ANGULARITY ANALYSIS

Sample Description

Two types of abrasive powders (Sample #1 and #2) are submitted for particle characterization and angularity analysis.

Purpose of Analysis

Demonstrate the ability of Clemex Vision image analysis system can discriminate the particles and perform size measurements.

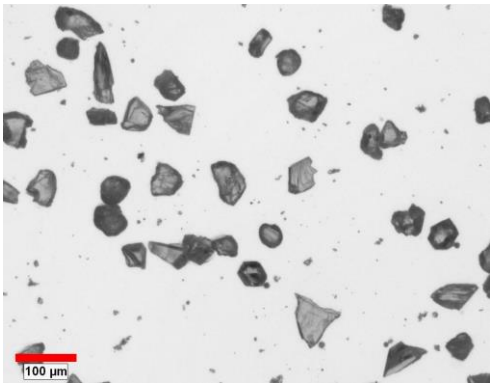


Figure 1: *Original image of sample #1 at 100X.*

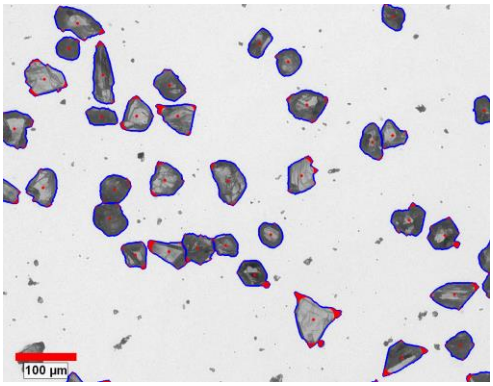


Figure 2: *Outline view of particles as measured in blue bitplane.*

Procedure[1]

A Guard Frame was used to avoid measuring features sectioned by the field of view. Particles were binarized into the blue bitplane. Holes were filled and artifacts were removed during the binarization process. Connected particles were separated prior to measurements.

Equipment

Image Analysis System:	Clemex Vision PE
Magnification:	100X
Calibration:	0.6804 µm/pixel

Results[2]

Angularity, Quantity, Roundness, Length and Aspect Ratio measurements were performed on each feature. Automated statistics and graphs were generated. Final results can be printed directly from Clemex Vision. Raw data are linked to their respective objects for validation purpose. Raw data can also be exported in Excel format.

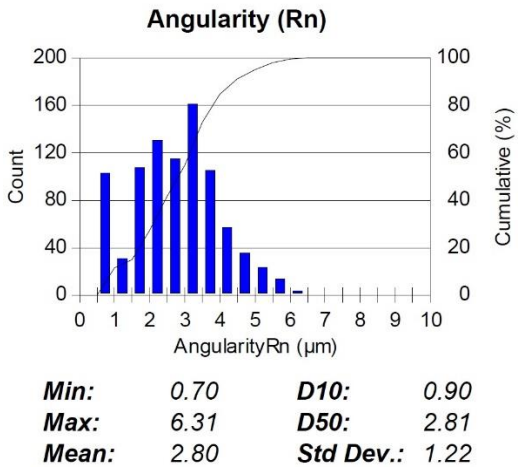


Figure 3: *Particles' Angularity distribution and corresponding statistics.*

1.Images taken during the procedure are available in appendix A
2. Complete results are available in appendix B

