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Novel Cathodoluminescence Detector with Extremely Large Field of View

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We have developed a new "two in one" cathodoluminescence (CL) detector capable of simultaneous panchromatic and color imaging in the spectral range from 350 nm to 850 nm with extremely large field of view. With the increasing number of available analytical techniques there is a growing need for complex modular multi-analytical systems with as many integrated analytical tools as possible. Material studies performed on such systems are more accurate and less time consuming. This trend makes high demands on the actual versatility of analytical equipment and detectors. Small space demand is desirable. The new Rainbow CL detector was designed to meet these requirements by enabling simultaneous panchromatic and color CL imaging, contrary to previous systems that allow either one or the other.

The novel CL detector retains all the advantages of the existing TESCAN CL detectors [1], mainly extremely large field of view (FOV) up to 35 mm (width) and uniform collection efficiency over the full FOV. Unique collection optics in combination with a highly efficient multi-anode photomultiplier provides excellent sensitivity of the detector. The detection efficiency of the color channels was increased by a factor of four relative to the previous color version. Even unpolished, topographic and uncoated samples were successfully studied.

High resolution sub-micron color CL imaging at low acceleration voltages is possible, see Figure 1. The detector is fully integrated into the SEM's software, thus no external scanning is needed and simultaneous CL acquisition with other SEM signals is straightforward, for example CL with back-scattered electron image, see Figure 2. Color images can be processed directly in SEM software.

The new compact Rainbow CL detector can be easily integrated into a modular multi-analytical SEM-system without obscuring field of view of other detectors. The potential fields of applications are in geoscience, optoelectronic research, forensic science or life science [2].

References:
[1] Jiruše *et al,* Microsc. Microanal. 19 (Suppl 2) 2013, p. 1346
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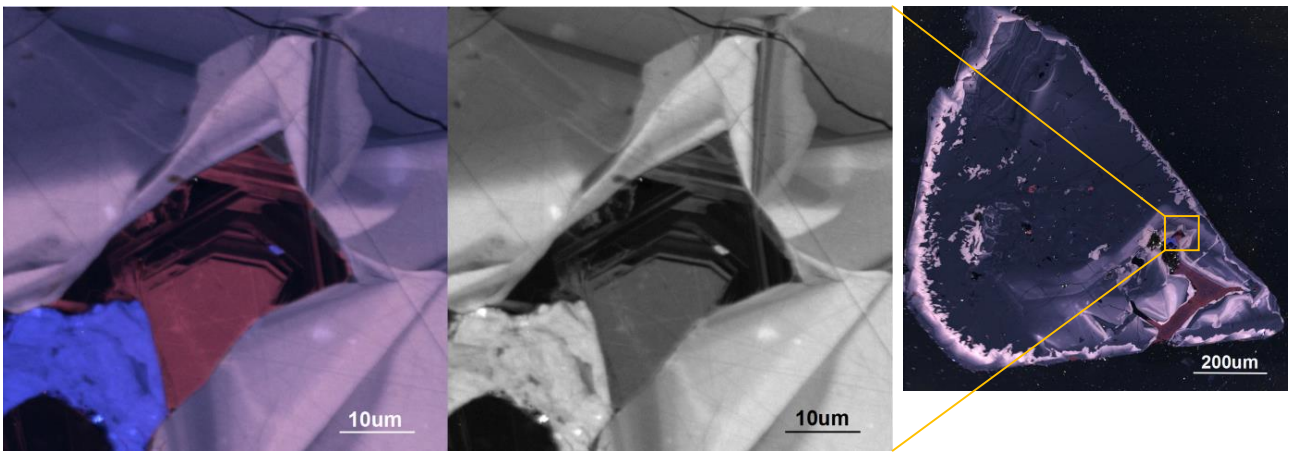

Figure 1. Color (left) and panchromatic (middle) high resolution CL images of a zoned quartz inclusion inside a zircon grain (right). Color and panchromatic CL imaging was done simultaneously using 5kV acceleration voltage.

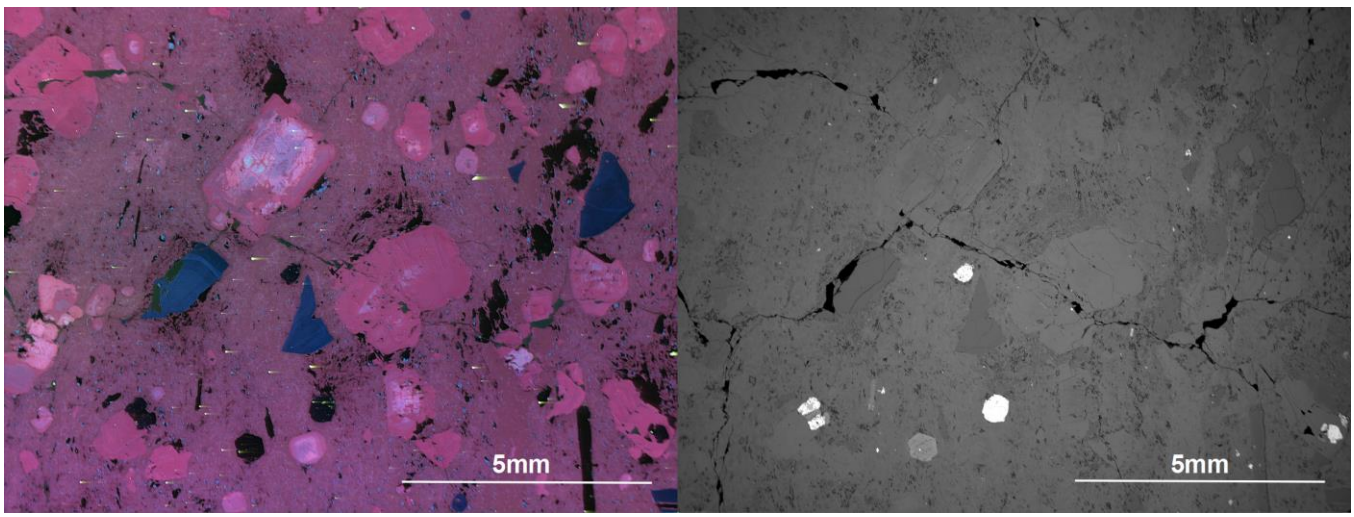

Figure 2. Color CL (left) and BSE (right) images of a rhyolite sample. Blue grains are quartz (note zoning typical for volcanic quartz), pinkish grains are topaz. CL and BSE imaging was done simultaneously within one single scan, FOV width is 13.6 mm.

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