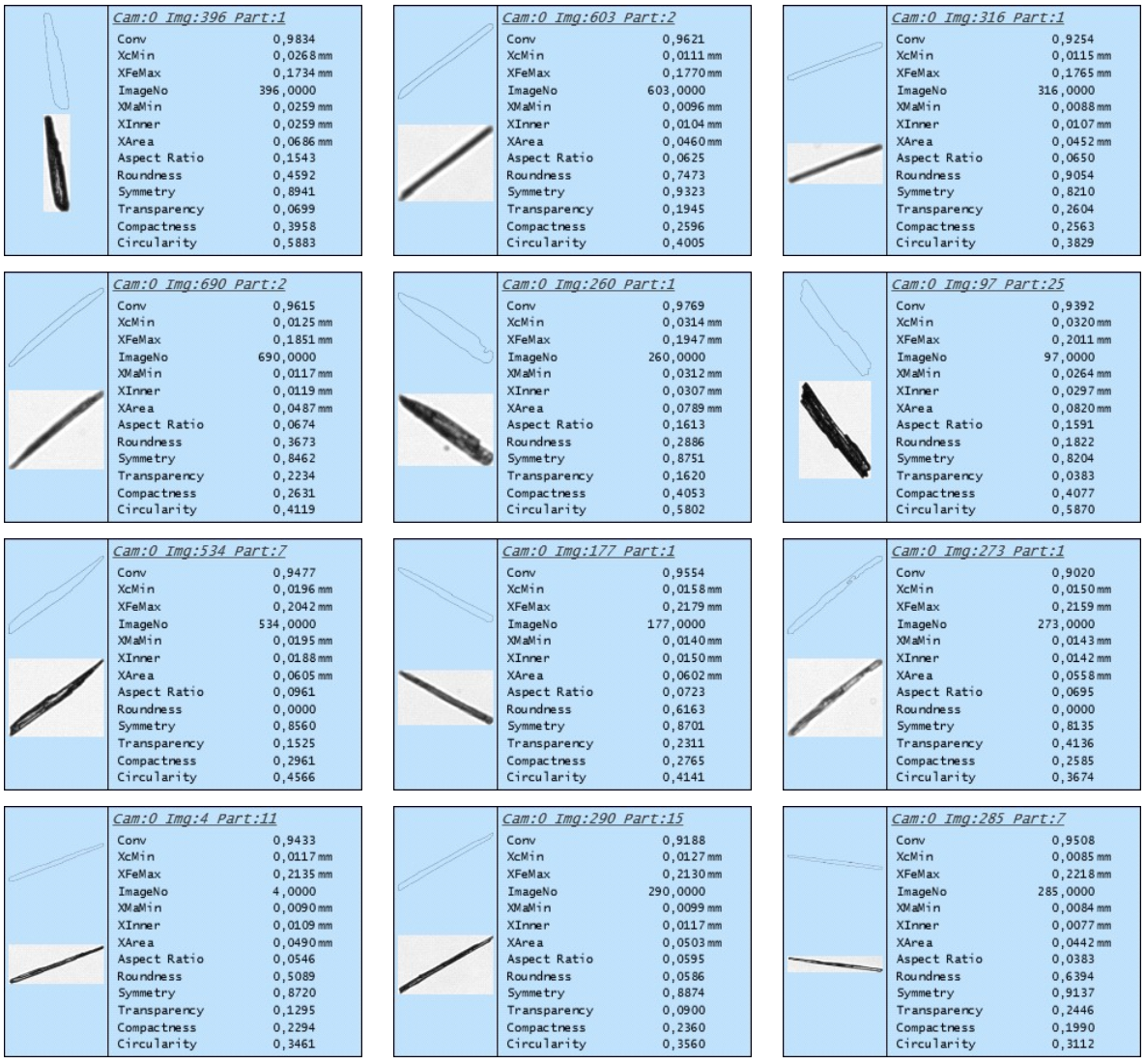


Fig. 8: Shape graphs of Wollastonite sample 1 (**red**) and wollastonite sample 2 (**blue**), shape parameter **aspect ratio** (b/l), 5 x magnification, transmitted light. Sample 1 has a lower aspect ratio than sample 2.

Particle Evaluation

All images that are acquired during the measurement are saved and can be used for later evaluation. The Particle X-Plorer software offers many possibilities to evaluate images or individual particles. Filter options are available to browse for particles with selected characteristics. In the following, the 30 longest particles from each sample are listed. Note that all relevant size and shape data are displayed right next to the particle images.



