

Topography imaging with the Phenom™

Phenom™ Backscattered Electron Detector provides topographical images in addition to compositional images - via an easy-to-use interface. The 4-segment detector design puts more information into every image.

Backscattered electrons vary in their amount and direction due to the composition and topography of the specimen. The contrast of the backscattered electron image depends on a couple of factors, like the atomic number (Z) of the sample material, the acceleration voltage of the primary beam and the specimen angle (tilt) with relation to the primary beam. The specimen angle is the key parameter for understanding topographic imaging.

The backscattered detector (semiconductor device) in the Phenom™ is mounted close to the sample, under the objective lens. The detector is split into four quadrants.

Electronically pairing the opposing quadrants allows the operator to separate out the two types of information that are contained in the backscattered electron image. Information can be seen on sample composition (material contrast) and topography.

The following two images are from the same material, showing the compositional mode (Figure 1) and the topographical mode (Figure 2).

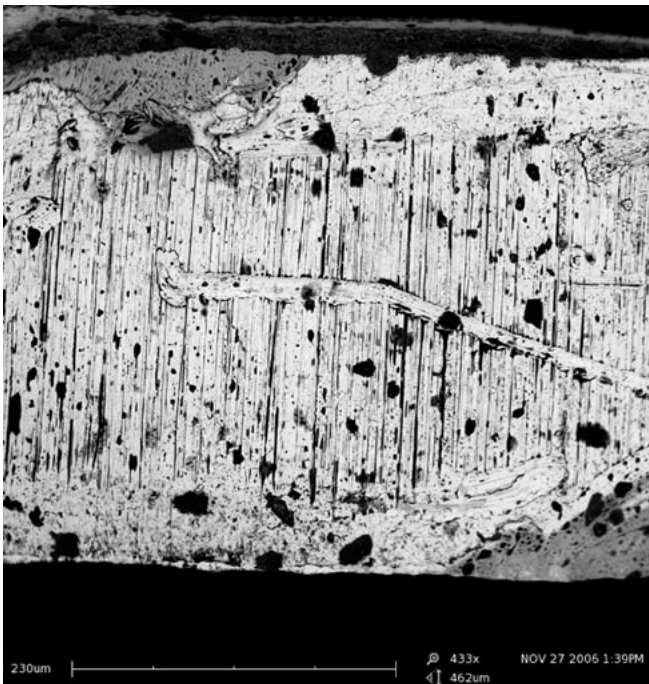


Figure 1. BSE imaging in compositional mode

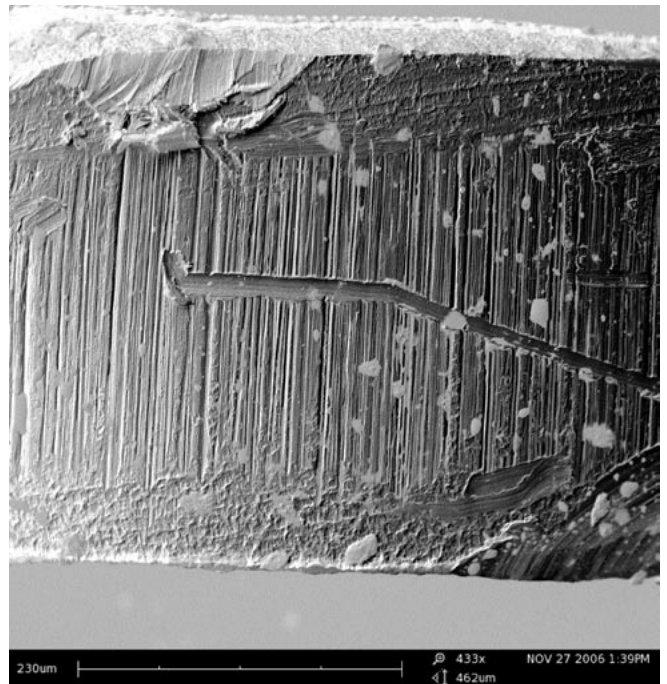


Figure 2. BSE imaging in topographical mode

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Operating the quadrants of the detector in pairs, and then adding the signals, will give compositional information about the sample, while subtraction will give topographic information. Rotating the pairing of the signals, allows the operator to effectively 'shine the light' on the sample from two different directions, over-under and left-right.

Figure 3 shows the principle of the compositional (full) mode, where all quadrants are active.

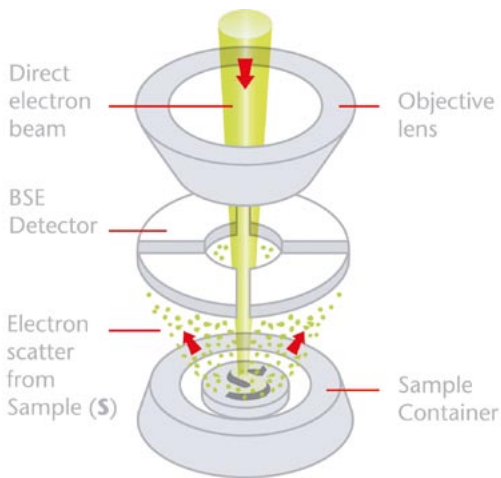


Figure 3. Schematic representation of the Phenom detection system in compositional (full) mode

Figure 4 shows the principle of the topographical B mode, which indicates the over-under illumination capabilities. Using the over-under mode will show a strong shadow effect like the sun shining on an object as can be seen in the two corresponding images. Both images show the letter 'S' (Specimen - Spanish Euro coin) taken in compositional (full) mode (Figure 5) and topographical B mode (Figure 6). Switching between the two modes is done via the software.

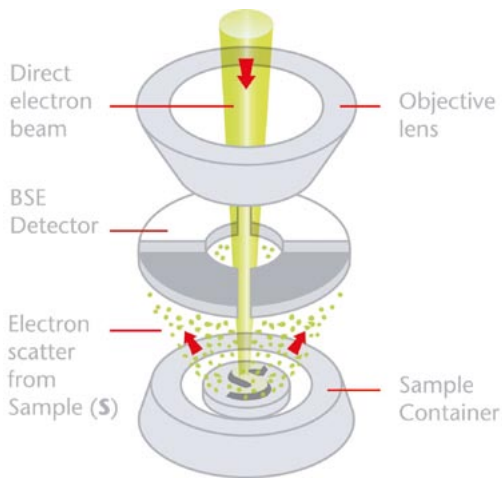


Figure 4. Schematic representation of the Phenom detection system in topographic mode



Figure 5. Image of the letter S (Euro coin) in compositional imaging mode



Figure 6. Image of the letter S (Euro coin) in topographical imaging mode