Occhio® powders

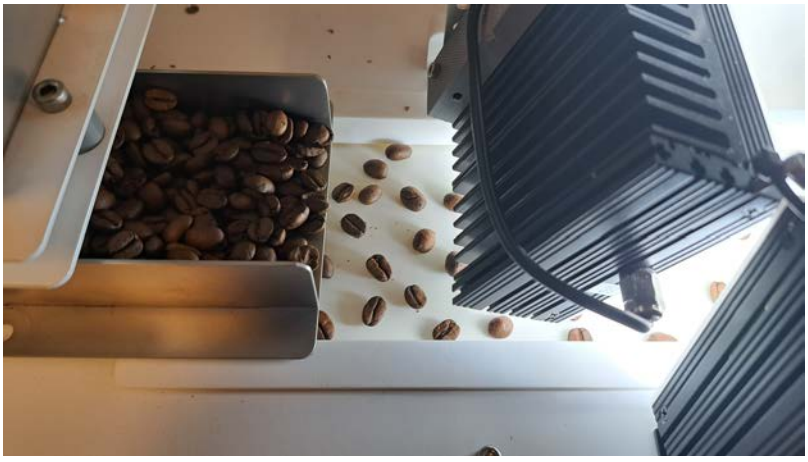
COFFEE LABORATORY
ANALYTICAL EQUIPMENT
www.coffeelabequipment.com

Zephyr ESR-C

THE SIEVING MEASUREMENT BY IMAGING ANALYSIS : FAST AND ACCURATE, INCLUDING PERFECT CORRELATION WITH STANDARD ASTM OR ISO SIEVING METHODS.

- Sieve correlated measurement
- Particle size
- Particle shape
- Dry application
- Color

Developed for the coffee industry by a team of specialized engineers at Occhio



Measures particle size , shape, and color for:

Coffee Beans
Ground Coffee
Instant Coffee

NOW with AI
Automatically detects agglomerates, and removes from analysis.

Unparalleled Accuracy



Digital Imaging Technology allows for correlation to sieve analysis, or laser diffraction

Coffee Laboratory 589 Rappahannock Drive White Stone Va 22578 TEL (804) 435-5522
www.coffeelabequipment.com



How it works

Based on a combination of mechanical dispersion and gravity phenomena, the Occhio Zephyr ESR-C provides a fast and accurate size and shape analysis of sieveable powders.
The instrument combines a high quality imaging system with a robust mechanical design, achieving quality and production control requirement.

Key points

Polyvalent instrument able to analyze different types of samples, powders, granules, pellets, stones, rows materials.

A simple procedure allows fixing analysis duration and cleaning time, just one click and the measurement starts. Within a few seconds, results are displayed and the report is stored or printed. Zephyr ESR2 is able to analyze a large quantity of samples in a short time.

Identifying sieve analysis as the standard measurement method to compute particle size distribution, Occhio Zephyr ESR2 is able to correlate the most efficient particle size distribution obtained by standard sieve method (according with ASTM or ISO procedure).

All Occhio instruments are based on specific optical technology, use high quality lenses with no any distortions, and are installed in a precise, robust mechanical system suitable for industrial working conditions.

Acquisition and statistic software

The Armadillo software ensures accurate particle characterization with an automatic procedure including powder dispersion, analysis, data displays along with statistics and report generation.

- Calibration procedure of each instrument
- Share compleate results with colleagues or clients who are connected to your network
- Compare different measurements
- Summarize measured parameters of hundreds of thousands of particles with the click of a mouse
- Print the report you have designed to fulfi ll your quality policy requirement
- Correlate with other measurement methods, such as sieve or laser methods
- CFR21 part 11 compliant

Size analysis and color characterization of instant coffee samples



Instrument : Zephyr ESR C
Resolution: from 5 to 50 µm/pixel depending on the optical configuration.
Measurement time: less than 5 minutes

Description

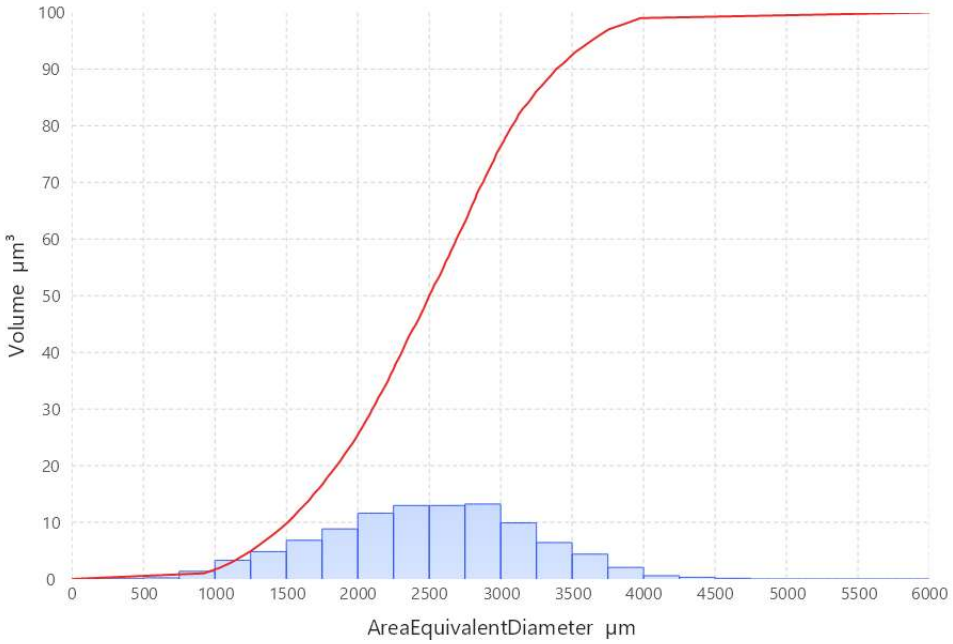
In this study, we utilized image analysis to evaluate the size and color characteristics of two distinct soluble coffee samples.

