AZtecSynergy & NordlysMax²: The fastest simultaneous collection of high quality EBSD and EDS maps

Introduction

Oxford Instruments’ AZtecSynergy system, coupled with a NordlysMax² detector, acquires simultaneous EBSD-EDS data from a dual phase material at high speeds and with consistently high hit rates. The EBSD and EDS data is processed as acquired and the maps are viewed in real time. This technical note will demonstrate simultaneous data acquisition at these fastest speeds.

Experimental

A tungsten heavy alloy (WHA) material containing tungsten particles in a nickel rich matrix was mounted in bakelite and mechanically polished. The final polishing required the use of hydrogen peroxide.

The specimen was examined in a FEG-SEM operating at an acceleration voltage and probe current of 20 kV and 12 nA respectively.

An AZtecSynergy system with a NordlysMax² and an X-Max 80 mm² detector were used for the simultaneous data acquisition.

Results and Discussion

A SEM backscattered image from the polished samples is shown in Figure 1, the spherical tungsten particles are distributed homogeneously in the nickel rich matrix. Representative EBSD patterns from the tungsten particles and the nickel matrix are shown in Figure 2.

Figure 1 SEM back-scattered image of the polished WHA, examined.

Figure 2 Typical EBSD patterns from the matrix and tungsten particles.
Simultaneous data were collected and the EBSD patterns collected at the different binning settings shown in Table 1.

Table 1. Summary of binning, indexing speed and hit rates achieved during acquisition collected at 640x480 resolution

<table>
<thead>
<tr>
<th>Pattern Binning</th>
<th>Speed Hz</th>
<th>Hit Rate %</th>
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</thead>
<tbody>
<tr>
<td>2x2</td>
<td>330</td>
<td>99</td>
</tr>
<tr>
<td>4x4</td>
<td>590</td>
<td>99</td>
</tr>
<tr>
<td>6x6</td>
<td>750</td>
<td>99</td>
</tr>
<tr>
<td>8x8</td>
<td>870</td>
<td>99</td>
</tr>
</tbody>
</table>

The speeds and hit rates achieved for the selected settings are given. EBSD maps and the corresponding EDS maps for each acquisition are shown in Figures 3a-3d. The EBSD patterns were indexed and solved in real time, and the data shown in these maps is unprocessed. Hit rates above 99% were achieved for each indexing speed. Any zero solutions are confined to the particle: matrix interface.

At maximum binning, the fastest speed of 870 patterns per second was achieved even during simultaneous data acquisition. These data were collected and indexed in real-time, for a real-time characterisation of the sample.
Summary

This study illustrates the capability of AZtecSynergy and NordlysMax to acquire and solve high quality, fast simultaneous EBSD-EDS data. The fastest speed of 870 points per second was achieved for simultaneous acquisition.

This data was collected and indexed in real time giving a true characterisation of the sample in real time. At these hit rates in excess of 99% were achieved. The combination of the Tru-I® solver combined with the integration in AZtec is a powerful solution to fast mapping.