Appendix A: Image Analysis Steps

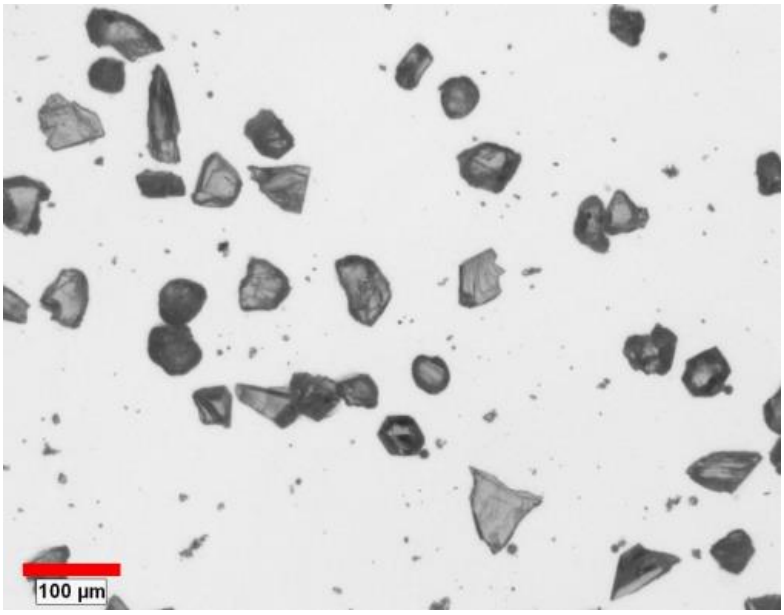


Image 1: Original image at 100X.

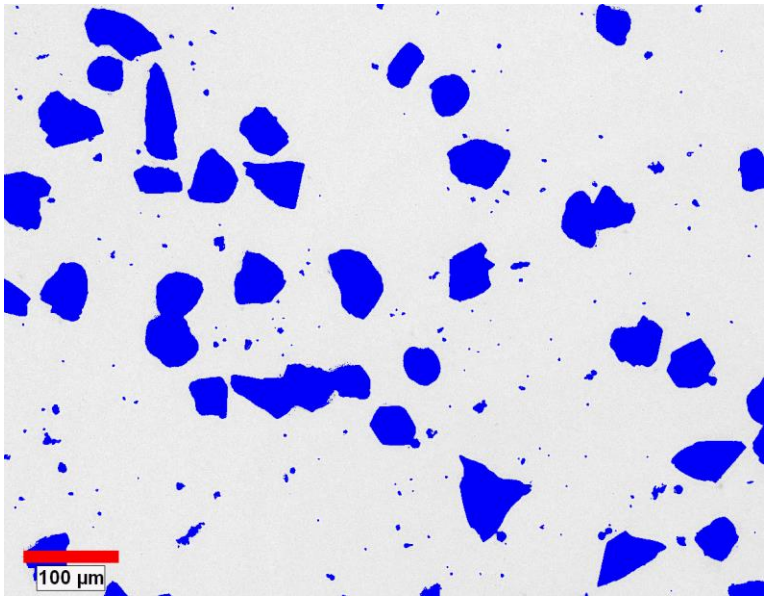


Image 2: Particles as binarized into the blue bitplane.

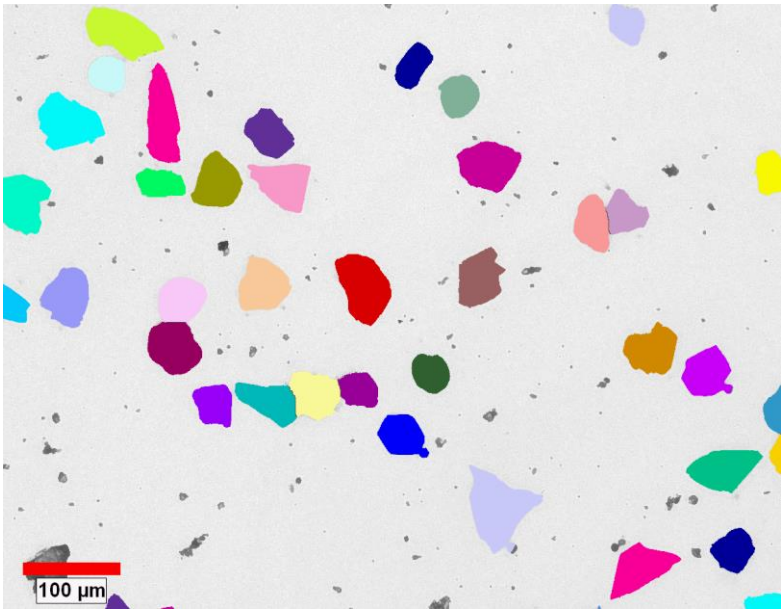


Image 3: Labelling view of separated particles. Small artifacts were eliminated.