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XcMin	0,0268 mm
XFeMax	0,1734 mm
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XMaMin	0,0259 mm
XInner	0,0259 mm
XArea	0,0686 mm
Aspect Ratio	0,1543
Roundness	0,4592
Symmetry	0,8941
Transparency	0,0699
Compactness	0,3958
Circularity	0,5883

Cam:0 Img:603 Part:2	
Conv	0,9621
XcMin	0,0111 mm
XFeMax	0,1770 mm
ImageNo	603,0000
XMaMin	0,0096 mm
XInner	0,0104 mm
XArea	0,0460 mm
Aspect Ratio	0,0625
Roundness	0,7473
Symmetry	0,9323
Transparency	0,1945
Compactness	0,2596
Circularity	0,4005

Cam:0 Img:316 Part:1	
Conv	0,9254
XcMin	0,0115 mm
XFeMax	0,1765 mm
ImageNo	316,0000
XMaMin	0,0088 mm
XInner	0,0107 mm
XArea	0,0452 mm
Aspect Ratio	0,0650
Roundness	0,9054
Symmetry	0,8210
Transparency	0,2604
Compactness	0,2563
Circularity	0,3829

Cam:0 Img:690 Part:2	
Conv	0,9615
XcMin	0,0125 mm
XFeMax	0,1851 mm
ImageNo	690,0000
XMaMin	0,0117 mm
XInner	0,0119 mm
XArea	0,0487 mm
Aspect Ratio	0,0674
Roundness	0,3673
Symmetry	0,8462
Transparency	0,2234
Compactness	0,2631
Circularity	0,4119

Cam:0 Img:260 Part:1	
Conv	0,9769
XcMin	0,0314 mm
XFeMax	0,1947 mm
ImageNo	260,0000
XMaMin	0,0312 mm
XInner	0,0307 mm
XArea	0,0789 mm
Aspect Ratio	0,1613
Roundness	0,2886
Symmetry	0,8751
Transparency	0,1620
Compactness	0,4053
Circularity	0,5802

Cam:0 Img:97 Part:25	
Conv	0,9392
XcMin	0,0320 mm
XFeMax	0,2011 mm
ImageNo	97,0000
XMaMin	0,0264 mm
XInner	0,0297 mm
XArea	0,0820 mm
Aspect Ratio	0,1591
Roundness	0,1822
Symmetry	0,8204
Transparency	0,0383
Compactness	0,4077
Circularity	0,5870

Cam:0 Img:534 Part:7	
Conv	0,9477
XcMin	0,0196 mm
XFeMax	0,2042 mm
ImageNo	534,0000
XMaMin	0,0195 mm
XInner	0,0188 mm
XArea	0,0605 mm
Aspect Ratio	0,0961
Roundness	0,0000
Symmetry	0,8560
Transparency	0,1525
Compactness	0,2961
Circularity	0,4566

