

EBSD CAMERA CALIBRATION: THE MOVING SCREEN TECHNIQUE REVISITED

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Phase analysis by electron backscatter diffraction (EBSD) in the SEM involves a camera calibration step to define the pattern center and the sample-to-screen distance (L). There are several calibration methods available and each of these methods requires either a standard (silicon single crystal) or knowledge of the matrix and the ability to identify zones in its EBSD pattern. The moving screen technique does not require a standard, but does require two patterns. In the conventional way of using this method, one pattern is taken at the operating distance, L , and a second pattern is taken after moving the camera to a screen distance, $L+h$. The second pattern is a magnified version of the first. Several pairs of corresponding points (such as band intersections) are then selected on each pattern. The pattern center is located from the common intersection of lines drawn through each pair of points, after plotting all points on the operating pattern. L , on the other hand, is determined from a knowledge of two or more indexed zone axes positions.

We have reformulated the moving screen technique to show that the all three calibration parameters can be determined with no knowledge of the specimen crystallography. With the digitized pairs, taken as in the conventional method, it can be shown that

Eq. 1
$$y_{li} = L \Delta y_i/h + y_p,$$

where, y_{li} are the y coordinates from the operating pattern, Δy_i are the differences between corresponding y coordinates and y_p is the y coordinate of the pattern center. A similar equation holds for the x coordinates. Linear least squares fits to the equations for x and y yield the pattern center coordinates as well as the specimen-to-screen distance. No zone axes locations are required for determining L . The selection of corresponding pairs of points is facilitated by standard image sharpening and zooming functions. In addition, plots of Eq. 1 and the corresponding equation in x can be used to evaluate the quality of the data.

The reformulated moving screen technique is particularly advantageous in phase analysis since the calibration can be done without a standard and without moving the beam or the sample stage. In addition, no knowledge of the specimen is required.

¹Managed by BWXT Y-12, L.L.C. for the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-00OR222800.