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IT-4-P-5937 New scintillation low-energy BSE detector

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In the electron microscopy research of nanomaterials, biomaterials or semiconductors, low energy electron beam imaging is often necessary. Reducing the primary beam energy decreases the depth of specimen radiation damage, enables clear visualization of non-conductive samples and leads to enhanced specimen surface contrast.
Low accelerating backscattered electron (BSE) imaging with sufficiently high signal to noise level can be done with the new generation of solid state detectors. These detectors have good sensitivity in the low energy region and their speed approaches the speed of scintillation-type detectors. However, in dual beam systems the deposition of sputtered material on the detection surface can lead to deterioration of performance. Further drawback is the sensitivity of solid state detectors to light.
Scintillation detectors are fast and versatile, but their sensitivity drops rapidly in the low energy region thanks to the ‘dead layers’ on the detection surface (e.g. conductive coating), which are impenetrable for slow electrons. CRYTUR in cooperation with TESCAN has developed a new scintillation type BSE detector with special surface treatment, which guarantees enhanced sensitivity in the low energy region.
Detection limit of the new detector is less than 1 keV. It’s high performance in the field of energies under 3 keV makes it ideal for example for BSE imaging of surface details and contrast changing (see Figure 1), high resolution imaging of sensitive biological samples, or artifact free imaging of nonconductive samples (see Figure 2).

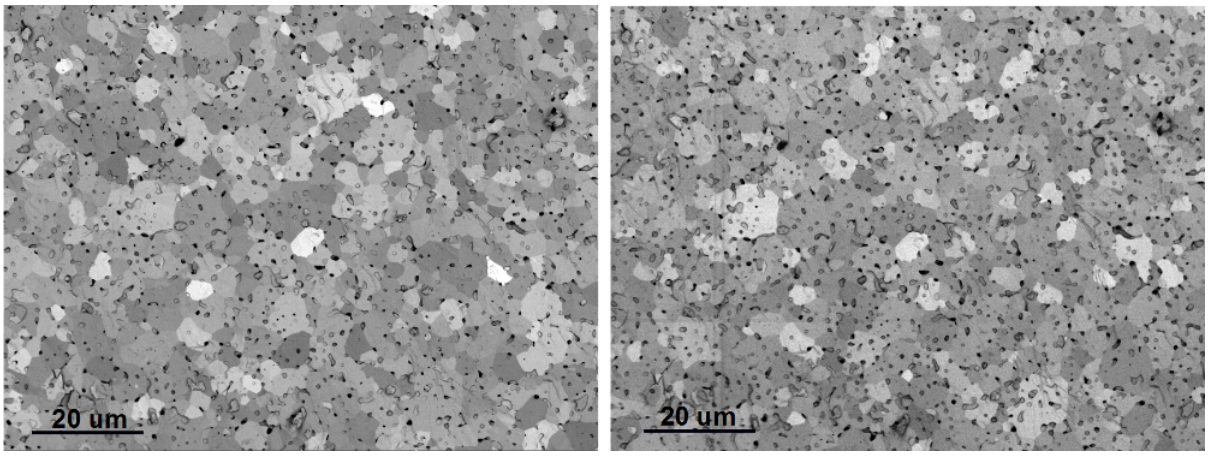

Fig. 1: Change of contrast in BSE images of CeO_2 ceramics taken at 3 kV (left) and 1 kV (right) accelerating voltages. More surface details are resolved with lower primary beam energy.

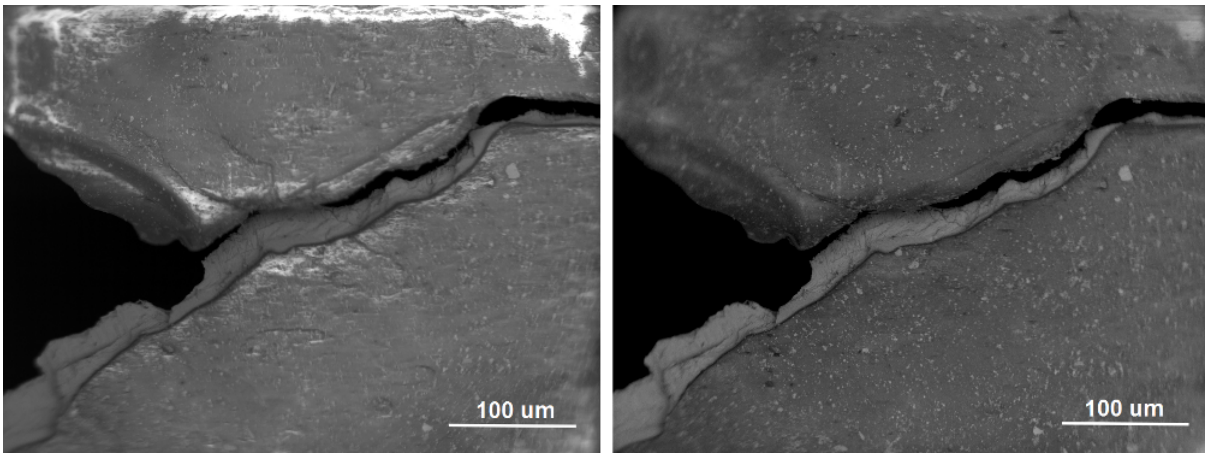

Fig. 2: BSE image of Vitrina pellucida shell taken at 3 kV (left) and 2 kV (right) acceleration voltages. Charging artifacts are not visible at 2 kV.