

Carbides Shape, Size - Mean Free Path

Image Analysis Report # 400
Clemex Technologies

Sample Description

An image of steel showing carbides was submitted for analysis.

Purpose of Analysis

Demonstrate that the Clemex Vision image analysis system can discriminate the carbides and analyze their shape, size and mean free path.

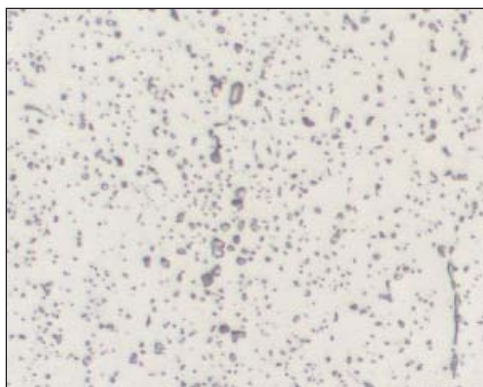


Figure 1: Part of the original image (500x, 0.25 microns/pixel).

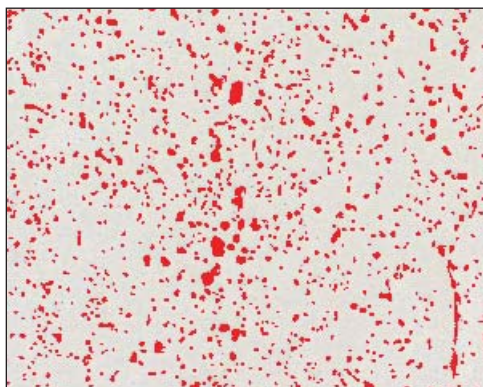


Figure 2: Red bitplane representing the carbides as measured.

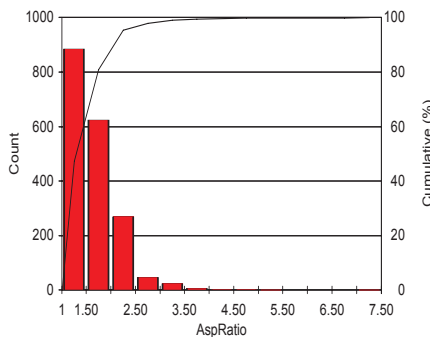
Procedure

A gray filter was applied to the original image to decrease intermediate gray levels. The carbides were binarized in red using Gray Threshold. Some binary tools were applied to eliminate artifacts from the red bitplane and fill holes prior to performing measurements.

Results

Average Area, Area Percent, Mean Free Path, Length, Sphericity, and Aspect Ratio measurement were performed. Automated

statistics and graph were generated and would be cumulated if we were analyzing several images (sample). 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.



Minimum: 1.04 μm
Maximum: 7.15 μm
Mean: 1.64 μm
Std Dev.: 0.476 μm

Figure 3: Aspect Ratio distribution and corresponding statistics.

Mean results of the measurements included in the analysis:

Average Area: 0.46 μm^2
Area Percent: 9.61 %
Mean Free Path: 5.73 μm
Length: 0.93 μm
Sphericity: 0.97
Aspect Ratio: 1.64

Equipment

Image Analysis System:	Clemex Vision PE
Microscope:	Leica DM LM
Objective/Magnification:	50x /500x
Illumination:	Reflected Light
Calibration:	0.2541 microns/pixel
Camera:	Sony DXC 950P
Motorized Stage:	Marzhauser EK32IM 75x50mm
Stage Controller:	Clemex ST-2000

Discussion

Measuring carbides is straightforward when working with a high resolution camera, quality optics and well prepared samples.

A custom measurement was created to measure the Mean Free Path. The formula is based on vertical and horizontal spacing. Other measurements are available with Vision Lite or PE. If any automatic separation needs to be done, the PE version would be required.

Results are reproducible.