

Acicular Particles

The object of this analysis is to demonstrate the challenge that exists when trying to calculate or evaluate the true volume of Acicular Particles (or needle-like particles). Using Image Analysis the operator can measure the length and breadth of the projected area. The Operator can then derive the true cylindrical volume because the particles lay in their most mechanically stable position.

Fig. 1 shows a sample analyzed at 100X using a black and white camera. First, a grey enhancement algorithm is applied to define the edges of the needles, followed by a grey thresholding of the particles in the red bitplane. Two binary functions are applied to eliminate the clusters of particles; aspect ratio and roughness filters (Fig.2).

Length, breadth, equivalent spherical diameter and aspect ratio are measured on each particle and the cylindrical volume of each particle is calculated. For comparison purposes, Fig. 3 illustrates measurements of equivalent spherical volume. A total of 1203 separated particles were measured on 40 fields in less than 3 minutes. The results indicate a significant difference between spherical volume (based on equivalent spherical diameter) and cylindrical volume (based on breadth and length). Clearly, for particles with a high aspect ratio such as these ones, spherical volume does not correspond to true volume.



Fig. 1 : Original image at 100x magnification

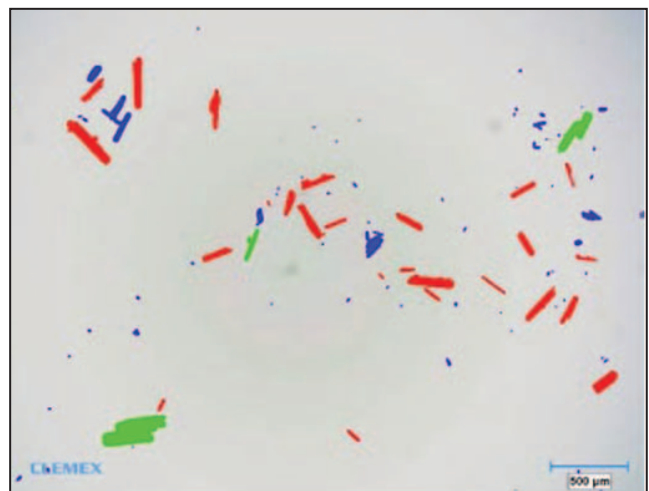
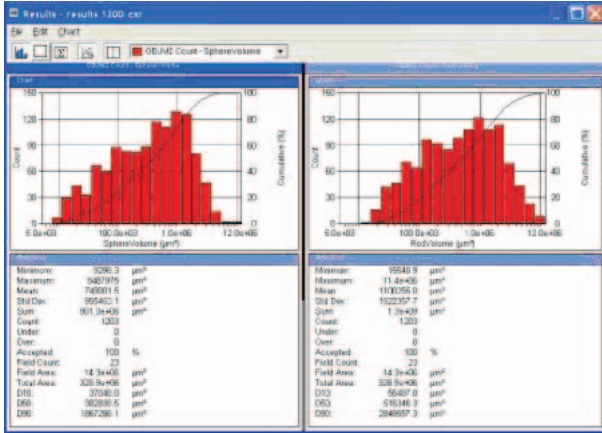
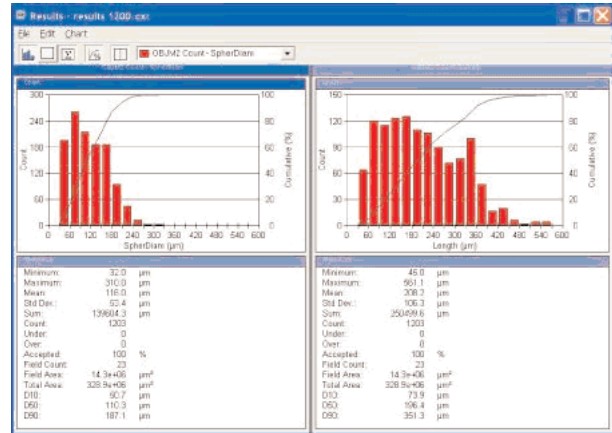


Fig. 2 : Only single particles remain in the red bitplane

Acicular Particles; Results. 1200 particles were analyzed in 3 minutes at 100X.



Results Histograms and Statistics: Spherical Volume and Cylindrical Volume Distributions



Result Histograms and Statistics: Spherical Diameter and Length Distributions

Feature Measured (units)	Cylindrical Volume (microns ³)	Spherical Volume (microns ³)	Length (microns)	Equivalent Spher.Diam. (microns)	Breadth (microns)	Aspect Ratio (microns)
value	120 104	76 104	209.3	116.5	56.8	4.15

Fig. 3 : Results Table