X-Ray Microanalysis with Silicon Nitride Detector Windows for FIB SEM Applications

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The Silicon Nitride window for x-ray detectors is a major advancement in Silicon Drift Detector (SDD) technology. The new window is an order of magnitude thinner than traditional polymer windows and increases transmission of x-ray signal to the sensor. The sturdy and rugged ceramic, Si3N4, is able to hold a higher vacuum within the detector which ensures the integrity of the module. These advancements bring performance benefits for durability and use in FIBSEM environments as well as in improved detection sensitivity and limits of detection.

This latest detector window is well-suited to FIBSEM applications where the detector is exposed to ion milling conditions and the potential for materials contamination, which is not suitable for windowless detectors. The new detector modules have been exposed to plasma cleaning for over 100 hours with no change in performance. Silicon Nitride’s increased thermal resistance compared to polymer or windowless detectors brings the possibility of in-situ and dynamic experiments with heating stages.

This work will explore the detection of ultra-low x-ray energy lines, including AlL and SiL, as well as microelectronics applications where these detection improvements allow never before achieved performance in spectral analysis, feature detection and mapping sensitivity.

Fig 1. Al L line ratio compared to AlK at 2.5 kV.

Fig 2. Carbon detection at 750 KCPS in steel at 20 kV.