Applications Data Sheet

Hitachi Backscatter Electron Detector for S-3000 Series Standard SEMs

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HITACHI'S BACKSCATTER ELECTRON DETECTOR PROVIDES VERSATILITY AND DYNAMIC CONTROL WITH AN EASY-TO-USE INTERFACE. THE 4-SIGMENT DESIGN PUTS MORE INFORMATION INTO EVERY IMAGE.

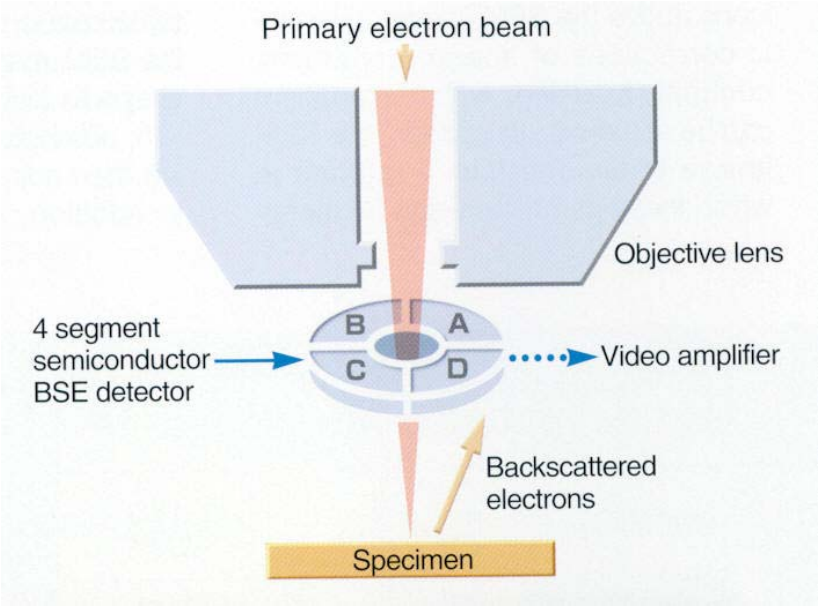
Backscattered Electron Detector

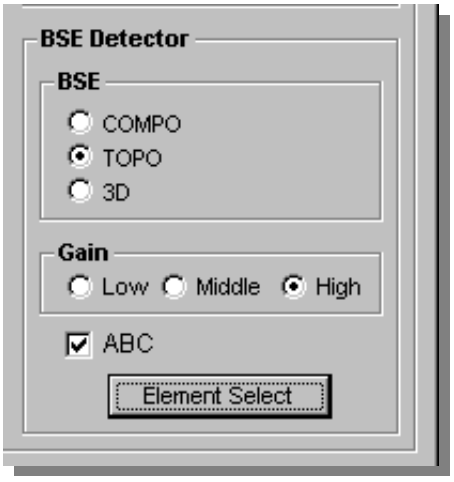
Secondary electron images are the most frequently obtained images from the SEM. However, the backscattered electron (BSE) image provides important information and in some cases more information than the secondary image. BSE's vary in their amount and direction due to the composition and topography of the specimen. The contrast of the backscattered electron image depends on three factors:

(1) Atomic number of the specimen material.
(2) Accelerating Voltage
(3) Specimen tilt angle with relation to the primary beam.

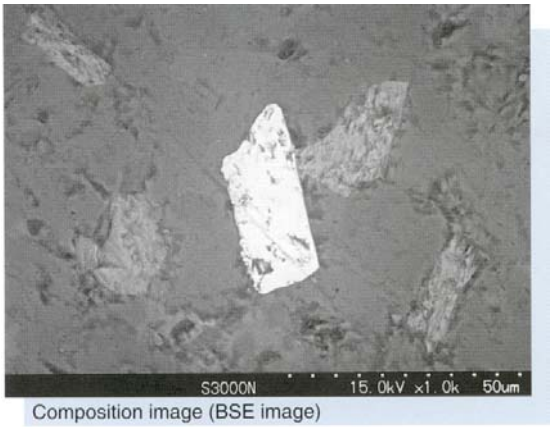
4-Segment Backscattered Detector

The backscattered electron image contains two types of information: compositional and topographic. To separate the two types of information, the Hitachi four segment semiconductor detector has the capabilities of summing the four segment's output signal giving a compositional image, or subtracting the segment's output signal to achieving a topographic image.