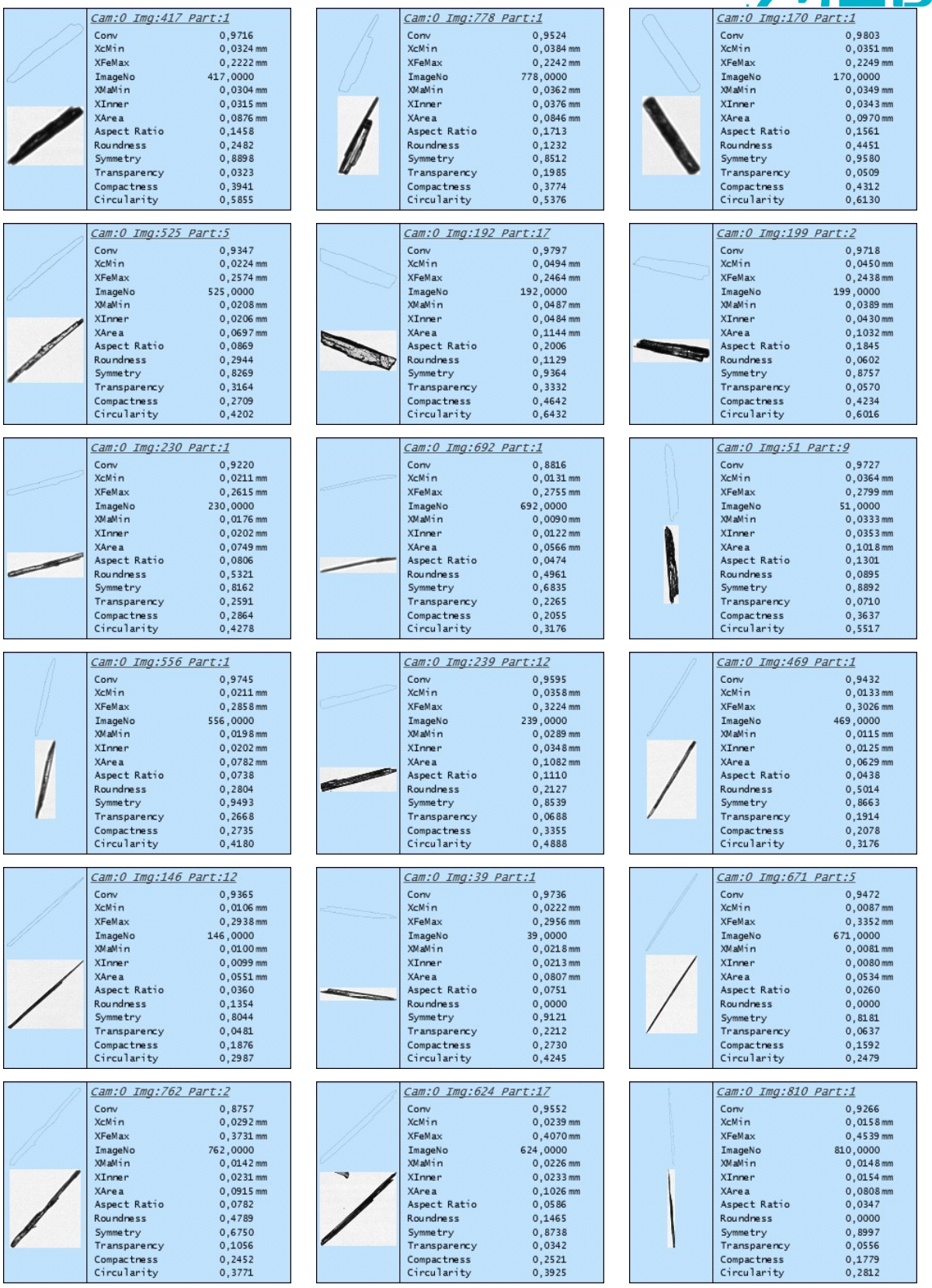
Cam:0 Img:177 Part:1	
Conv	0,9554
XcMin	0,0158 mm
XFeMax	0,2179 mm
ImageNo	177,0000
XMaMin	0,0140 mm
XInner	0,0150 mm
XArea	0,0602 mm
Aspect Ratio	0,0723
Roundness	0,6163
Symmetry	0,8701
Transparency	0,2311
Compactness	0,2765
Circularity	0,4141

Cam:0 Img:273 Part:1	
Conv	0,9020
XcMin	0,0150 mm
XFeMax	0,2159 mm
ImageNo	273,0000
XMaMin	0,0143 mm
XInner	0,0142 mm
XArea	0,0558 mm
Aspect Ratio	0,0695
Roundness	0,0000
Symmetry	0,8135
Transparency	0,4136
Compactness	0,2585
Circularity	0,3674

Cam:0 Img:4 Part:11	
Conv	0,9433
XcMin	0,0117 mm
XFeMax	0,2135 mm
ImageNo	4,0000
XMaMin	0,0090 mm
XInner	0,0109 mm
XArea	0,0490 mm
Aspect Ratio	0,0546
Roundness	0,5089
Symmetry	0,8720
Transparency	0,1295
Compactness	0,2294
Circularity	0,3461

Cam:0 Img:290 Part:15	
Conv	0,9188
XcMin	0,0127 mm
XFeMax	0,2130 mm
ImageNo	290,0000
XMaMin	0,0099 mm
XInner	0,0117 mm
XArea	0,0503 mm
Aspect Ratio	0,0595
Roundness	0,0586
Symmetry	0,8874
Transparency	0,0900
Compactness	0,2360
Circularity	0,3560

Cam:0 Img:285 Part:7	
Conv	0,9508
XcMin	0,0085 mm
XFeMax	0,2218 mm
ImageNo	285,0000
XMaMin	0,0084 mm
XInner	0,0077 mm
XArea	0,0442 mm
Aspect Ratio	0,0383
Roundness	0,6394
Symmetry	0,9137
Transparency	0,2446
Compactness	0,1990
Circularity	0,3112



