CASE STUDY

Rods and Sphere Analysis for Shape and Particle Size

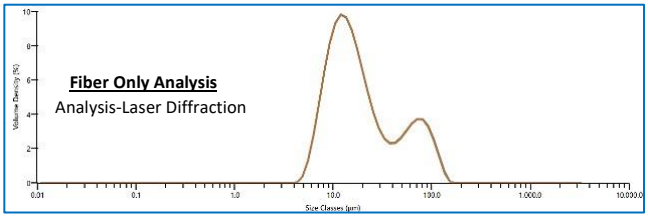
Particle size reduction is a common practice to increase surface area, for recycling, adapting to specific bioavailability, etc., or for use of an appropriate size for downstream processing. It is also well understood that particle size is one of the most significant influences that affects the flow behavior of powders.

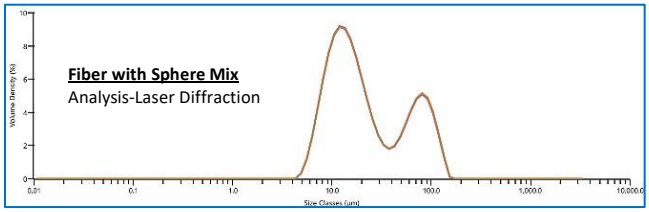
Particle size measurement is a routine and accepted practice to characterize powders to obtain a better understanding of powder performance in relation to flow, packing density, compression rate and porosity. Of the most popular sizing methodologies, Laser Diffraction is the most broadly used technique.

Laser diffraction measures the scattering angular patterns of particles and then applies the Mie or Fraunhofer theory to perform a matrix conversion to obtain Particle Size Distribution (PSD). These mathematical theories assume all particles are spherical regardless of their actual shapes. Laser diffraction results are always expressed in terms of "equivalent sphere" diameters. Deviation and bias between the reported PSD and the actual "equivalent sphere" diameter exist, especially for mixtures of particles of different shapes.

Why Shape is a Necessity and not a Novelty, as an orthogonal technique to Laser Diffraction

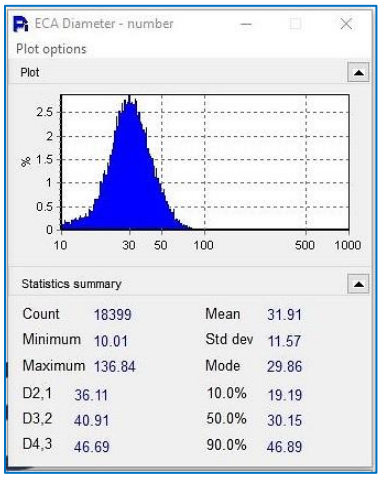
Changes in particle shape can be challenging to capture with laser diffraction. In many cases, even though two PSDs from laser diffraction could be similar, their particle sizes and shapes may not be the same, resulting in the performance of powders composed of these particles to be subsequently different. If particle shape changes in thickness, diameter uniformity or aspect ratio, significant changes in raw material performance may occur.



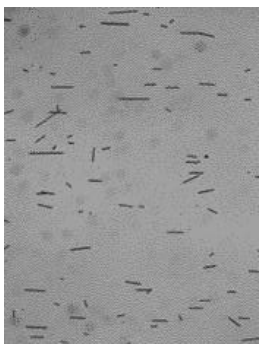


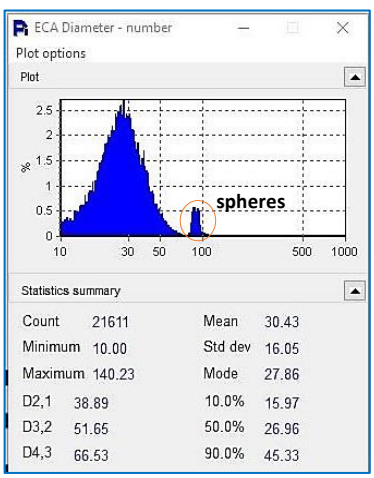
The resulting data presented here demonstrates how Laser Diffraction may be misrepresentative by reporting a fiber sample of broad distribution as a bimodal distribution due to an expected bias of Laser Diffraction. This data also shows how the mixing of fiber particles with particles of another shape (spheres) may be difficult to draw a firm conclusion to the sample contents based on a ratio of a bimodal distribution. As can be seen here, the addition of spheres to the fiber sample is only expressed as in increase in the ratio of the bimodal distribution.

The same sample measured by the SentinelPro, Dynamic Image Analyzer produces truer data representative of the actual sample, with the fiber only analysis showing a broader distribution, and in the fiber-sphere mixture- a distinguishable peak representing the spheres. One of the features of this analyzer is the ability to inquire on the physical character for each individual particle imaged regarding size, shape, circularity, aspect ratio and more.

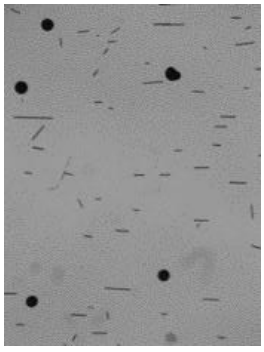


Fiber Only Analysis-
SentinelPro Image Analysis





Fiber w/Sphere Mix Analysis-
SentinelPro Image Analysis



Let us illustrate how you can directly integrate Dynamic Imaging for Shape Analysis into your current Particle Sizing workflow with **the SentinelPro Image Analyzer**.

FIND OUT MORE HERE

SENTINELPRO Image Analyzer

SCAN ME

Unique Design Benefits:

HIGH SPEED

127 frames-per-second rated Digital Camera, with up to 5 Mpix resolution, captures live images of thousands of particles

MORE THAN 30 SHAPE PARAMETERS

are recorded, including circularity, ellipticity, opacity, mean diameter, smoothness, aspect ratio, fiber length and many more

THUMBNAIL IMAGES

All analyzed particles have **thumbnail images** saved for post-run viewing and shape analysis, both in grey scale and binary views.

DIFFERENT ANALYSES COMPARISON

Ability to **compare different analyses** via histogram overlays for all analyzed shape parameters

TWO SHAPE MEASUREMENTS

Scatter plot correlates **two shape measurements** and can be utilized as a process quality control criterion as an at-line application within unit operations.

UNIQUE AND POWERFUL SOFTWARE

Unique and powerful software permits the user to simplify data processing to a pass/fail reporting or choose to extend data analysis to a full suite of post processing image and shape analysis reports.

MULTI-RUN SAMPLE TRENDING

Multi-Run sample trending – Statistical Process Control capability and ability to track shape changes over user defined time intervals.

INSTRUMENT QUALIFICATION FEATURE

Instrument Qualification feature includes NIST standards and detailed Quality Assurance documentation.

PARTICLE CONCENTRATION CORRELATION

Particle Concentration Correlation– adjust concentration reporting to correlate to traceable reference concentration standards.

Vision Analytical Incorporated

4444 Southwest 71st Avenue, Suite #112, Miami, Florida 33155, USA

www.ParticleShape.com, Sales@ParticleShape.com, USA+305-801-7140