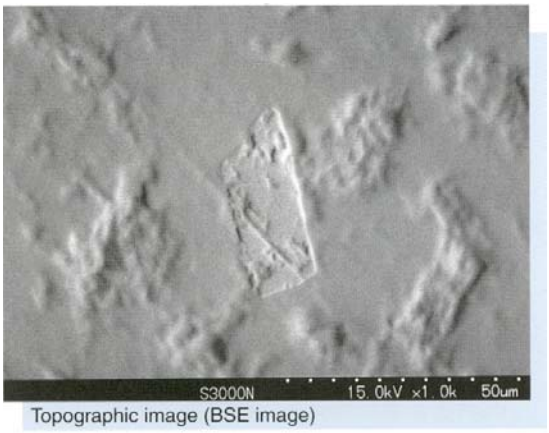




The images below demonstrate the significant differences between the two modes of backscattered electron collection. The compositional image emphasizes the heavy element grain in the middle of the image by presenting it as brighter while the topographic image shows the grain as "impressed" in the surface of the sample.

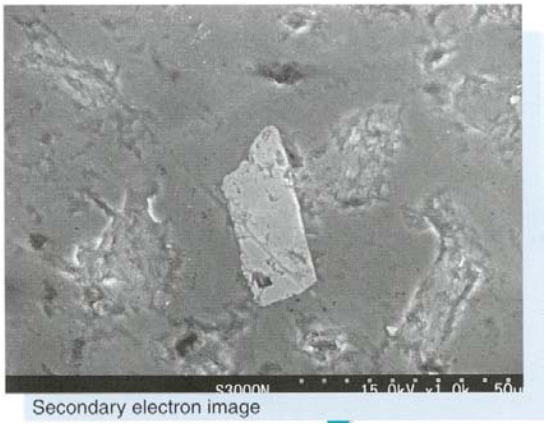


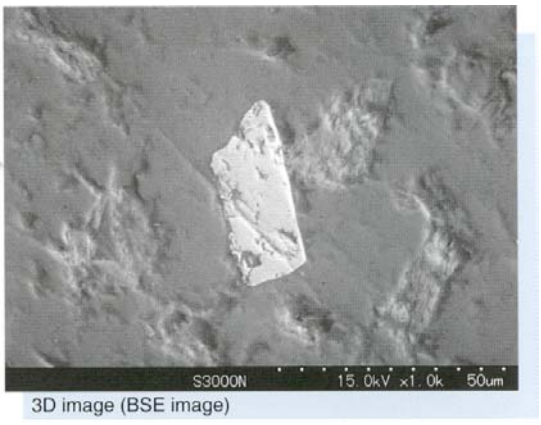
Composition image (BSE image)



Topographic image (BSE image)

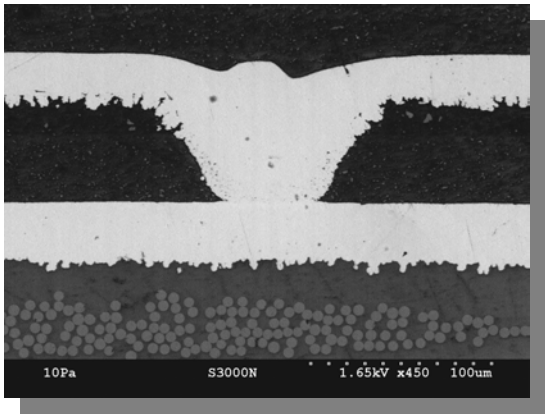
Changing the detector position permits viewing images three-dimensionally in which composition and topographic information on the specimen surface are mixed.


Secondary electron image



3D image (BSE image)

Low Voltage Backscatter Imaging



The image to the left illustrates how the patented Dual Bias circuit and gain selection allows the Hitachi BSED to operate at voltages previously unattainable. The Dual Bias circuit generates in excess of 100 μA at 5 kV and below so that low voltage imaging can be done with ease.