Simultaneous high speed Backscattered Electron and X-Ray (BEX) imaging - a new technique for SEM

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Conventional SEM analysis uses separate electron detector(s) combined with Energy Dispersive Spectroscopy (EDS) to navigate samples for subsequent analysis. Sequential working, i.e. first imaging followed by EDS is inevitably time consuming when surveying many/large areas to find features.

A new integrated Backscattered Electron detector incorporating x-ray sensors has been developed. It is located beneath the SEM final lens, providing high solid angle for both imaging of backscattered electrons and X-Rays. Peltier cooling minimises signal noise, such that extremely high quality images with embedded elemental information can be achieved in just a few seconds. This allows navigation in real time with unprecedented detail and quality. In conjunction with a conventional EDS detector, speed and accuracy is achieved, i.e. the full range of quant analysis, maps and linescans etc. are available without compromise. X-Ray count rates of an order of magnitude greater than the largest conventional EDS detectors is possible and the collection geometry means that any working distance can be used for BEX acquisition. Further, the resultant images are free from shadowing effects normally associated with conventional EDS.

This makes the technique especially suited to large and rough samples. The talk covers the design considerations of the combined BEX detector, the operational characteristics and advantages, as well as a range of applications where it has proved to be a significant advance over conventional working methods; most notably the speed and convenience that this manner of working affords. BEX is anticipated to become the preferred method of surveying samples and acquiring combined electron and X-Ray images.