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Conv	0,9716
XcMin	0,0324 mm
XFeMax	0,2222 mm
ImageNo	417,0000
XMaMin	0,0304 mm
XInner	0,0315 mm
XArea	0,0876 mm
Aspect Ratio	0,1458
Roundness	0,2482
Symmetry	0,8898
Transparency	0,0323
Compactness	0,3941
Circularity	0,5855

Cam:0 Img:778 Part:1	
Conv	0,9524
XcMin	0,0384 mm
XFeMax	0,2242 mm
ImageNo	778,0000
XMaMin	0,0362 mm
XInner	0,0376 mm
XArea	0,0846 mm
Aspect Ratio	0,1713
Roundness	0,1232
Symmetry	0,8512
Transparency	0,1985
Compactness	0,3774
Circularity	0,5376

Cam:0 Img:170 Part:1	
Conv	0,9803
XcMin	0,0351 mm
XFeMax	0,2249 mm
ImageNo	170,0000
XMaMin	0,0349 mm
XInner	0,0343 mm
XArea	0,0970 mm
Aspect Ratio	0,1561
Roundness	0,4451
Symmetry	0,9580
Transparency	0,0509
Compactness	0,4312
Circularity	0,6130

Cam:0 Img:525 Part:5	
Conv	0,9347
XcMin	0,0224 mm
XFeMax	0,2574 mm
ImageNo	525,0000
XMaMin	0,0208 mm
XInner	0,0206 mm
XArea	0,0697 mm
Aspect Ratio	0,0869
Roundness	0,2944
Symmetry	0,8269
Transparency	0,3164
Compactness	0,2709
Circularity	0,4202

Cam:0 Img:192 Part:17	
Conv	0,9797
XcMin	0,0494 mm
XFeMax	0,2464 mm
ImageNo	192,0000
XMaMin	0,0487 mm
XInner	0,0484 mm
XArea	0,1144 mm
Aspect Ratio	0,2006
Roundness	0,1129
Symmetry	0,9364
Transparency	0,3332
Compactness	0,4642
Circularity	0,6432

Cam:0 Img:199 Part:2	
Conv	0,9718
XcMin	0,0450 mm
XFeMax	0,2438 mm
ImageNo	199,0000
XMaMin	0,0389 mm
XInner	0,0430 mm
XArea	0,1032 mm
Aspect Ratio	0,1845
Roundness	0,0602
Symmetry	0,8757
Transparency	0,0570
Compactness	0,4234
Circularity	0,6016

Cam:0 Img:230 Part:1	
Conv	0,9220
XcMin	0,0211 mm
XFeMax	0,2615 mm
ImageNo	230,0000
XMaMin	0,0176 mm
XInner	0,0202 mm
XArea	0,0749 mm
Aspect Ratio	0,0806
Roundness	0,5321
Symmetry	0,8162
Transparency	0,2591
Compactness	0,2864
Circularity	0,4278

Cam:0 Img:692 Part:1	
Conv	0,8816
XcMin	0,0131 mm
XFeMax	0,2755 mm
ImageNo	692,0000
XMaMin	0,0090 mm
XInner	0,0122 mm
XArea	0,0566 mm
Aspect Ratio	0,0474
Roundness	0,4961
Symmetry	0,6835
Transparency	0,2265
Compactness	0,2055
Circularity	0,3176

Cam:0 Img:51 Part:9	
Conv	0,9727
XcMin	0,0364 mm
XFeMax	0,2799 mm
ImageNo	51,0000
XMaMin	0,0333 mm
XInner	0,0353 mm
XArea	0,1018 mm
Aspect Ratio	0,1301
Roundness	0,0895
Symmetry	0,8892
Transparency	0,0710
Compactness	0,3637
Circularity	0,5517

Cam:0 Img:556 Part:1	
Conv	0,9745
XcMin	0,0211 mm
XFeMax	0,2858 mm
ImageNo	556,0000
XMaMin	0,0198 mm
XInner	0,0202 mm
XArea	0,0782 mm
Aspect Ratio	0,0738
Roundness	0,2804
Symmetry	0,9493
Transparency	0,2668
Compactness	0,2735
Circularity	0,4180

