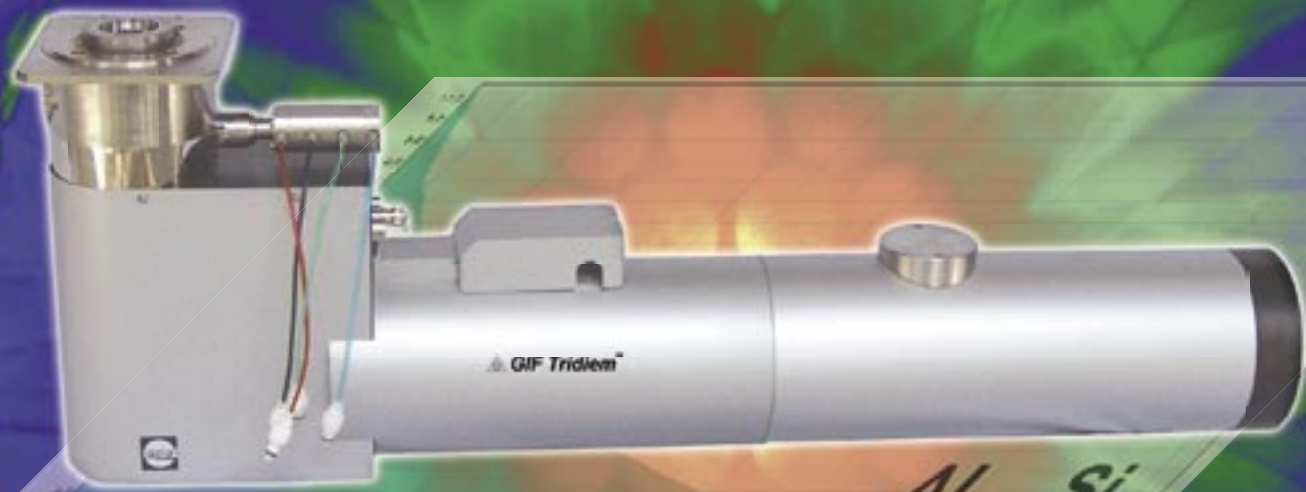


GIF TRIDIEM



863

GIF Tridiem

The GIF Tridiem represents Gatan's 3rd generation of post-column energy filters. It combines 3rd-order spectrometer aberration correction with a multi-port, high-speed, high-resolution CCD sensor to yield a system that defines the new state-of-the-art in the capture of highly-detailed EELS and EFTEM data sets with maximum throughput. This new GIF, combined with the Gatan Microscopy Suite (GMS) software, is ideally suited for generating and working with the rich 3-dimensional data sets demanded by today's analytical electron microscopists, including EFTEM and EELS STEM spectrum images, EFTEM tilt and tomography series, and time series. GIF Tridiem makes such tri-dimensional EM readily accessible.

The key features of the GIF Tridiem system include:

Large collection semi-angle for energy-filtered diffraction: 120 mRad, full azimuth (on selected TEM models)

Large field-of-view for energy-filtered TEM imaging and mapping: 20 μm , diagonal (on selected TEM models)

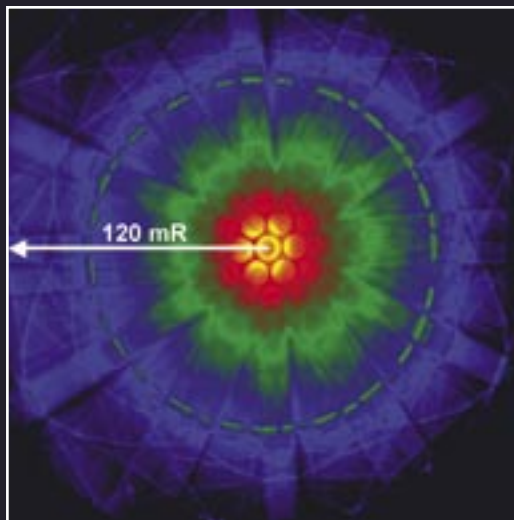
Excellent isochromaticity over the entire EFTEM field-of-view: deviations < 1.25 eV

Very large searchable field-of-view in unfiltered TEM mode: > 200 μm , diagonal (on selected TEM models)

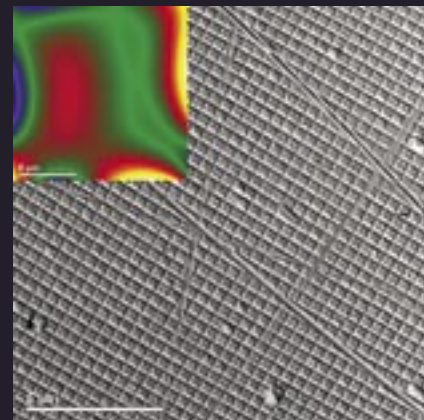
Rich EELS detail with each spectrum readout: > 2000 channels (e.g. capture 600 eV range at 0.3 eV/channel)