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Size analysis

Sample A

Volume-weighted particle size distribution



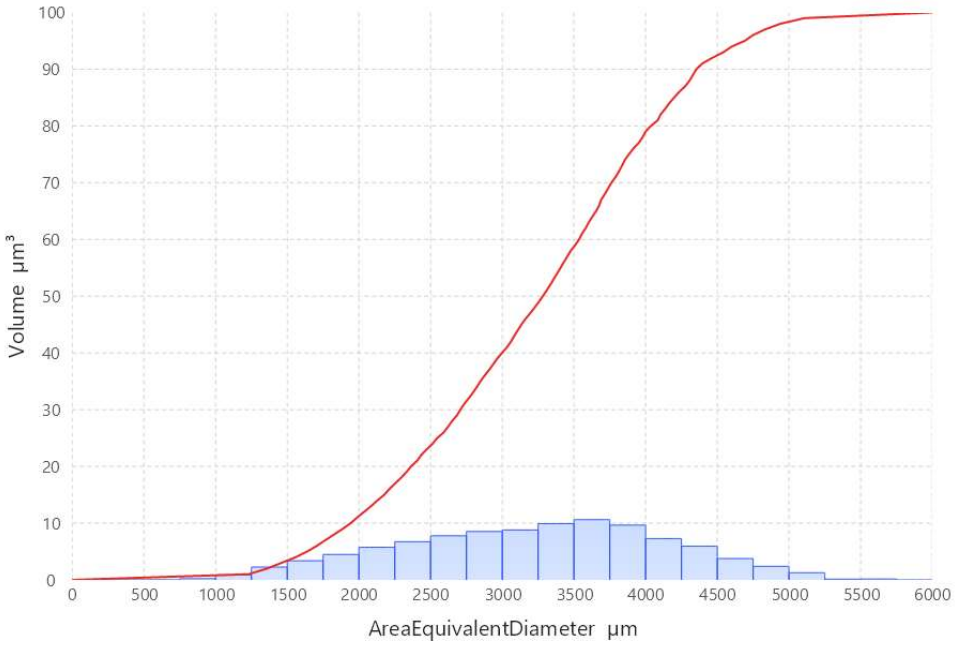
Sample A	d[10]	d[25]	d[50]	d[75]	d[90]
Size (µm)	1510.35	1989.96	2499.9	2968.79	3387.76

Size classes (µm)	Values (%)	Cumulative (%)
0 - 250	0.01	0.01
250 - 500	0.04	0.05
500 - 750	0.21	0.26
750 - 1000	1.36	1.62
1000 - 1250	3.29	4.91
1250 - 1500	4.83	9.74
1500 - 1750	6.83	16.57
1750 - 2000	8.84	25.41
2000 - 2250	11.62	37.04
2250 - 2500	12.97	50.01
2500 - 2750	12.98	62.98
2750 - 3000	13.24	76.22
3000 - 3250	9.91	86.13
3250 - 3500	6.43	92.56
3500 - 3750	4.39	96.95
3750 - 4000	2.05	99
4000 - 4250	0.58	99.58
4250 - 4500	0.3	99.88
4500 - 4750	0.12	100
4750 - 5000	0	100

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Sample B

Volume-weighted particle size distribution



Sample B	d[10]	d[25]	d[50]	d[75]	d[90]
Size (µm)	1942.45	2546.32	3282.61	3883.46	4354.35

Size classes (µm)	Values	Cumulative
500 - 750	0.02	0.02
750 - 1000	0.21	0.24
1000 - 1250	0.87	1.11
1250 - 1500	2.26	3.37
1500 - 1750	3.38	6.74
1750 - 2000	4.48	11.23
2000 - 2250	5.75	16.98
2250 - 2500	6.74	23.71
2500 - 2750	7.78	31.49
2750 - 3000	8.53	40.03
3000 - 3250	8.81	48.83
3250 - 3500	9.92	58.75
3500 - 3750	10.62	69.38
3750 - 4000	9.66	79.03
4000 - 4250	7.29	86.32
4250 - 4500	5.94	92.26
4500 - 4750	3.77	96.03
4750 - 5000	2.4	98.42
5000 - 5250	1.27	99.69
5250 - 5500	0.14	99.84
5500 - 5750	0.16	100
5750 - 6000	0	100