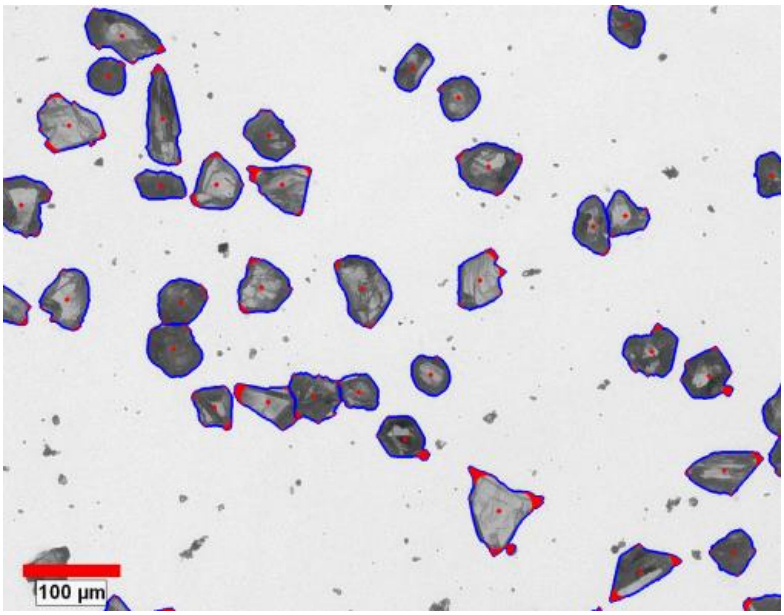


Image 4: Outline view of particles as measured.

Appendix B: Results

Sample #1

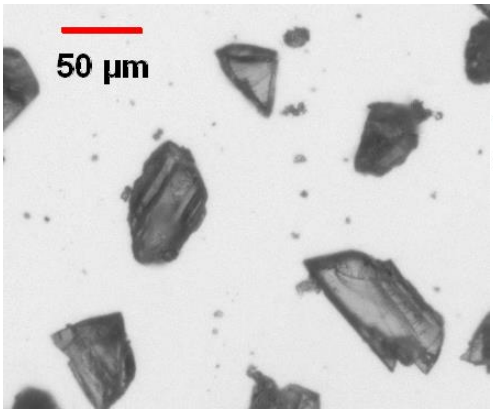
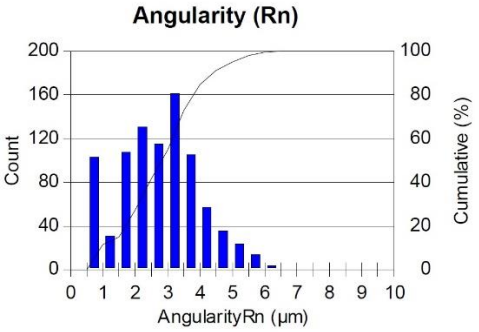
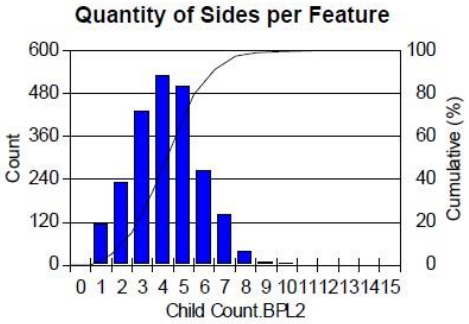


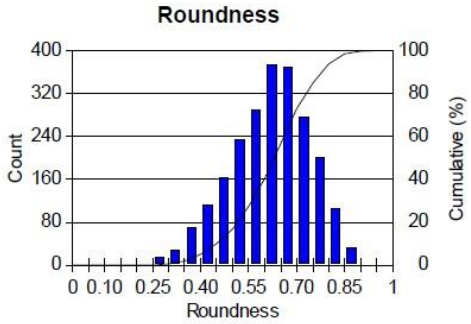
Figure 1. Part of a typical field of view.