Exclusive "cinema mode" readout for smooth, high-quality real-time viewing: > 10 frames/sec

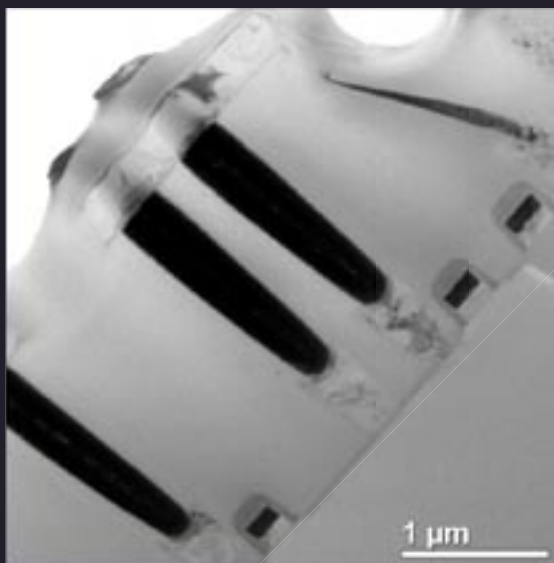
High spectrum readout rate for STEM spectrum imaging: > 30 spectra/sec



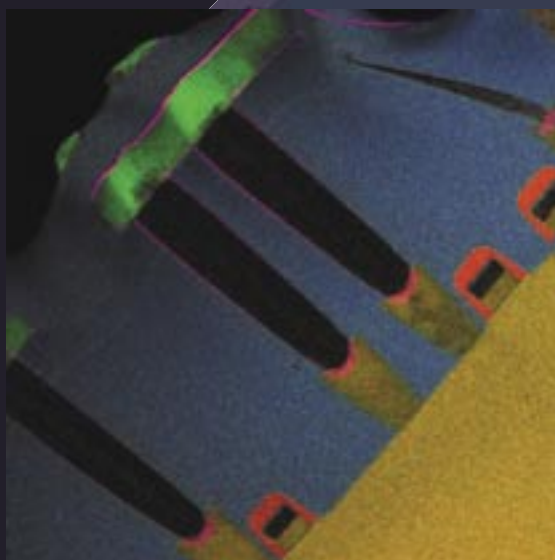
(Above) Zero-loss filtered Si [111] CBED pattern taken at 200 keV. FOLZ ring represents scattering angle of 78 mR.



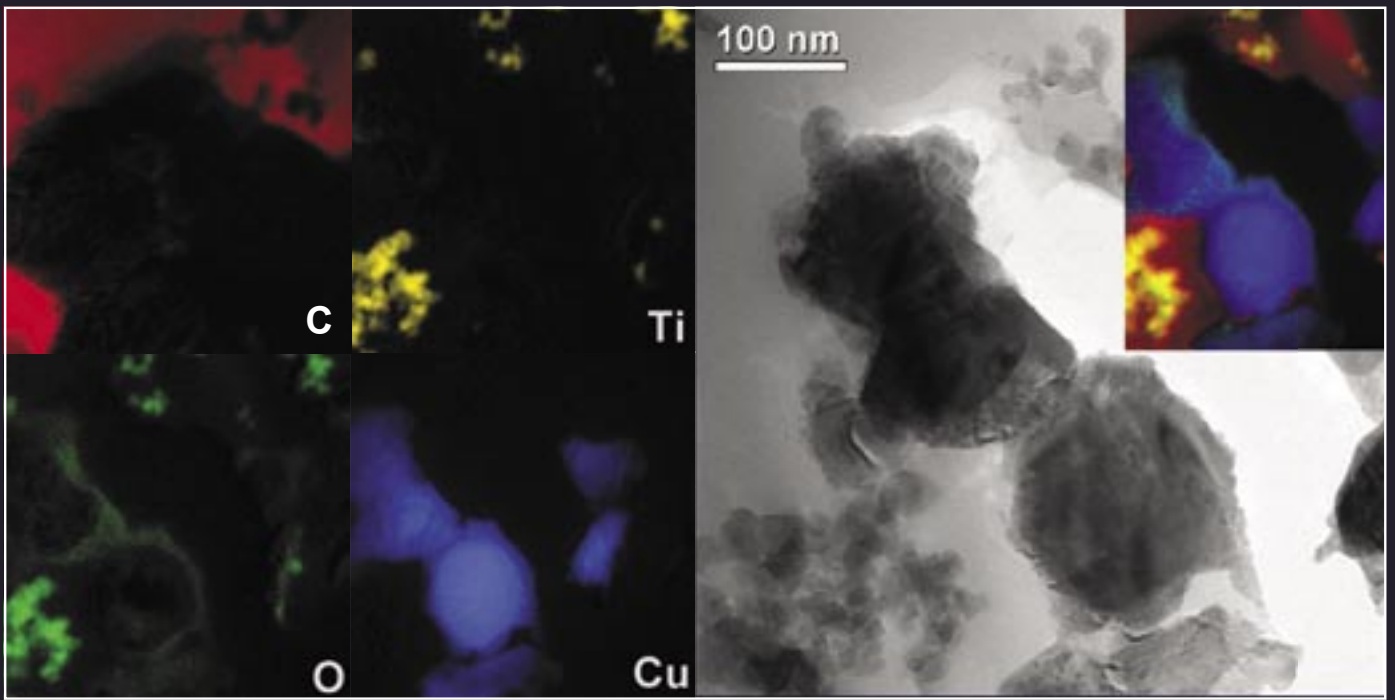
(Above) Zero-loss image of grating replica showing large field of view for EFTEM. Grating pitch is 463 nm. Inset shows energy deviation across image field corrected thru 3rd order to < 2 eV.