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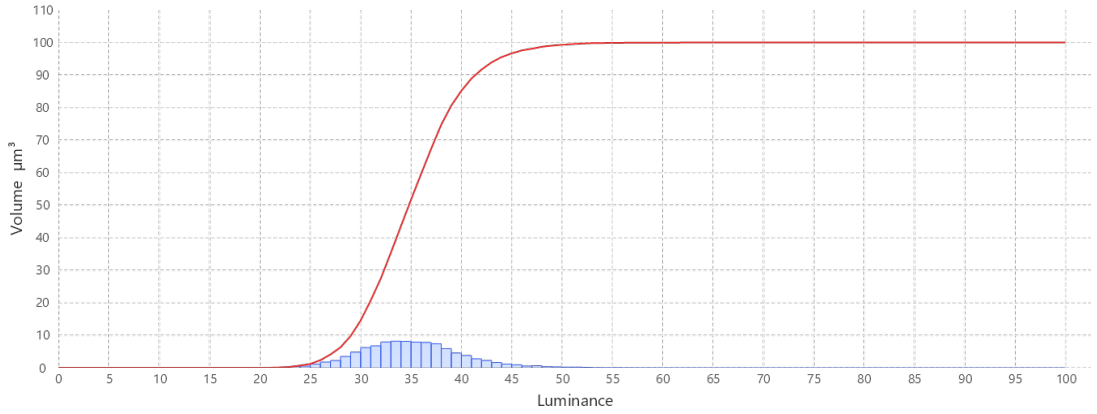
Color characterization

To determine the color of the coffee particles, we employed the luminance parameter. This parameter represents the average value of the three signals (red, green, and blue) captured by the camera during image acquisition. The dispersed particles were allowed to pass through the image region, while a reflection lighting system enabled their acquisition. The Armadillo software then computed the luminance value of each particle in real time.

Darker particles resulted in lower luminance parameter values, while clear particles produced higher values. The luminance distribution was utilized to identify how the luminance varied with respect to the total volume of the sample. For instance, we determined that 50% of the volume of sample A had a luminance value lower than 34.8%, while 50% of the volume of sample B had a luminance value lower than 45.1%. Consequently, we deduced that sample B was 10% brighter than sample A.

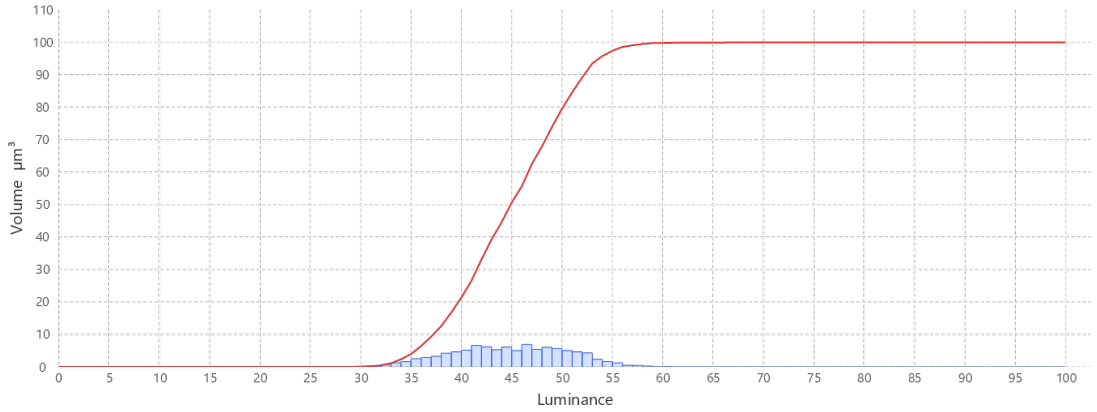
Sample A

Volume distribution of luminance



Sample B

Volume distribution of luminance



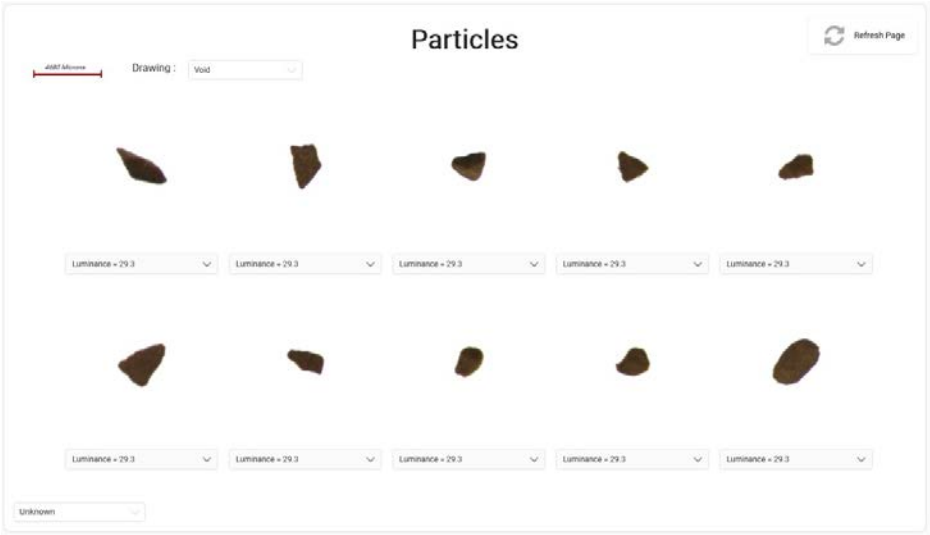
Luminance	P[10]	P[50]	P[90]
Sample A	29.1%	34.8%	41.1%
Sample B	37.3%	45.1%	51.7%

