CENTAURUS DETECTOR

Cathodoluminescence - Backscattered Electron

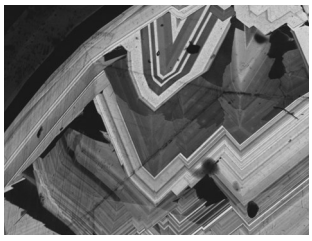
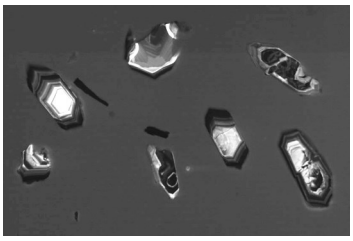
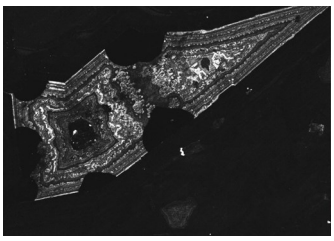
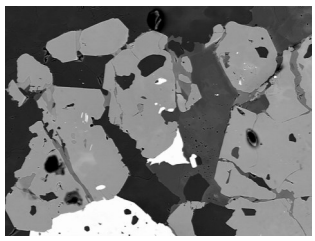
Centaurus is a scintillation type Backscattered Electron (BSE) or Cathodoluminescence (CL) panchromatic detector which can generate either compositional (with topographic information) BSE images or with a quickly removable tip it can be converted to a CL imaging detector giving an additional function for little extra cost.

Using a diamond polished parabolic reflector tip the Deben detector collects far more signal than competitor products.

CL imaging is widely used in geology, mineralogy, ceramic materials research and luminescent material development. Centaurus is capable of producing high-resolution cathodoluminescent (CL) images of luminescent materials. CL images can be easily collected and fed back into the SEM auxiliary video input. The photomultiplier may also be exchanged to select a particular wavelength range with sensitivity available from UV to deep IR at 185nm to 1200nm.

BSE imaging provides image contrast as a function of elemental composition, as well as an element of surface topography. Backscattered electrons are produced by the elastic interactions between the sample and the incident electron beam. These high- energy electrons can escape from much deeper than secondary electrons, so surface topography is not as accurately resolved as for secondary electron imaging. The production efficiency for backscattered electrons is proportional to the sample material's mean atomic number, which results in image contrast as a function of composition, i.e., higher atomic number material appears brighter than low atomic number material in a backscattered electron image.

- **Exchangeable BSE or Cathodoluminescence (CL) tips**
- **High Speed TV rate imaging**
- **Manual insertion and retraction**

Cathodoluminescence Imaging

Photon emissions can provide general information on trace elements contained in minerals or the production of mechanically induced defects in crystals. Perhaps more importantly for the geologic context, distribution of photon emission from a material gives fundamental insights into such processes as crystal growth, replacement, deformation and provenance. Applications include; Investigations of cementation and digenesis processes in sedimentary rocks. Provenance of clastic material in sedimentary and meta sedimentary rocks. Details of internal structures of fossils. Growth/dissolution features in igneous and metamorphic minerals. Deformation mechanisms in metamorphic rocks. Discrimination of different generations of the same mineral as a result of differences in trace amounts of activator elements.

Back Scattered Imaging

Backscattered electron detectors produce an image with contrast (grey levels) as a function of elemental composition. This is particularly useful for identifying different elements in samples. They are commonly used in the semiconductor industry for imaging junctions and looking for defects, in Geology when investigating the composition of rocks and in the construction industry for monitoring the composition of concrete. BSE detectors are also an essential tool for those using X-Ray microanalysis by helping to determine the particular area of the sample to be analysed. Centaurus detectors will give excellent results with all types of SEM from Tungsten low vacuum to high end Cold Field Emission.

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2023 200223

DEBEN

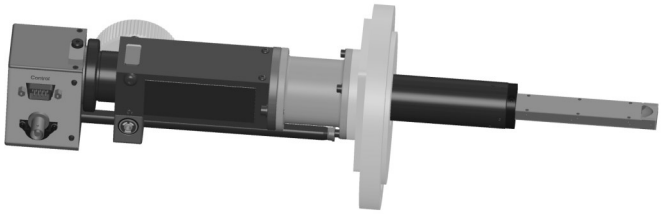
IN-SITU TESTING | E-BEAM INSTRUMENTATION | DETECTORS SEM TEM | DESIGN MANUFACTURING

Specifications

- Panchromatic scintillator BSE/CL detector
- Parabolic collection tip
- Fast TV rate imaging
- Excellent performance from 5kV to 30kV
- Manual insertion mechanism
- 185nm-850nm photomultiplier
- Pre-amplifier built into head unit
- Standalone video processor with brightness and contrast controls
- Video output adjustable for different SEM input requirements
- Voltage: 115V/230V
- CE and RoHS compliant

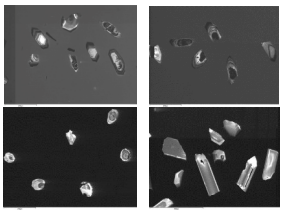
Options

- Polished parabolic mirror for CL, phosphor BSE or YAG BSEtips
- 400nm-1200nm Photomultiplier
- Bellows sealing with motorised insertion (for HV FEG applications)



Applications

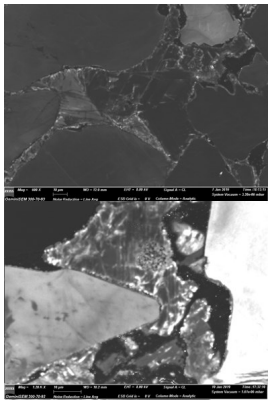
Cathodoluminescence Detector used at Royal Holloway, University of London



A selection of CL images of zircons showing oscillatory zoning, complex internal structures & core/rim rela-

Professor Robert Hall leads field based research into the geology of South East Asia and the western Pacific. Samples of sedimentary rocks are brought back to the UK where they are analysed by heavy and light mineral analyses as well as uranium-lead (U-Pb) zircon geochronology for provenance studies and pathway reconstruction. Cathodoluminescence (CL) imaging is an important tool for us to evaluate the internal zircon structure prior to U-Pb analysis. It is used to select laser spot positions and allows us to specifically target an area of interest in the zircon. It can also help to detect possible inclusions or cracks. Commenting on the choice of detector, Dr Hennig said "The group chose the Centaurus CL detector from Deben based on previous experiences at Birkbeck College/UCL. It has provided very good results and high quality images from the scanning electron microscope (SEM)."

Cathodoluminescence Detector used at University of Aberdeen



Dr Alex Brasier is the academic lead at the Centre and a Senior Lecturer in Geology at the University of Aberdeen. He uses electron microscopy for both academic research and teaching. Dr Brasier talks about his use of cathodoluminescence detectors and why he chose to purchase the Centaurus from Deben. "Cathodoluminescence is a technique commonly used on carbonate rocks to look at crystal growth histories. Using the other detectors of the electron microscope, I can see crystal sizes and shapes as they appear today. With the Deben CL detector, the images are greyscale but can easily be related to backscatter electron images and energy dispersive spectrometry (EDS) X-ray element maps of exactly the same part of the same specimen. We tried a few proposed in-house solutions from electron microscope manufacturers, but none of these produced a satisfactory image with carbonate rocks. We knew other SEM labs had a Deben Centaurus CL detector so we sent some specimens away for a test, and the results were much better. The issue with unsuitable detectors is usually 'streaking' of bright stripes across the image."

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