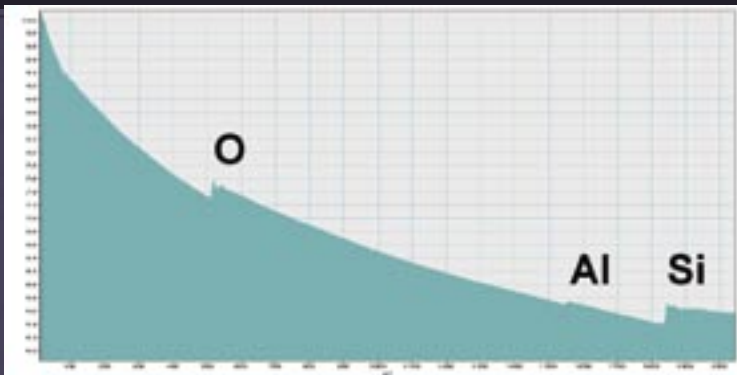
(Left) Unfiltered bright-field TEM image of semiconductor device structure.



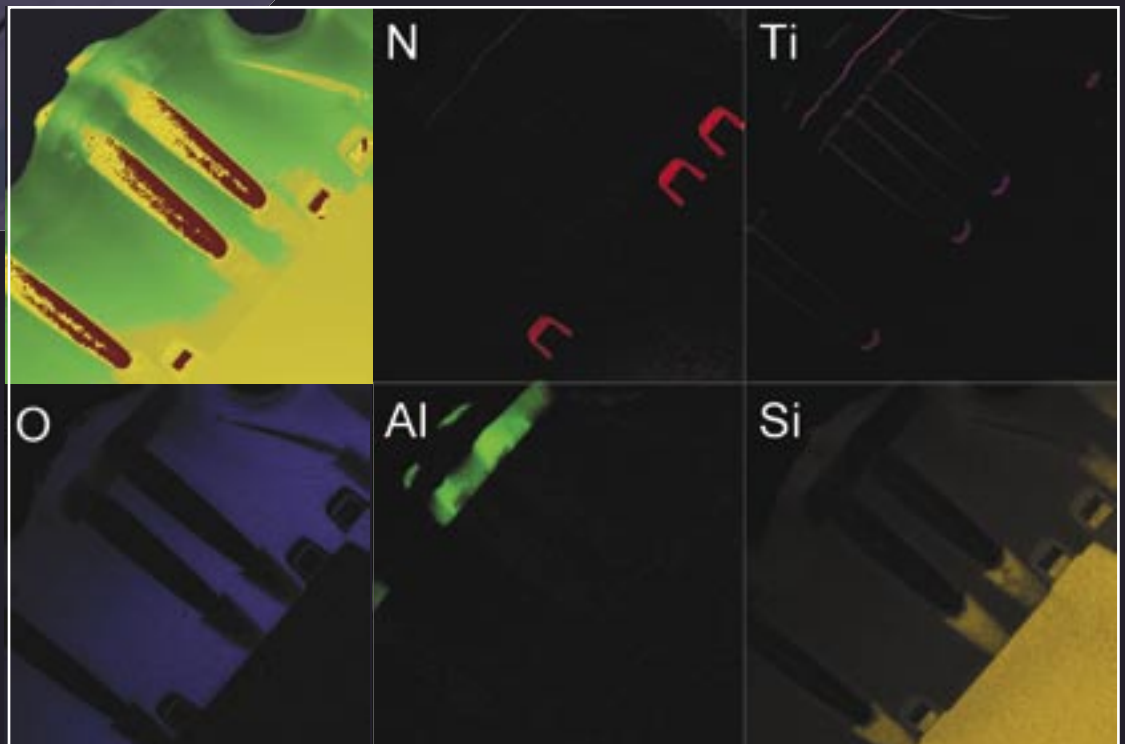
(Left) Color composite of all 5 elemental maps displayed at right, clearly showing the construction of the device.



