

Analytical Solutions

for BioTechnology

May 9, 2007 (Version 2.0)

BN 1345

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.

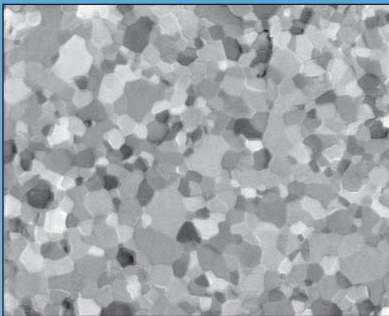
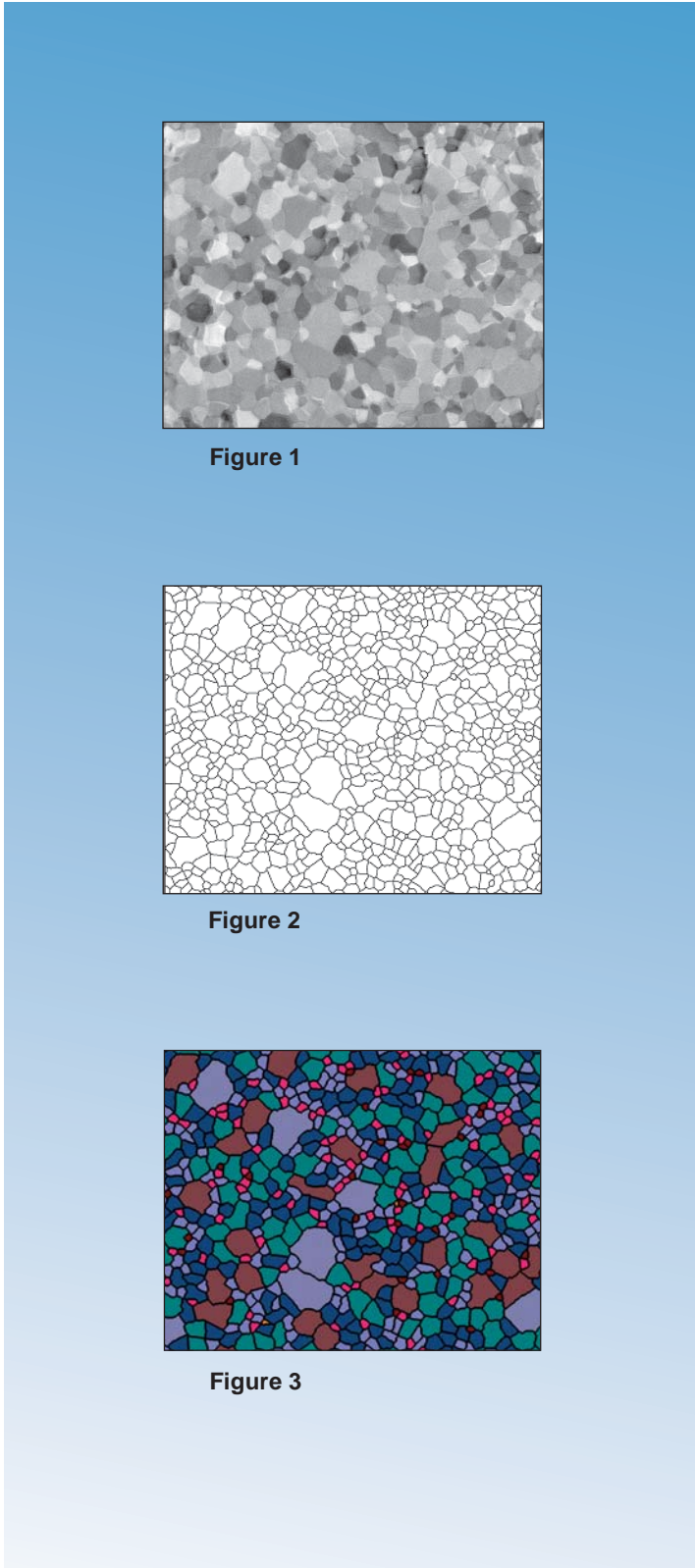