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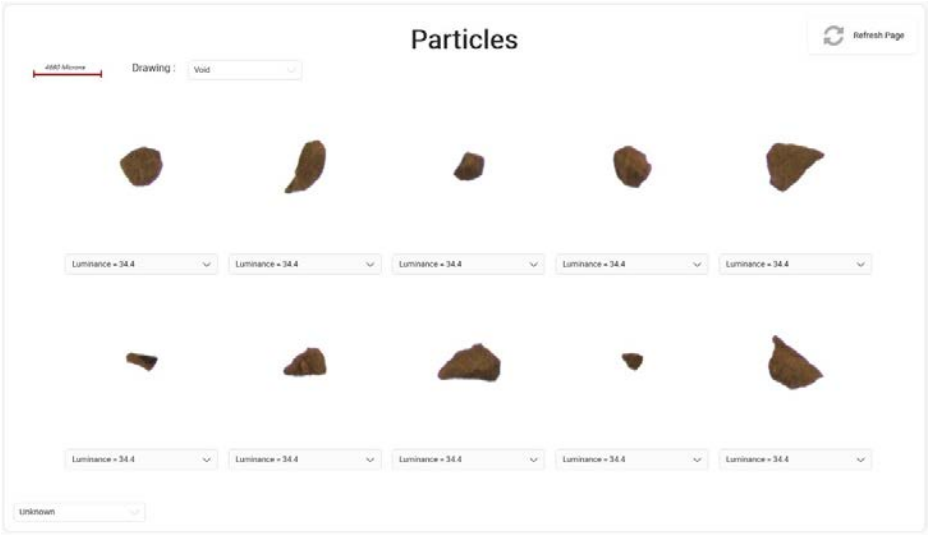
Particle visualization

Sample A

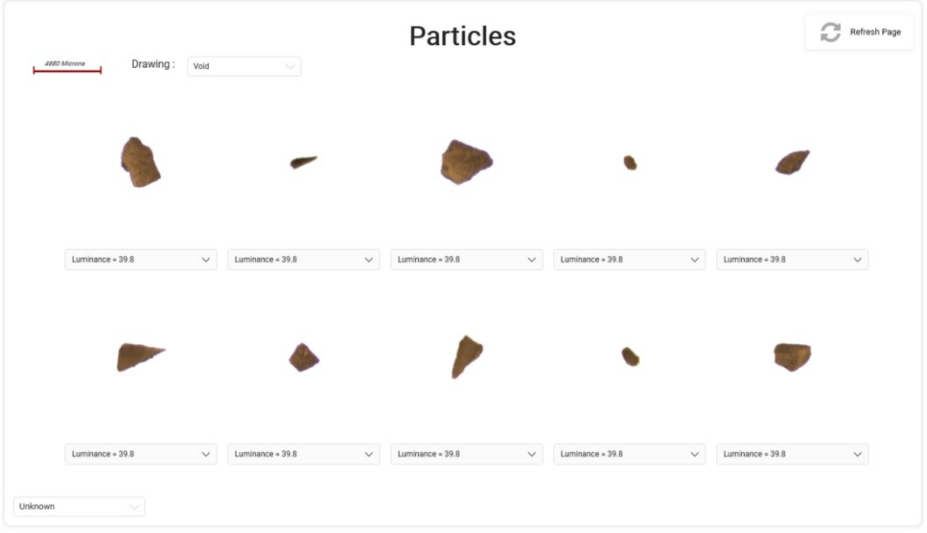
Luminance value corresponds to the P[10] of the distribution (dark particles) for sample A



Luminance value corresponds to the P[50] of the distribution (middle dark particles) for sample A



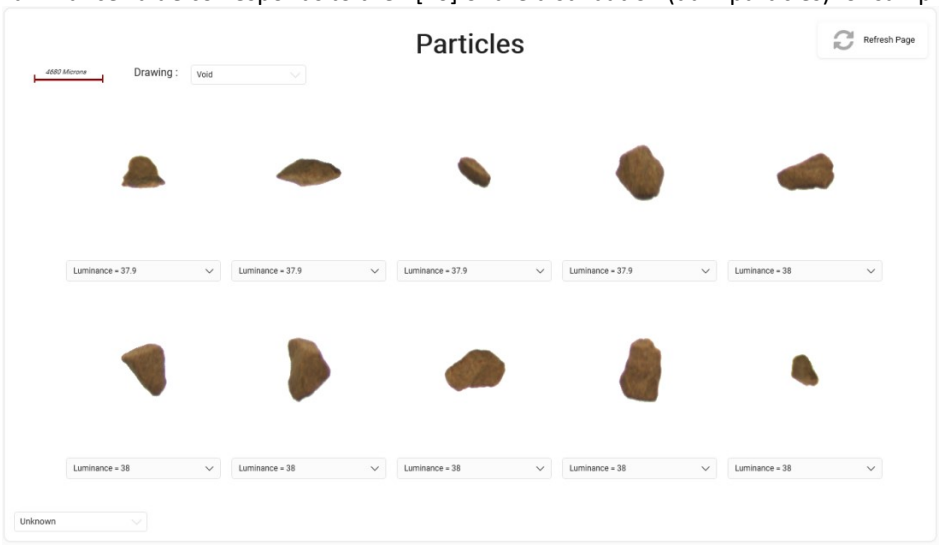
Luminance value corresponds to the P[90] of the distribution (clear particles) for sample A