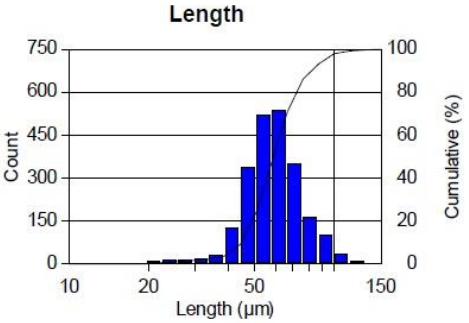
Min:	*0.70*	***D10:***	*0.90*
Max:	*6.31*	***D50:***	*2.81*
Mean:	*2.80*	***Std Dev.:***	*1.22*



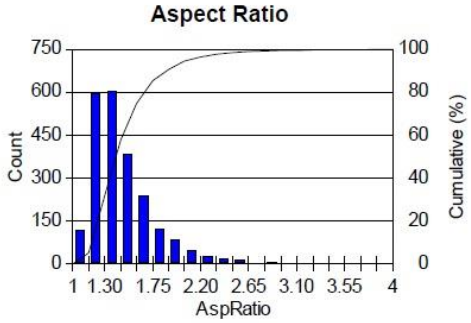
Min:	*1.00*	***D10:***	*1.48*
Max:	*11.00*	***D50:***	*3.68*
Mean:	*4.21*	***Std Dev.:***	*1.67*



Min:	*0.24*	***D10:***	*0.45*
Max:	*0.91*	***D50:***	*0.63*
Mean:	*0.62*	***Std Dev.:***	*0.12*



Min:	*18.29*	***D10:***	*44.80*
Max:	*147.39*	***D50:***	*58.88*
Mean:	*60.94*	***Std Dev.:***	*15.38*



Min:	*1.05*	***D10:***	*1.18*
Max:	*3.82*	***D50:***	*1.40*
Mean:	*1.48*	***Std Dev.:***	*0.31*

Extreme Angularity Values

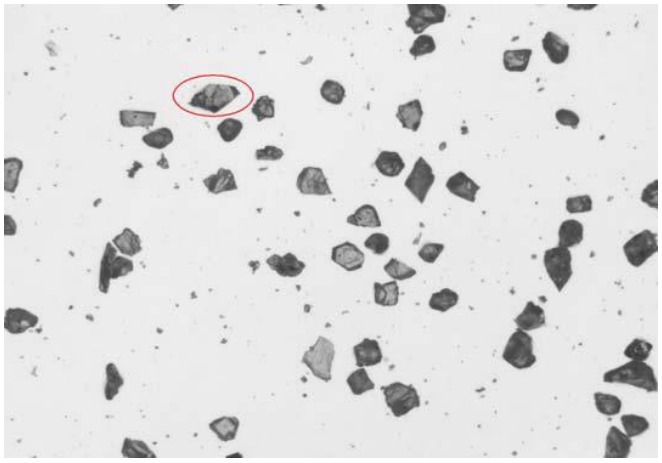


Figure 1. A particle having the mean angularity value is circled in red.

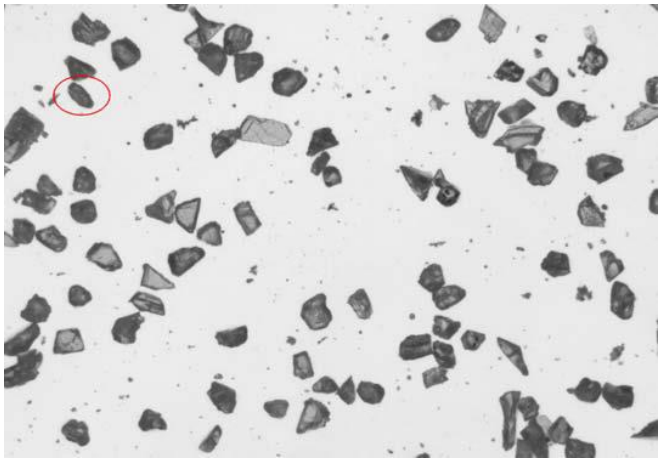


Figure 2. Particle with the lowest angularity value is circled in red.