Figure 1

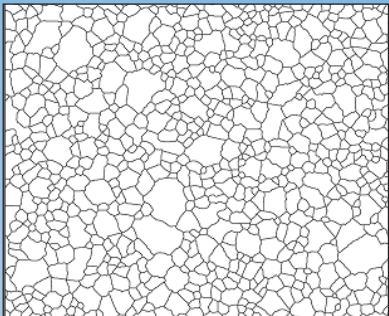


Figure 2

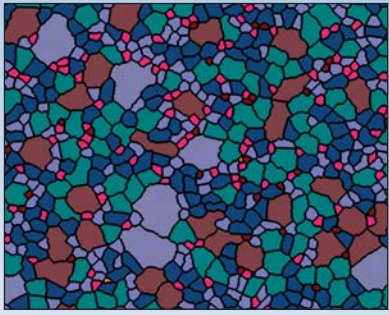


Figure 3

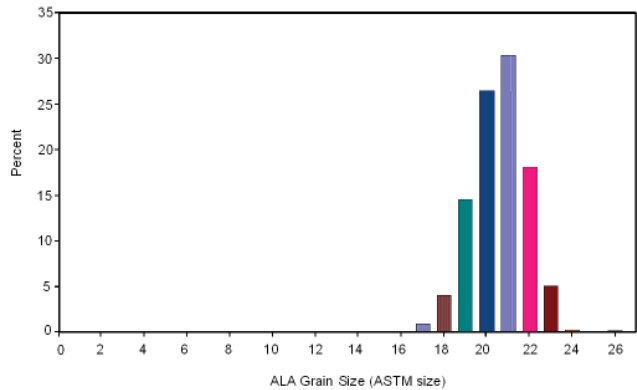
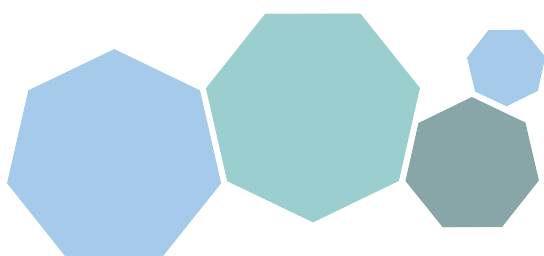


Figure 4



United States Locations

Tempe, Arizona
+1 480 239 0602 info.az@eaglabs.com
+1 602 470 2655 fax

Sunnyvale, California
810 Kifer Road
+1 408 530 3500 info.ca@eaglabs.com
+1 408 530 3501 fax

1135 E Arques Avenue
+1 408 738 3033
+1 408 738 3035 fax

785 Lucerne Drive
+1 408 737 3892
+1 408 737 3916 fax

Peabody, Massachusetts
+1 978 278 9500 info.ma@eaglabs.com
+1 978 278 9501 fax

Chanhassen, Minnesota
+1 952 828 6411 info.mn@eaglabs.com
+1 952 828 6449 fax

East Windsor, New Jersey
+1 609 371 4800 info.nj@eaglabs.com
+1 609 371 5666 fax

Syracuse, New York
+1 315 431 9900 info.ny@eaglabs.com
+1 315 431 9800 fax

Raleigh, North Carolina
+1 919 829 7041 info.nc@eaglabs.com
+1 919 829 5518 fax

Round Rock, Texas
+1 512 671 9500 info.tx@eaglabs.com
+1 512 671 9501 fax

International Locations

Shanghai, China
+ 86 21 6879 6088 info.cn@eaglabs.com
+ 86 21 6879 9086 fax

Tournefeuille, France
+ 33 5 61 73 15 29 info.fr@eaglabs.com
+ 33 5 61 73 15 67 fax

Frankfurt, Germany
+ 49 (0) 693053213 info.de@eaglabs.com
+ 49 (0) 69307941 fax

Tokyo, Japan
+ 81 3 5396 0531 info.jp@eaglabs.com
+ 81 3 5396 1930 fax

HsinChu, Taiwan
+ 886 3 5632303 info.tw@eaglabs.com
+ 886 3 5632306 fax

Uxbridge, United Kingdom
+ 44 (0) 1895 811194 info.uk@eaglabs.com
+ 44 (0) 1895 810350 fax