Cam:0 Img:239 Part:12	
Conv	0,9595
XcMin	0,0358 mm
XFeMax	0,3224 mm
ImageNo	239,0000
XMaMin	0,0289 mm
XInner	0,0348 mm
XArea	0,1082 mm
Aspect Ratio	0,1110
Roundness	0,2127
Symmetry	0,8539
Transparency	0,0688
Compactness	0,3355
Circularity	0,4888

Cam:0 Img:469 Part:1	
Conv	0,9432
XcMin	0,0133 mm
XFeMax	0,3026 mm
ImageNo	469,0000
XMaMin	0,0115 mm
XInner	0,0125 mm
XArea	0,0629 mm
Aspect Ratio	0,0438
Roundness	0,5014
Symmetry	0,8663
Transparency	0,1914
Compactness	0,2078
Circularity	0,3176

Cam:0 Img:146 Part:12	
Conv	0,9365
XcMin	0,0106 mm
XFeMax	0,2938 mm
ImageNo	146,0000
XMaMin	0,0100 mm
XInner	0,0099 mm
XArea	0,0551 mm
Aspect Ratio	0,0360
Roundness	0,1354
Symmetry	0,8044
Transparency	0,0481
Compactness	0,1876
Circularity	0,2987

Cam:0 Img:39 Part:1	
Conv	0,9736
XcMin	0,0222 mm
XFeMax	0,2956 mm
ImageNo	39,0000
XMaMin	0,0218 mm
XInner	0,0213 mm
XArea	0,0807 mm
Aspect Ratio	0,0751
Roundness	0,0000
Symmetry	0,9121
Transparency	0,2212
Compactness	0,2730
Circularity	0,4245

Cam:0 Img:671 Part:5	
Conv	0,9472
XcMin	0,0087 mm
XFeMax	0,3352 mm
ImageNo	671,0000
XMaMin	0,0081 mm
XInner	0,0080 mm
XArea	0,0534 mm
Aspect Ratio	0,0260
Roundness	0,0000
Symmetry	0,8181
Transparency	0,0637
Compactness	0,1592
Circularity	0,2479

Cam:0 Img:762 Part:2	
Conv	0,8757
XcMin	0,0292 mm
XFeMax	0,3731 mm
ImageNo	762,0000
XMaMin	0,0142 mm
XInner	0,0231 mm
XArea	0,0915 mm
Aspect Ratio	0,0782
Roundness	0,4789
Symmetry	0,6750
Transparency	0,1056
Compactness	0,2452
Circularity	0,3771

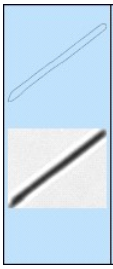
Cam:0 Img:624 Part:17	
Conv	0,9552
XcMin	0,0239 mm
XFeMax	0,4070 mm
ImageNo	624,0000
XMaMin	0,0226 mm
XInner	0,0233 mm
XArea	0,1026 mm
Aspect Ratio	0,0586
Roundness	0,1465
Symmetry	0,8738
Transparency	0,0342
Compactness	0,2521
Circularity	0,3925

Cam:0 Img:810 Part:1	
Conv	0,9266
XcMin	0,0158 mm
XFeMax	0,4539 mm
ImageNo	810,0000
XMaMin	0,0148 mm
XInner	0,0154 mm
XArea	0,0808 mm
Aspect Ratio	0,0347
Roundness	0,0000
Symmetry	0,8997
Transparency	0,0556
Compactness	0,1779
Circularity	0,2812

Fig. 9: *The 30 longest particles of sample 1*

Cam:0 Img:396 Part:1

Conv	0,9834
XcMin	0,0268 mm
XFeMax	0,1734 mm
ImageNo	396,0000
XMaMin	0,0259 mm
XInner	0,0259 mm
XArea	0,0686 mm
Aspect Ratio	0,1543
Roundness	0,4592
Symmetry	0,8941
Transparency	0,0699
Compactness	0,3958
Circularity	0,5883



Cam:0 Img:603 Part:2

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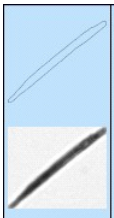
XFeMax	0,1770 mm
ImageNo	603,0000
XMaMin	0,0096 mm
XInner	0,0104 mm
XArea	0,0460 mm
Aspect Ratio	0,0625
Roundness	0,7473
Symmetry	0,9323
Transparency	0,1945
Compactness	0,2596
Circularity	0,4005

