

Porosity Analysis of Styrene Foam

Image Analysis Report 460

Sample Description

One BMP image file showing styrene foam with pores was submitted for analysis.

Purpose of Analysis

Demonstrate that the Clemex Vision image analysis system can distinguish the pores and measure their size.

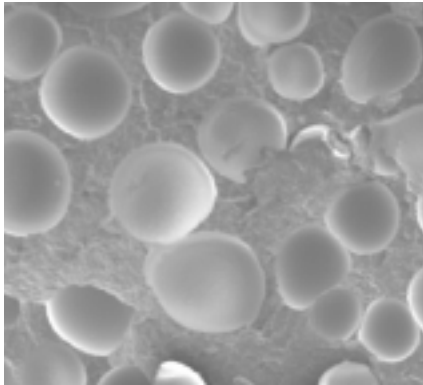


Figure 1: Part of the original BMP image. Not calibrated.

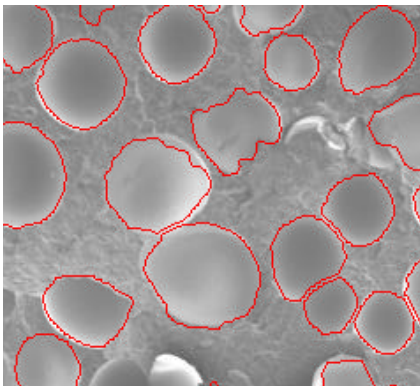


Figure 2: Outline view of measured pores of the same area after the validation process using the mapping view mode.

Procedure

A copy of the original image is kept before applying a first gray filter (Top Hat on White) to highlight the texture of the broken styrene foam. A first gray threshold is applied to binarize the highlighted structure into cyan bitplane. The original image is brought back to the image window prior to applying a second gray filter (Top Hat on Black). This second modified image is binarized into red bitplane to obtain thin shadows of the textured part.

The cyan bitplane is added to the red bitplane using a

boolean instruction. Other binary tools are used to eliminate some artifacts and, the red bitplane is inverted to obtain the first draft of the pores.

Touching features are isolated to pink bitplane using Object Transfer on Roughness and are further processed to separate them. Both bitplanes are put back together into red bitplane. Some remaining artifacts are eliminated using binary tools and object transfer by limits.

A zone instruction brings the pore detected back to their good size. Final measurements are performed after sectioned pores have been eliminated.

Results

Once the particles are detected, performing the desired measurements is simple. Area, Length, Circular Diameter, Sphericity, and Aspect Ratio are selected through the Object Measurements tools and inserted at the very end of the routine. Automated statistics and graph are generated. Analysing several images, results would be cumulated. Final results can be printed directly from Clemex Vision. Raw data are linked to their respective objects for validation process which is necessary for this application. Raw data can also be exported in Excel format.

Equipment

Image Analysis System:	Clemex Vision PE
Magnification:	Unknown
Calibration used:	1 micron/pixels

Discussion

Since no calibration factor was available, a calibration of 1 micron per pixel was used. To obtain real value, one should multiply the Length and Circular Diameter by the real calibration and the Area by the square of the calibration.

The main difficulty of this analysis came from the common gray level ranges for both the solid matrix and the pores. Also, both had a widely spread range of gray levels without having a real contrast between pores and matrix. Gray filters were used to highlight the matrix texture and pores were deducted from there.

Trying to obtain as much of the pores as possible, some features were measured even if they were not pores. The validation process through the mapping view mode allow to eliminate them from the results and the statistics.