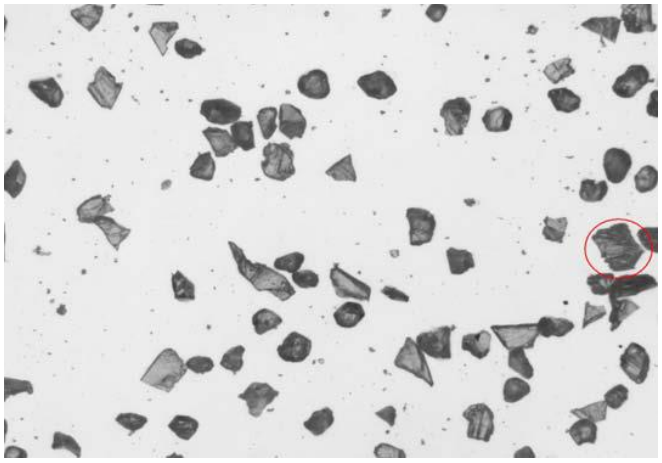


Figure 3. Particle with the highest angularity value is circled in red.

Sample #2

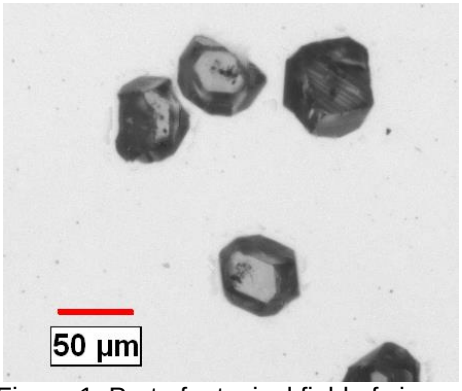
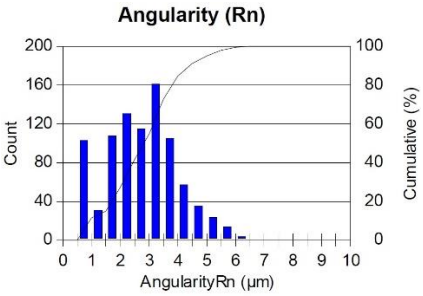
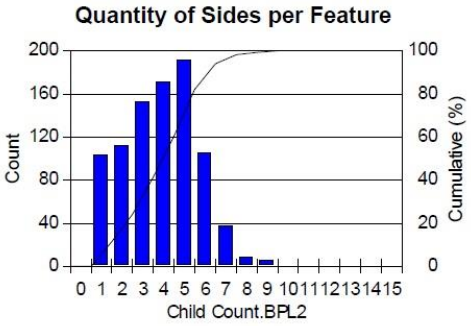


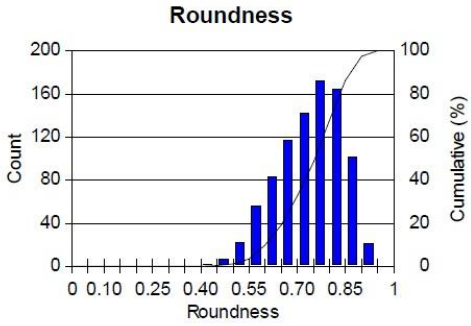
Figure 1. Part of a typical field of view.



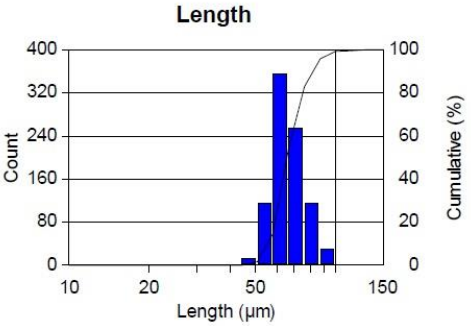
Min:	*0.70*	***D10:***	*0.90*
Max:	*6.31*	***D50:***	*2.81*
Mean:	*2.80*	***Std Dev.:***	*1.22*



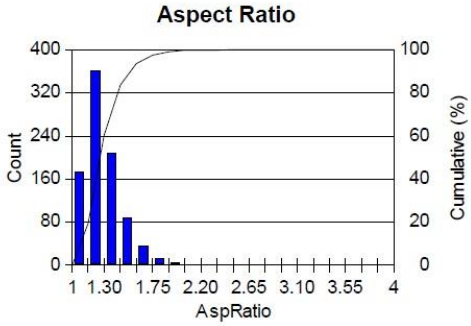
Min:	*1.00*	***D10:***	*1.00*
Max:	*9.00*	***D50:***	*3.45*
Mean:	*3.88*	***Std Dev.:***	*1.76*