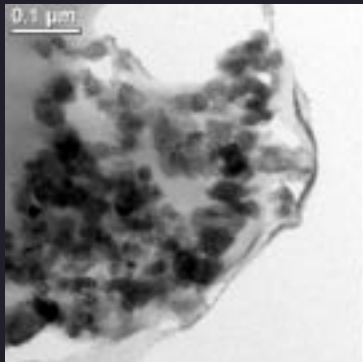
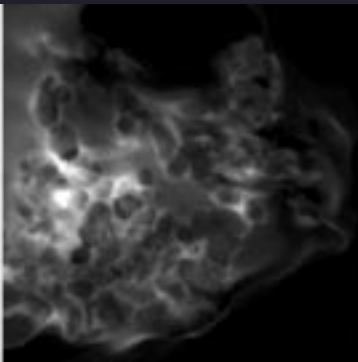
Series of elemental maps from copper-titania powder embedded in resin showing clear evidence of oxide layer surrounding copper particles.



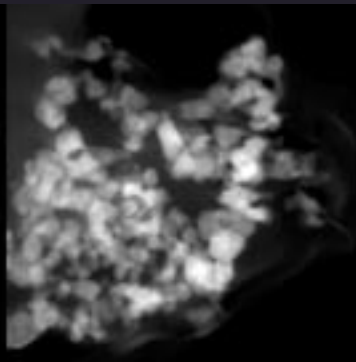
(Left) Spliced 6000-channel EELS spectrum (log of intensity) at 0.3eV/ch. This detailed spectrum contains features for all elements in device area shown below.



(Right) Thickness and elemental maps formed from ionization-edge signals of N-K, Ti-L, O-K, Al-K, and Si-K.

Zero-loss image of TiO₂ particles.

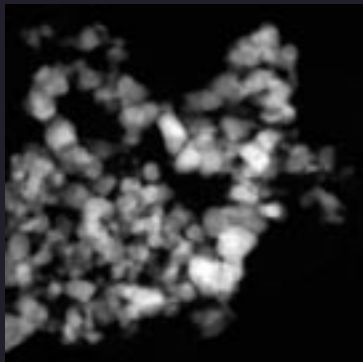
Ti L pre-edge image at 436 eV.



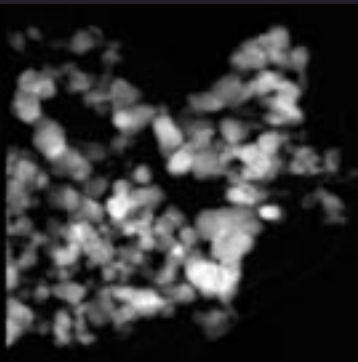
Ti L post-edge image at 481 eV.

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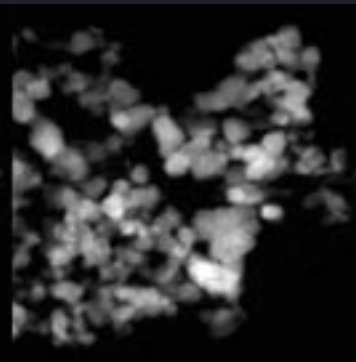
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Ti L map at 10 degrees tilt.



Ti L map at 20 degrees tilt.



Ti L map at 30 degrees tilt.

The 3-dimensional arrangement of the titania particles can be seen by viewing the above maps as stereo pairs.

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GIF Tridiem Specifications

Imaging

Entrance aperture	5 mm
EFTEM field of view	20 μm (diagonal, select TEM models)
Maximum diffraction angle	120 mRad (select TEM models)
Non-isochromaticity	< 1.25 eV
Distortion	< 1.75 %
Chromaticity	< 1.5 μm/eV
Detector resolution	2048 x 2048 pixels (UltraScan™ sensor with HCR™ technology)
EFTEM readout speed	4 frames/sec (EFTEM, 512 x 512)
Viewing readout speed	> 10 frames/sec (Cinema mode, 512 x 256)

Spectroscopy

Filter energy resolution	0.25 eV
Attainable system resolution	0.6 eV (0.55 eV TEM with cold FEG, 0.25 eV GIF)
Detector channels per readout	2048
Detector dynamic range	0 – 60000 counts/ch
Detector noise	< 6 counts/ch
Maximum readout speed	> 30 spectra/sec