

Analytical Solutions

for BioTechnology

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Grain Size Analysis of Metallurgical Coatings Using FIB

Discussion

Various aspects of grains such as size, uniformity and shape influence the performance of metallurgical coatings e.g. conductivity, appearance, adhesion and susceptibility to corrosion. A number of industries that would benefit from this technique include aerospace, biomedical, automotive, food packaging, and integrated circuits.

The characterization and testing of metallurgical coatings is a necessary step in the production process. The behavior of coatings under various test conditions needs to be evaluated to prevent failure of components in which these coatings are incorporated. Proper characterization provides a range of optimal operating conditions. Characterization of grain size in metallurgical coatings is an essential part of this effort.

The FIB (Focused Ion Beam) was used to obtain grain size information from an Al film. Figure 1 shows an image of the film's grains obtained by combining several images from the ion beam of the FIB. The ion beam was chosen to take advantage of the very high grain contrast obtained when imaging with ions. From this image, the grain boundaries are delineated using standard image processing techniques, the results of which are shown in Figure 2. The grain size can then be characterized using a number of methods, including intercept and grain area. Figure 3 is the result of color coding the grains according to ASTM grain size. Figure 4 is the result of a histogram showing the distribution of ASTM grain size for this sample is demonstrated in Figure 4.

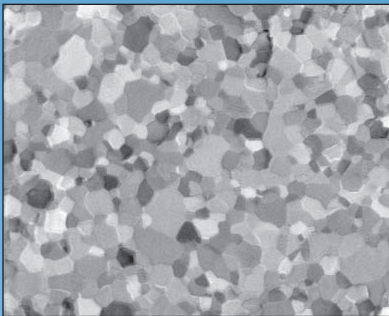
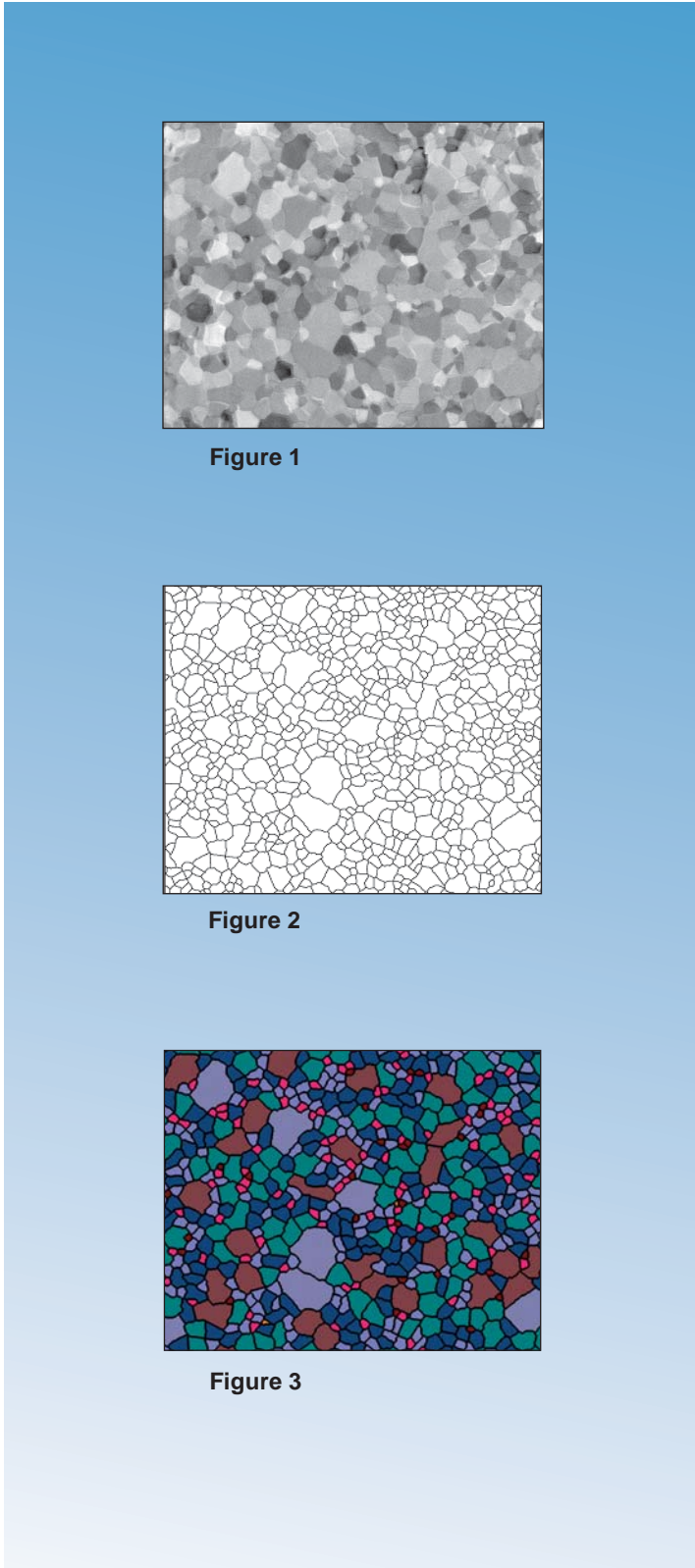


Figure 1

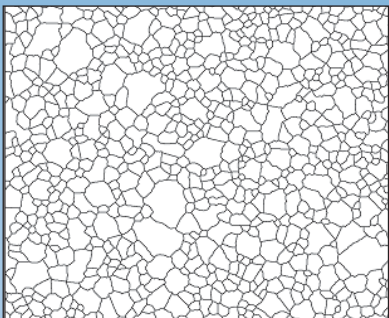


Figure 2

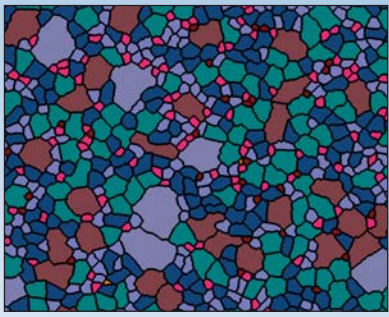


Figure 3

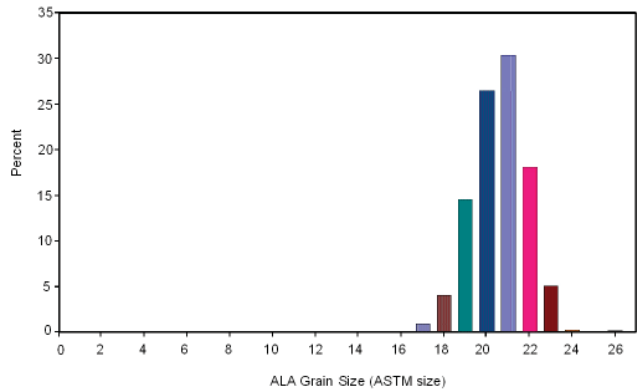
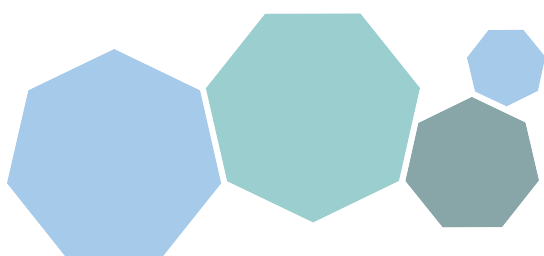


Figure 4



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