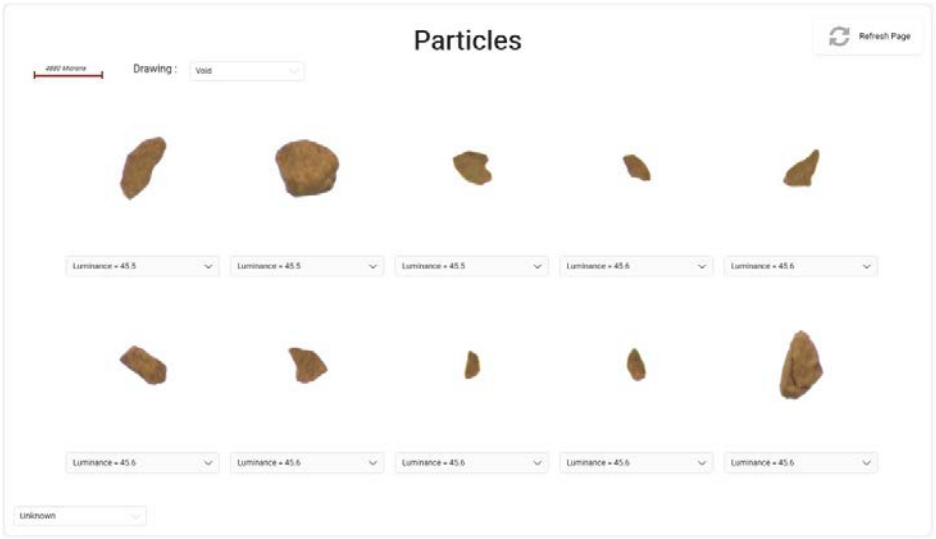
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Sample B

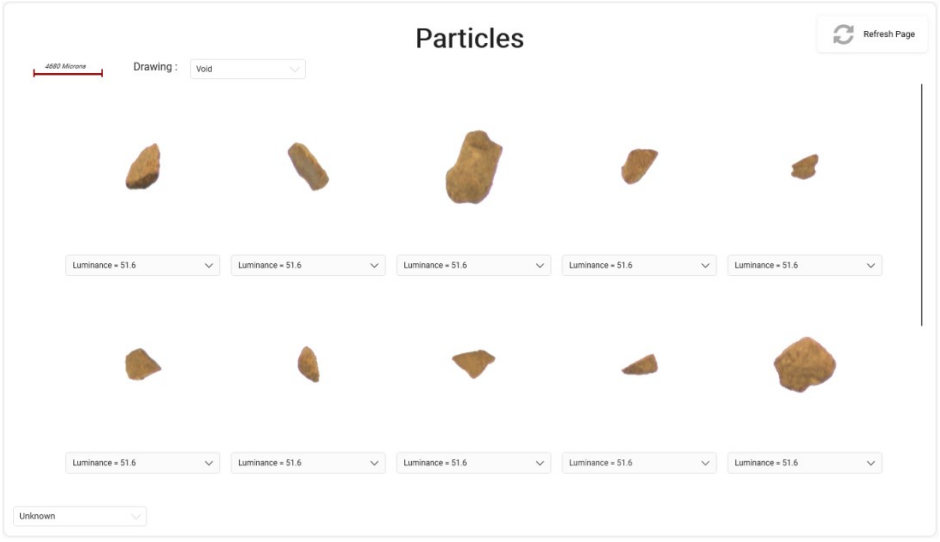
Luminance value corresponds to the P[10] of the distribution (dark particles) for sample B



Luminance value corresponds to the P[50] of the distribution (middle dark particles) for sample B



Luminance value corresponds to the P[90] of the distribution (clear particles) for sample B



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Conclusion

In production quality control, color analysis can provide supplementary information that is highly valuable. With the high-quality images acquired by the Zephyr ESR C, even slight variations in coffee color can be detected.

