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Introducing twin X-ray detectors and fast backscattered electron imaging through a new Field Emission SEM from Carl Zeiss

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This paper describes a new Field Emission Scanning Electron Microscope (FE-SEM) from Carl Zeiss. The SEM is equipped with ultra-fast scanning electronics capable of 25 ns per pixel image acquisition. The new SEM combines the ability to operate two Energy Dispersive Spectroscopy (EDS) detectors simultaneously with high speed elemental mapping. Further elemental contrast is provided by a new advanced 5 segment backscatter detector and associated electronics capable of extended dynamic range imaging. An all new chamber design permits more Carl Zeiss detectors and third party accessories to be simultaneously supported. This meets the growing demand for a single system to analyse a multitude of specialised applications is met.

The new microscope system is based around the established Gemini field emission column technology [1] and encompasses an in-lens secondary electron detector for high resolution topographical imaging. Exceptional resolution is achieved through a combination of column design and enhanced vibration isolation. In addition, the advanced objective lens of the Gemini column facilitates investigations of ferromagnetic materials since the magnetic field produced by the column is negligible at the sample surface. The Gemini column's beam booster technology virtually eliminates the effect of electromagnetic interference on the microscope. The microscope vacuum technology also allows for operation in variable pressure (VP) mode for the characterisation and imaging of non-conducting samples.

Data from a range of conducting and non-conducting materials are presented which highlight the capabilities of the new technology contained within this research grade microscope. The operation of in-lens detectors in dual channel mode combined with a multimode STEM detector provides exceptional imaging of samples such as carbon nanotubes. Both transmission and topographic images are simultaneously available which permit unchallenged visualisation of this class of specimen.

The twin EDS detectors offer analytical results that feature both faster throughput and more accurate quantitative results for rough specimens. Analytical results on fractured sandstone surfaces are used to illustrate the benefits.

The new backscattered electron detector system employs a low keV sensitive multi segment Si diode with fast supporting electronics. This permits navigation across specimens close to "TV" speeds. Applications include the imaging of geological thin sections (Figure 1) and polished metallurgical blocks.

References

[1] E. Weimer & J.P. Martin, ICEM 13-Paris p. 67 July 1994

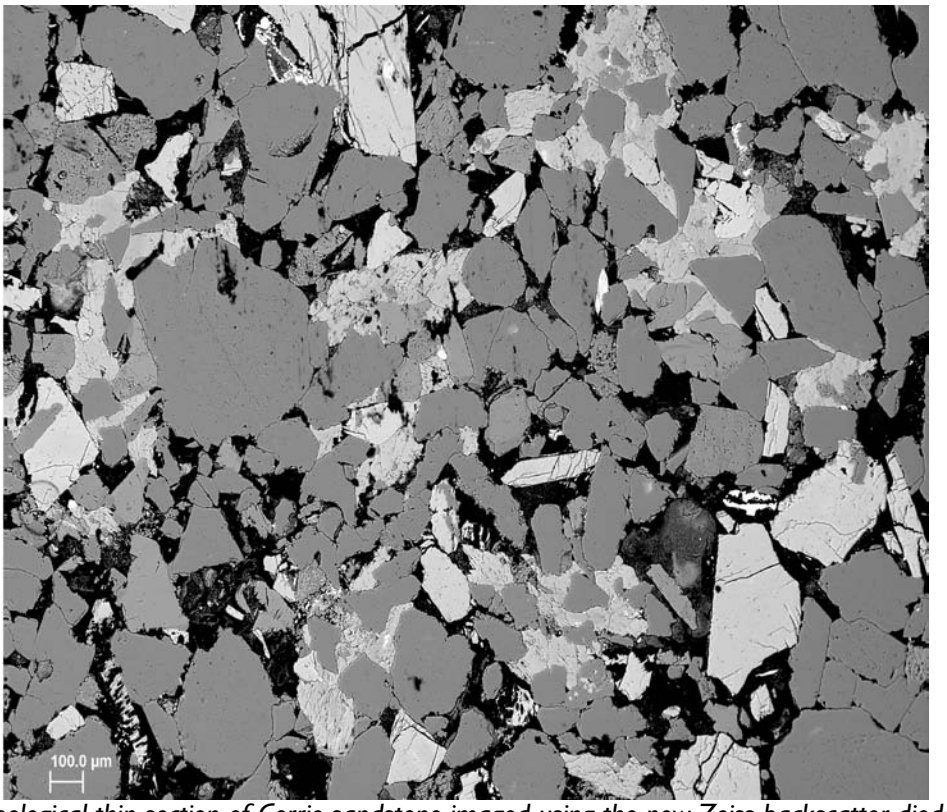

Figure 1. *Geological thin section of Corrie sandstone imaged using the new Zeiss backscatter diode detector*