CLEMEX

Particle Distribution Analysis

Image Analysis Report **391**

Sample Description

Two specimens represented by BMP images were submitted for analysis. Images from SEM are fusion zones with or without HT.

Purpose of Analysis

Demonstrate the ability of the Clemex Vision image analyzer to measure the area percentage, size, diameter and aspect ratio of the black particles and to cumulate the statistics over all images.

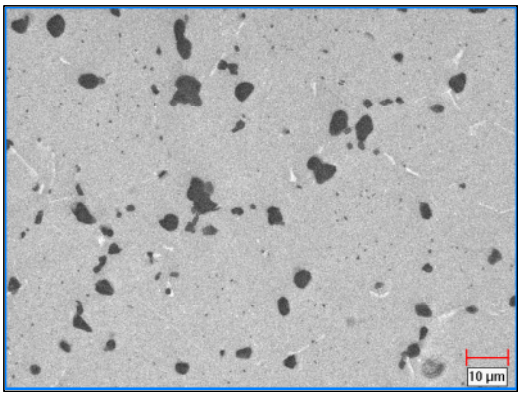

Figure 1: *Original image from SEM (1000x).*

Procedure

Several gray filters were applied to eliminate some noise from the image. The black particles were then binarized into the red bitplane using Gray Thresholding. Objects represented by 5x5 pixels or less were eliminated. Count and area percentage measurements were performed. Objects sectioned by the field of view were eliminated (pink in figure 2) before performing shape and size measurements.

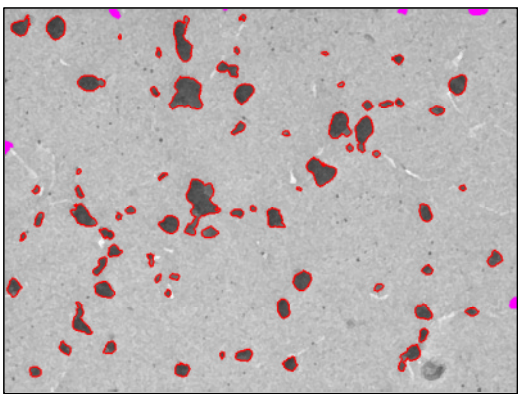

Figure 2**:** *Red bitplane in outline view showing black particles as measured.*

Results Summary

Since images were loaded in sequential order, results were cumulated for the whole sample for automated statistics and graph generation. Count and area percent measurement were performed for each field and all objects were evaluated for area, length, width, diameter and aspect ratio. Final results can be printed directly from Clemex Vision. Raw data are linked to their respective objects for validation purposes and can be exported in Excel format.

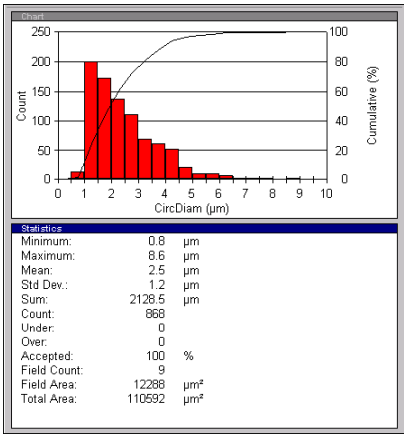

Figure 3: *Cumulative graph and statistics showing the circular diameter distribution.*

It was possible to discriminate and measure the black particles as requested. A few images had some darker spots on the background that could be mistaken for black particles. If it is not possible to remove these spots during the sample preparation process, some binary operations will have to be added to process them. Objects represented by only a few pixels should be removed as they not significant compared to the noise.

Equipment

Image Analysis System:	Clemex Vision SE
Image Format :	Bitmap (converted to cxi. format)
Microscope:	SEM
Objective:	1000x (0.2 micron / pixel)