Cam:0 Img:316 Part:1

Conv	0,9254
XcMin	0,0115 mm
XFeMax	0,1765 mm
ImageNo	316,0000
XMaMin	0,0088 mm
XInner	0,0107 mm
XArea	0,0452 mm
Aspect Ratio	0,0650
Roundness	0,9054
Symmetry	0,8210
Transparency	0,2604
Compactness	0,2563
Circularity	0,3829



Cam:0 Img:690 Part:2

Conv	0,9615
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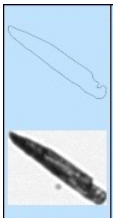
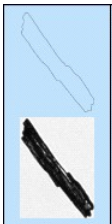
XFeMax	0,1851 mm
ImageNo	690,0000
XMaMin	0,0117 mm
XInner	0,0119 mm
XArea	0,0487 mm
Aspect Ratio	0,0674
Roundness	0,3673
Symmetry	0,8462
Transparency	0,2234
Compactness	0,2631
Circularity	0,4119



Cam:0 Img:260 Part:1

Conv	0,9769
XcMin	0,0314 mm
XFeMax	0,1947 mm
ImageNo	260,0000
XMaMin	0,0312 mm
XInner	0,0307 mm
XArea	0,0789 mm
Aspect Ratio	0,1613
Roundness	0,2886
Symmetry	0,8751
Transparency	0,1620
Compactness	0,4053
Circularity	0,5802



Cam:0 Img:97 Part:25

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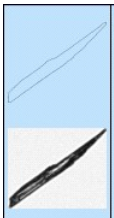
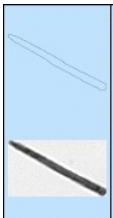
XFeMax	0,2011 mm
ImageNo	97,0000
XMaMin	0,0264 mm
XInner	0,0297 mm
XArea	0,0820 mm
Aspect Ratio	0,1591
Roundness	0,1822
Symmetry	0,8204
Transparency	0,0383
Compactness	0,4077
Circularity	0,5870



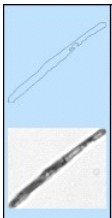
Cam:0 Img:534 Part:7

Conv	0,9477
XcMin	0,0196 mm
XFeMax	0,2042 mm
ImageNo	534,0000
XMaMin	0,0195 mm
XInner	0,0188 mm
XArea	0,0605 mm
Aspect Ratio	0,0961
Roundness	0,0000
Symmetry	0,8560
Transparency	0,1525
Compactness	0,2961
Circularity	0,4566



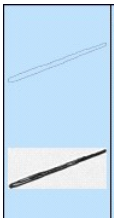
Cam:0 Img:177 Part:1

Conv	0,9554
XcMin	0,0158 mm
XFeMax	0,2179 mm
ImageNo	177,0000
XMaMin	0,0140 mm
XInner	0,0150 mm
XArea	0,0602 mm
Aspect Ratio	0,0723
Roundness	0,6163
Symmetry	0,8701
Transparency	0,2311
Compactness	0,2765
Circularity	0,4141



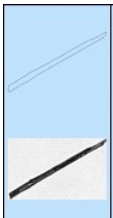
Cam:0 Img:273 Part:1

Conv	0,9020
XcMin	0,0150 mm
XFeMax	0,2159 mm
ImageNo	273,0000
XMaMin	0,0143 mm
XInner	0,0142 mm
XArea	0,0558 mm
Aspect Ratio	0,0695
Roundness	0,0000
Symmetry	0,8135
Transparency	0,4136
Compactness	0,2585
Circularity	0,3674



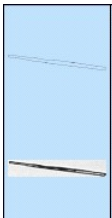
Cam:0 Img:4 Part:11

Conv	0,9433
XcMin	0,0117 mm
XFeMax	0,2135 mm
ImageNo	4,0000
XMaMin	0,0090 mm
XInner	0,0109 mm
XArea	0,0490 mm
Aspect Ratio	0,0546
Roundness	0,5089
Symmetry	0,8720
Transparency	0,1295
Compactness	0,2294
Circularity	0,3461



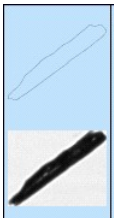
Cam:0 Img:290 Part:15

Conv	0,9188
XcMin	0,0127 mm
XFeMax	0,2130 mm
ImageNo	290,0000
XMaMin	0,0099 mm
XInner	0,0117 mm
XArea	0,0503 mm
Aspect Ratio	0,0595
Roundness	0,0586
Symmetry	0,8874
Transparency	0,0900
Compactness	0,2360
Circularity	0,3560