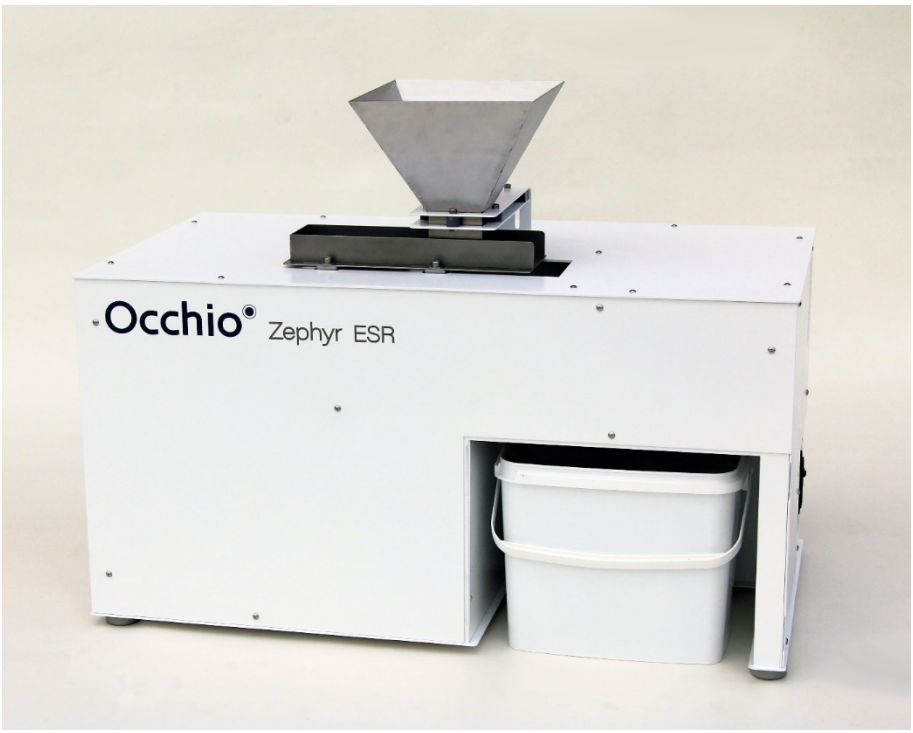


The disparity between the two samples can be easily observed in the image depicted below. Thanks to the capabilities of the Armadillo software and the Zephyr ESR C instrument, this difference can be measured and quantified accurately during particle size measurement in QC.

If you would like to learn more or evaluate our equipment with your own samples, please feel free to get in touch with us.

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Ground coffee size characterization using artificial intelligence

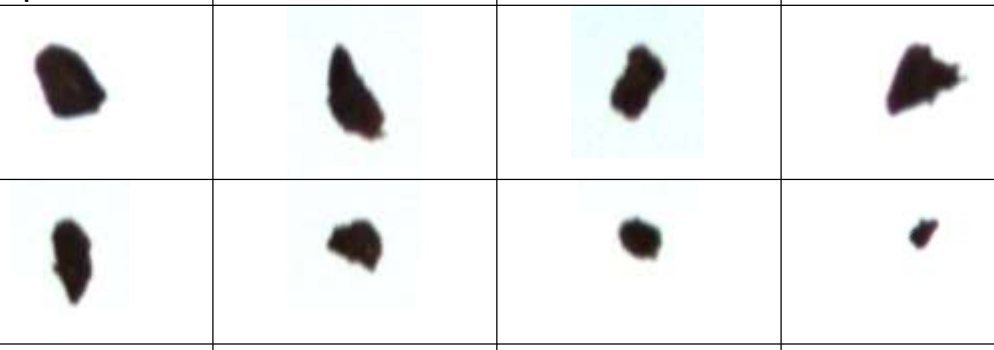
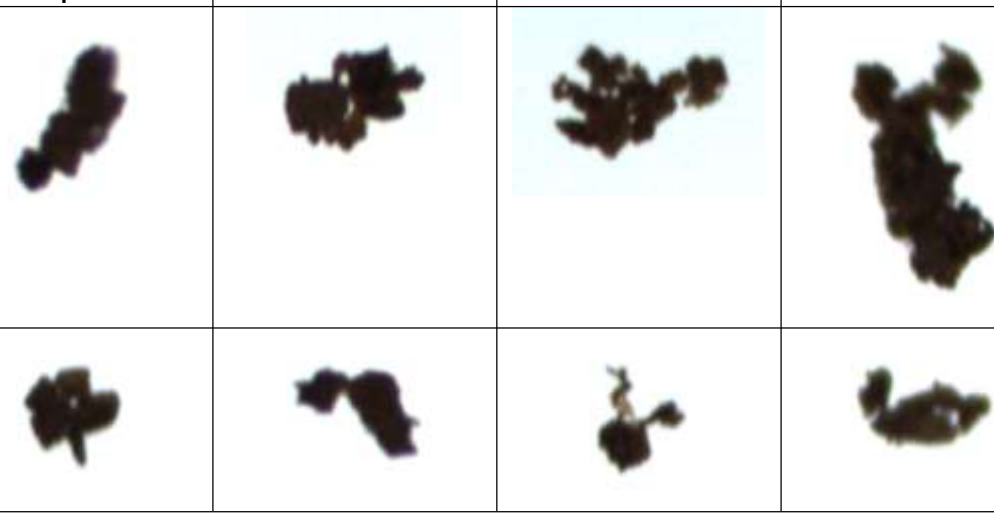


Instrument : Zephyr ESR C
Resolution: from 5 to 50 µm/pixel depending on the optical configuration.
Measurement time: less than 5 minutes

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Description

This application note demonstrates the use of artificial intelligence (AI) in identifying aggregated particles in ground coffee analysis. Due to the challenge of dispersing ground coffee particles without altering the original sample, a specialized AI was developed to recognize aggregated particles and remove them from the final size distribution. The purpose of this approach is to improve the accuracy of size analysis and standardize the procedure.