Min:	*0.39*	***D10:***	*0.60*
Max:	*0.94*	***D50:***	*0.75*
Mean:	*0.74*	***Std Dev.:***	*0.10*

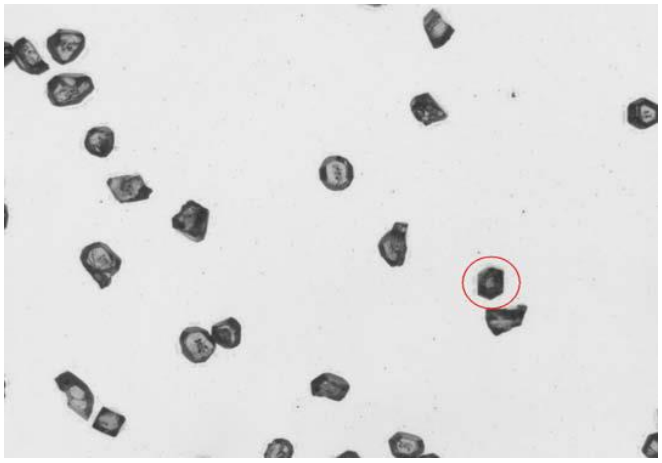


Min:	*37.93*	***D10:***	*56.97*
Max:	*128.60*	***D50:***	*65.64*
Mean:	*67.30*	***Std Dev.:***	*9.97*



Min:	*1.04*	***D10:***	*1.12*
Max:	*2.37*	***D50:***	*1.25*
Mean:	*1.30*	***Std Dev.:***	*0.18*

Extreme Angularity Values



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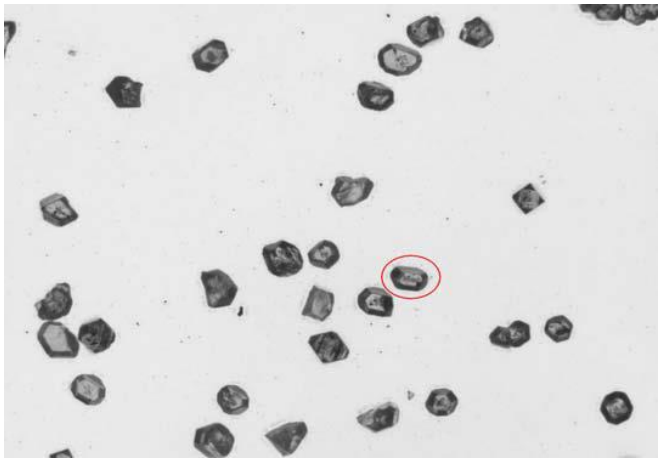

Figure 2. Particle with lowest angularity value is circled in red.

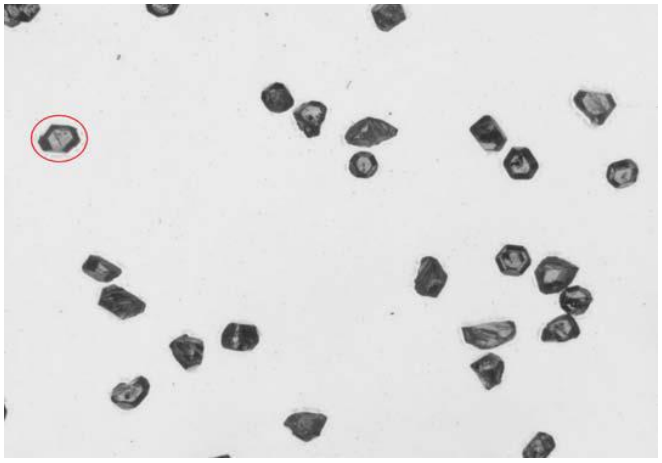

Figure 3. Particle with the highest angularity value is circled in red.