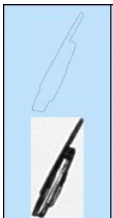
Cam:0 Img:285 Part:7

Conv	0,9508
XcMin	0,0085 mm
XFeMax	0,2218 mm
ImageNo	285,0000
XMaMin	0,0084 mm
XInner	0,0077 mm
XArea	0,0442 mm
Aspect Ratio	0,0383
Roundness	0,6394
Symmetry	0,9137
Transparency	0,2446
Compactness	0,1990
Circularity	0,3112



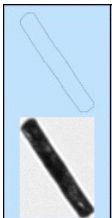
Cam:0 Img:417 Part:1

Conv	0,9716
XcMin	0,0324 mm
XFeMax	0,2222 mm
ImageNo	417,0000
XMaMin	0,0304 mm
XInner	0,0315 mm
XArea	0,0876 mm
Aspect Ratio	0,1458
Roundness	0,2482
Symmetry	0,8898
Transparency	0,0323
Compactness	0,3941
Circularity	0,5855



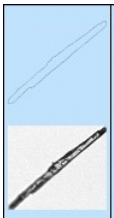
Cam:0 Img:778 Part:1

Conv	0,9524
XcMin	0,0384 mm
XFeMax	0,2242 mm
ImageNo	778,0000
XMaMin	0,0362 mm
XInner	0,0376 mm
XArea	0,0846 mm
Aspect Ratio	0,1713
Roundness	0,1232
Symmetry	0,8512
Transparency	0,1985
Compactness	0,3774
Circularity	0,5376



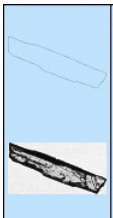
Cam:0 Img:170 Part:1

Conv	0,9803
XcMin	0,0351 mm
XFeMax	0,2249 mm
ImageNo	170,0000
XMaMin	0,0349 mm
XInner	0,0343 mm
XArea	0,0970 mm
Aspect Ratio	0,1561
Roundness	0,4451
Symmetry	0,9580
Transparency	0,0509
Compactness	0,4312
Circularity	0,6130



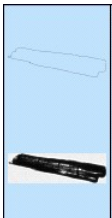
Cam:0 Img:525 Part:5

Conv	0,9347
XcMin	0,0224 mm
XFeMax	0,2574 mm
ImageNo	525,0000
XMaMin	0,0208 mm
XInner	0,0206 mm
XArea	0,0697 mm
Aspect Ratio	0,0869
Roundness	0,2944
Symmetry	0,8269
Transparency	0,3164
Compactness	0,2709
Circularity	0,4202



Cam:0 Img:192 Part:17

Conv	0,9797
XcMin	0,0494 mm
XFeMax	0,2464 mm
ImageNo	192,0000
XMaMin	0,0487 mm
XInner	0,0484 mm
XArea	0,1144 mm
Aspect Ratio	0,2006
Roundness	0,1129
Symmetry	0,9364
Transparency	0,3332
Compactness	0,4642
Circularity	0,6432



Cam:0 Img:199 Part:2

Conv	0,9718
XcMin	0,0450 mm
XFeMax	0,2438 mm
ImageNo	199,0000
XMaMin	0,0389 mm
XInner	0,0430 mm
XArea	0,1032 mm
Aspect Ratio	0,1845
Roundness	0,0602
Symmetry	0,8757
Transparency	0,0570
Compactness	0,4234
Circularity	0,6016