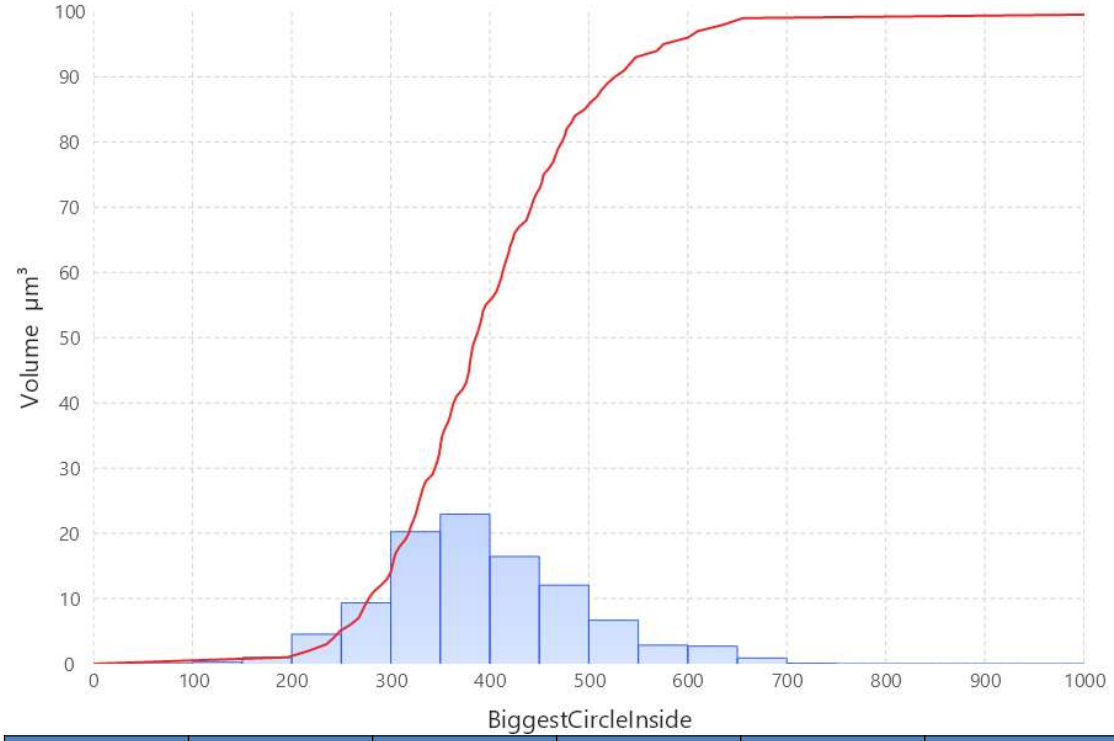
Ground coffee particles			
			
Aggregated ground coffee particles			
			

We developed the AI by using an image dataset acquired from coffee samples using the Occhio Zephyr ESR C instrument. The dataset was composed of two distinct populations: AGGREGATED and NOT AGGREGATED. To create the AI, we utilized the Armadillo AI creator software, which is a specialized tool developed by Occhio. Once the AI was developed, it was integrated into the standard operating procedure, allowing for real-time size distribution calculation utilizing the AI sorting method.

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Sample 1

Size distribution of coffee sample 1 without agglomerated particles



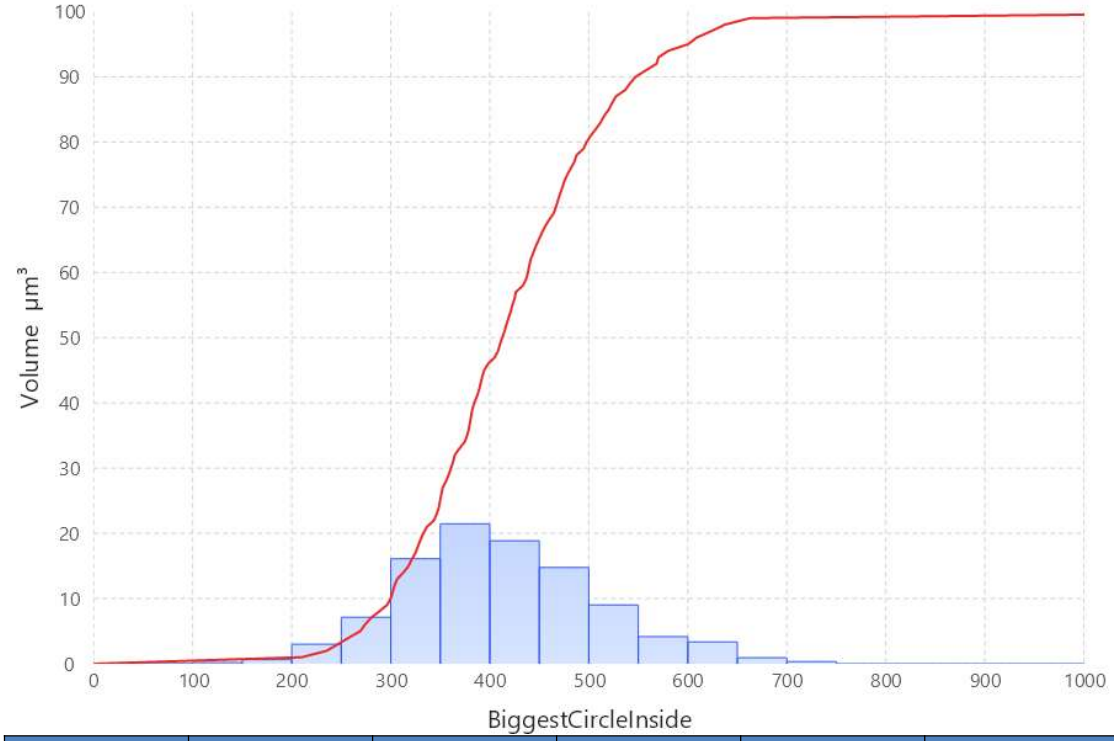
d[10]	d[25]	d[50]	d[75]	d[90]	
277.73	328.86	385.88	454.28	526.48	Coffee size percentiles
418.39	519.65	682.68	886.76	1022.23	Coffee + Agglomerates

