

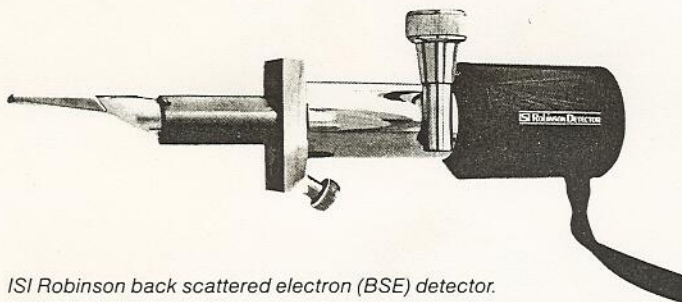
Retractable ISI Robinson BSE Detector

The Robinson BSE detector is unchallenged as the best BSE detector available today. The large solid angle subtended by the detector assures the highest electron collection efficiency, and the scintillator/photomultiplier construction provides extremely high signal generation efficiency and exceptional signal to noise ratio.

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This combination of features allows the attainment of BSE images with 10nm resolution, which is considerably better than is possible with the solid state BSE detectors offered by other manufacturers. Two other very important advantages are the ability to operate at TV scan rates and to produce images with incident beam energies down to 5kV.

There are now several hundred Robinson BSE detectors in use on ISI SEMs. In some instances they are the prime detector used, and the SE detector is delegated to a secondary role. We have recently introduced the retractable Robinson detector, shown in the accompanying photograph. This allows the detector to be permanently mounted to the specimen chamber and moved onto the electron optic axis or pulled back as required.



ISI Robinson back scattered electron (BSE) detector.

The main advantages of BSE imaging can be listed as follows:

1 **Minimizing Charging Artifacts.** Due to the high energy of BSEs compared to that of SEs, large surface voltage variations are required to influence the BSEs. It is often, therefore, possible to image a charged surface with BSEs without trouble, where SE images are severely degraded.

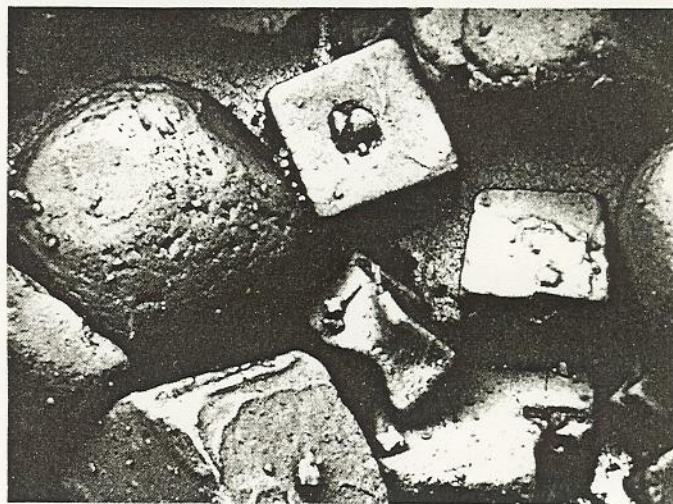
2 **Atomic Number Contrast.** It has long been known that the backscattered electron signal increases with average specimen atomic number. Due to the exceptionally high signal to noise ratio produced by the Robinson BSE detector, average atomic number differences as small as 0.01Z can be visualized. Even density differences as small as 0.5% for the same atomic number can be detected. This high sensitivity extends significantly the capabilities of the SEM, and is particularly useful in conjunction with any type of x-ray analysis system.

3 **Reduced Edge Highlights.** One characteristic of an SE image is the very strong signal associated with edges. It is this strong edge highlight which gives a "crisp" appearance to many micrographs. However, this signal can also be so strong that it prevents detail from being seen on other areas of the specimen. The Robinson detector automatically suppresses this strong signal and gives a picture a much more uniform intensity.

4 **Uniform Illumination.** A backscattered electron detector placed above and around a specimen gives a good signal from all areas of the specimen it "sees." No longer do you have to worry about the signal from the side of the specimen away from the detector being much weaker than the signal from the side closest to the detector. This is important in a number of applications such as when the SEM image is presented to an automatic image analysis system.

Uncoated Insulator Examination

The ISI Charge Free Anticontamination System (CFAS) is unique to ISI SEMs. It couples the high resolution, large depth of field, and versatility of the SEM with the simplicity



Uncoated NaCl.

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