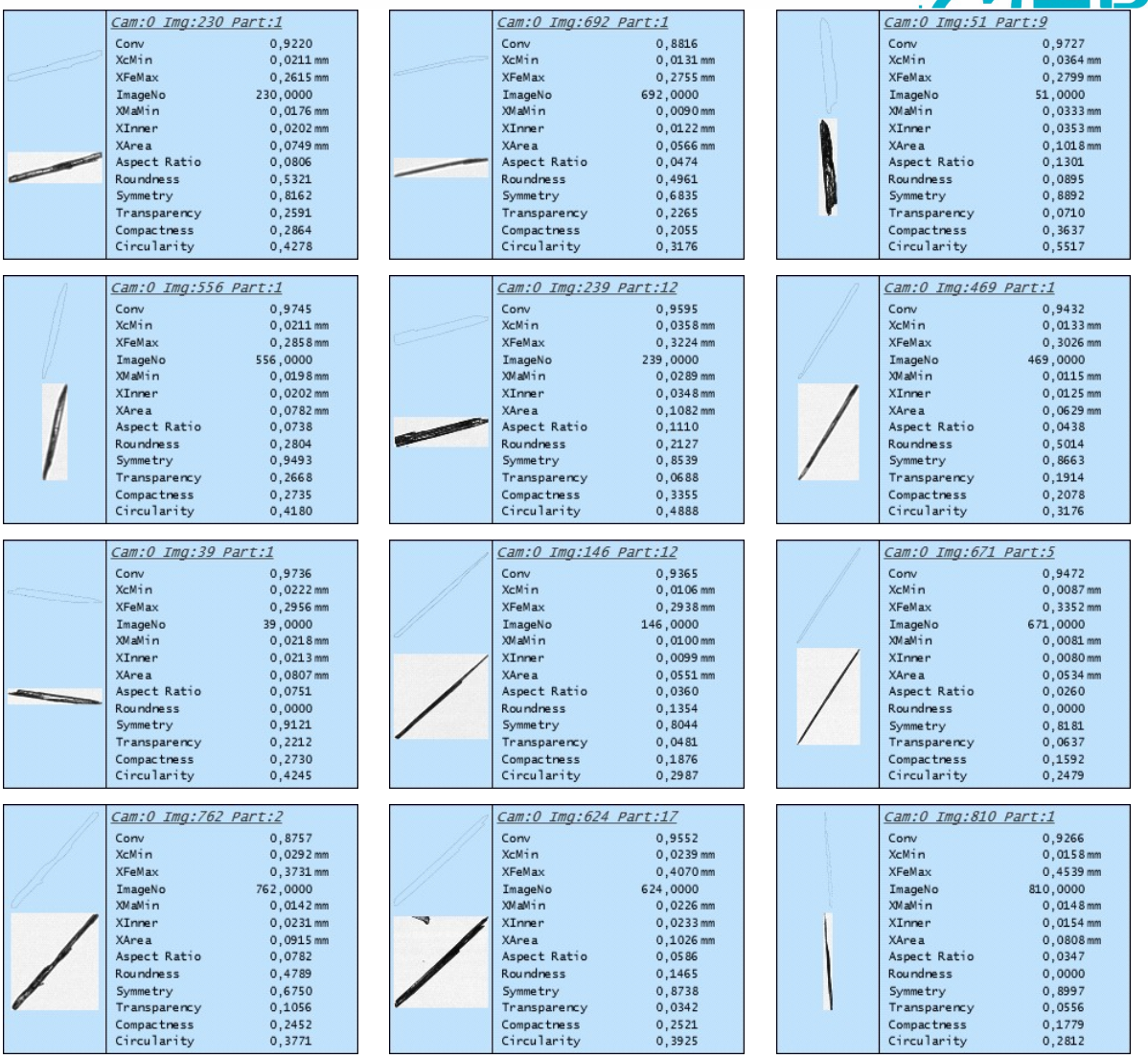
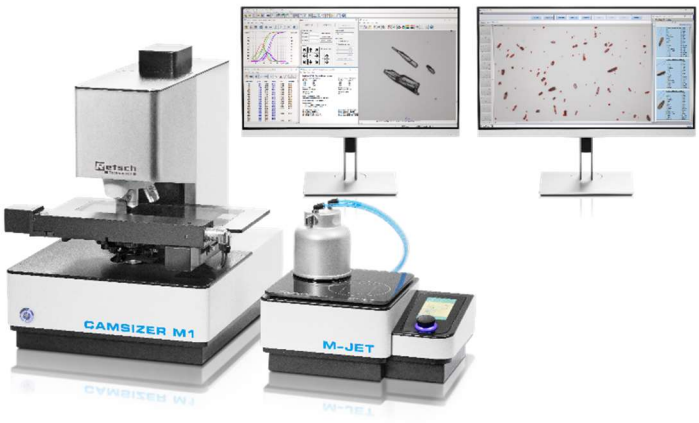


Fig. 10: *The 30 longest particles of sample 2*

CAMSIZER M1: benefits at a glance

- Static image analysis (ISO 13322-1) from 0,5 µm – 1500 µm
- 18.1 Megapixel camera
- Up to six objective lenses
- Transmitted and reflected light
- High precision sample stage
- Max. digital resolution: 35 nm
- M-Jet dispersion module
- Particle X-Plorer Software
- Precise analysis of small particles



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