Coffee S1 µm	Values %	Cumulative %
0 - 50	0.01	0.01
50 - 100	0.01	0.02
100 - 150	0.24	0.26
150 - 200	0.98	1.24
200 - 250	4.54	5.78
250 - 300	9.34	15.12
300 - 350	20.25	35.37
350 - 400	22.95	58.32
400 - 450	16.45	74.76
450 - 500	12.05	86.82
500 - 550	6.67	93.49
550 - 600	2.85	96.35
600 - 650	2.71	99.05
650 - 700	0.88	99.93
700 - 750	0.07	100

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Sample 2

Size distribution of coffee sample 2 without agglomerated particles



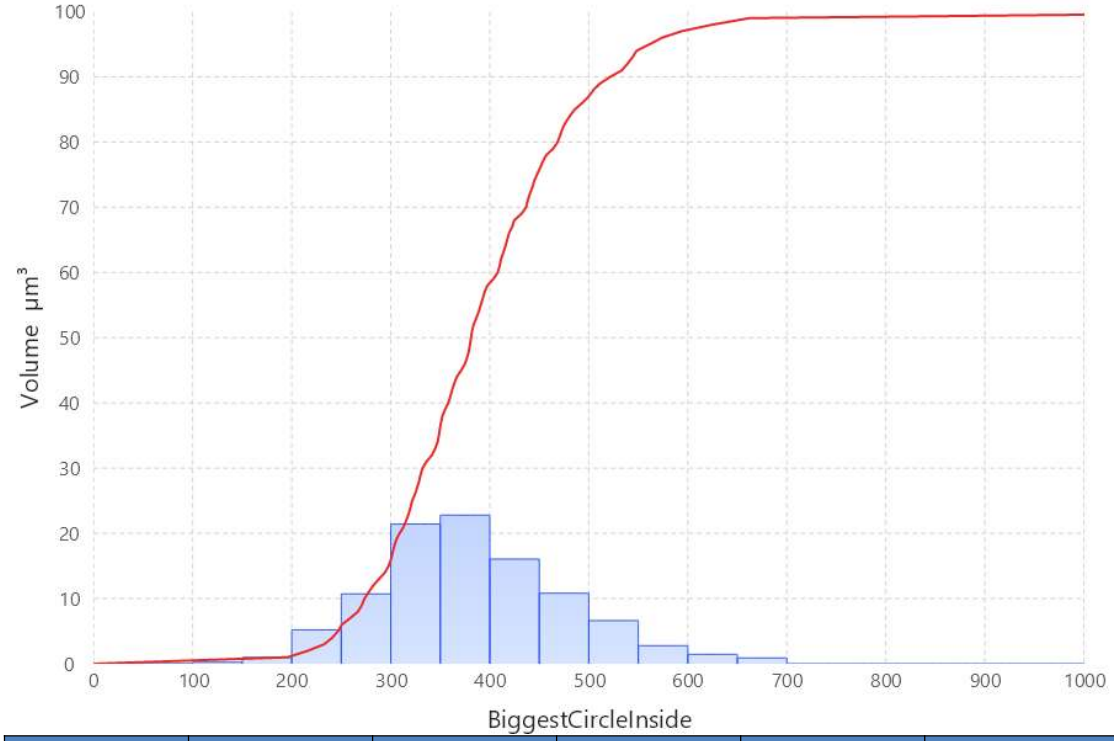
d[10]	d[25]	d[50]	d[75]	d[90]	Column1
299.87	349.81	412.61	478.33	547.21	Coffee size percentiles
453.58	560.41	722.88	914.48	1049	Coffee + Agglomerates

Coffee S2 µm	Values %	Cumulative %
0 - 50	0.01	0.01
50 - 100	0.02	0.03
100 - 150	0.18	0.21
150 - 200	0.63	0.84
200 - 250	3	3.84
250 - 300	7.14	10.98
300 - 350	16.11	27.08
350 - 400	21.47	48.55
400 - 450	18.86	67.42
450 - 500	14.77	82.18
500 - 550	9.02	91.2
550 - 600	4.16	95.37
600 - 650	3.36	98.73
650 - 700	0.93	99.66
700 - 750	0.34	100
750 - 800	0	100

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Sample 3

Size distribution of coffee sample 3 without agglomerated particles



d[10]	d[25]	d[50]	d[75]	d[90]	Column1
273.51	321.52	381.11	447.67	521.65	Coffee size percentiles
439.21	559.48	751.91	941.37	1064.42	Coffee + Agglomerates

Coffee S3 µm	Values %	Cumulative %
0 - 50	0.01	0.01
50 - 100	0.01	0.02
100 - 150	0.23	0.26
150 - 200	0.98	1.24
200 - 250	5.21	6.44
250 - 300	10.72	17.16
300 - 350	21.42	38.58
350 - 400	22.8	61.38
400 - 450	16.05	77.43
450 - 500	10.82	88.25
500 - 550	6.62	94.88
550 - 600	2.78	97.66
600 - 650	1.45	99.1
650 - 700	0.9	100
700 - 750	0	100

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Conclusion

Compared to the standard shape descriptor that requires visual inspection of particles by the user, our AI method is more efficient, enabling the identification of different categories of particles and providing more reliable particle characterization. If you would like to learn more or test our equipment with your samples, please feel free to contact us.

QUICK QUOTE

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