

## SU9000 CFE-UHR-SEM/STEM with EDS & EELS

The NEW Hitachi SU9000 CFE SEM/STEM joins the instrumentation fleet at Clemson AMRL. **This is the WORLD'S MOST ADVANCED ULTRA-HIGH-RESOLUTION SEM** and the only unit in the US equipped with ultra-high-performance imaging as well as EDS and EELS analytical capabilities, the SU9000EA will allow users to redefine boundaries and break new ground for materials/biological research.



To keep-up with the latest technology improvements in electron microscopy, upgraded instrumentation with unique features must be adopted to study materials at the nanometer scale. For materials study at the nanoscale, Hitachi has introduced a new line of instrumentation with improved CFE gun technologies that further reduce aberration artifacts and thereby increase imaging capabilities as well as versatility. Such advanced field emission gun technology is featured in the SU9000 allowing it to achieve the highest SEM resolution in the world. (0.4nm at 30kV)

The reduced aberration effects allow for high resolution imaging even at low accelerating voltage for beam sensitive materials. (1.2nm at 1kV). The SU9000 also features STEM performance that guarantees 0.34nm resolution as well as advanced analytical capabilities of EELS and EDS. SU9000 provides superior fundamental performance such as stable operation, high throughput, and high resolution to stay at the forefront of modern technology.

### **SU9000 features:**

- Cold Field Emission Source
- Resolution:
  - 0.4nm guaranteed at 30kV (SE)
  - 1.2nm guaranteed at 1kV (SE)
  - 0.34nm guaranteed at 30kV (STEM)
- Accelerating Voltage:
  - 0.5 - 30kV (100V step)
- Magnification Range:
  - Magnification on Display Monitor
  - LM mode: 220x - 25,000x
  - HM mode: 2,200x - 8,000,000x

- Magnification on 4" x 5" Polaroid size
- LM mode: 80x - 10,000x
- HM mode: 800x - 3,000,000x
- Side Entry Hyper Stage
- Standard Specimen Holder
- EDS Ready: DBC (P/N510-9803) and TCP/IP Interface (P/N510-9804)
- Anti-contamination Trap (P/N510-9721)
- Dry Vacuum System
- Windows 7 OS with Ethernet, W/R Drive and HD Back
- 24.1" Wide Screen Flat Panel Monitor
- Environmental Enclosure

Includes:

1. Electron Energy Loss Spectrometer (EELS)

- (1) Accelerating voltage: 30kV
- (2) Energy width for maps : 60eV (Energy dispersion: 0.44eV/ch)
  - 30eV (Energy dispersion: 0.22eV/ch)
  - 15eV (Energy dispersion: 0.11eV/ch)
  - 7eV (Energy dispersion: 0.05eV/ch)
- (3) Maximum selectable energy loss: 2000eV
- (4) Elemental distribution image
  - (a) Mapping: 1-window mode (Energy filtered image)
  - 2-window mode (Core loss ratio map)
  - 3-window mode (core loss intensity map with background reduction processing)
  - (b) Magnification: 30,000x – 500,000x
  - (c) Display: Dedicated EELS monitor
- (5) Image recording
  - (a) Signal channels: 5ch
  - (b) Image pixels: 512x512, 1024x1024, 2048x2048 pixel
  - (c) Grayscale: 16bit
  - (d) Saving format: TIFF (16bit), BMP (8bit)
- (6) Spectrum acquisition
  - (a) Channels: 1024ch
  - (b) Exposure time: 1ms – 60s (step: 1ms)
  - 1us – 999us (step: 1us)
  - (c) Displayable energy width: approx. 440eV at 60eV energy window for maps
  - approx. 220eV at 30eV energy window for maps
  - approx. 110eV at 15eV energy window for maps
  - approx. 50eV at 7eV energy window for maps
  - (d) Dark current correction for spectrum detector
  - (e) Gain variation correction for spectrum detector
  - (f) Spectrum record format: csv
- (7) Spectrum analysis function
  - (a) Energy shift: less than +/- 1eV at magnification of 30,000x and specimen height of 0mm
  - (b) Acquisition time: 1us – 60s/point
  - (c) Point analysis (Max. 26 points), Line analysis, spectrum imaging

(d) Spectrum analysis processing: Background reduction, Differentiation, Smoothing, Difference, Thickness analysis

## 2. Oxford EDS System

Oxford AztecEnergy with X-MaxN 100 LE- 100mm<sup>2</sup> windowless Ultra Large Solid Angle SDD detector

A comprehensive Energy Dispersive X-ray Microanalysis system including all the tools required to perform qualitative and quantitative analysis, image capture, image centric analysis and X-ray spectral mapping and line scanning.

Software includes:

- Tru-Q analysis engine
- Point and ID
- AutoID
- Standard-less quantitative analysis
- Spectral imaging
- TruMap and TruLine background and overlap-corrected mapping
- AutoLock Drift Correction
- AutoLayer element and phase visualization
- AutoPhaseMap
- QuantMap and QuantLinescan
- Aztec Feature Analysis
- AZtec Large Area Mapping
- AZtec Image Registration
- AZtec MapQueue
- TEM Quant for SEM
- Inca Energy 350 Software Suite
- Microsoft Office for report generation
- Additional license for off-line processing

Hardware includes:

- X-MaxN 100LE Windowless SDD detector with PentaFET Precision - 100mm<sup>2</sup> active area.
- Resolution guaranteed on Mn K - 127eV at 50,000 cps.

Includes

- MicsF+ - Microscope image capture system
- Xstream2 - Microanalytical Pulse Processor
- Windows 7 PC
- Upgrade to Aztec Auto PC
- Oxford Installation and Software Familiarization

## 3. Other capabilities -

Photomultiplier Power Supply Unit

Hi-Mouse

Top Detecting Device (HABSE)

YAG BSE Detecting Unit

Faraday Cup

Standard STEM Holder  
Double Tilt Holder  
High Resolution STEM Holder  
Cross Section Specimen Holder (1)  
Beam Deceleration Function for SU9000  
Flat-specimen Beam Deceleration Holder  
Cross Section Beam Deceleration Holder  
Retractable Bright Field STEM Detector  
Dark Field STEM Detector  
CD-Measurement Unit  
Diffraction Camera Unit

#### 4. ZONETEM Desk Top Sample Cleaner -

Hitachi TEM/STEM Sample Cleaning

- Microprocessor controlled UV Hydro Carbon removal system
- 2 cleaning modes (Vacuum clean, Vacuum storage)
- 20 watt UV lamp rated for > 1000 hours of operation
- Dry pumping system
- Cleaning time from 0 to 30 minutes, 1 minute steps
- Pressure adjustable from 500 Torr to 100 Torr in 100 steps
- Accepts up to 3 Hitachi TEM holders simultaneously\*
- Manual sample rotation allows cleaning from both sides of grid
- AC 100-240V, 0.2kVA

#### 5. SPARKLE Chamber Cleaning System

- UV cleaning technology
- Low-energy, non-destructive gentle chamber cleaning
- Instant ON/OFF. Operates in high vacuum (no need to stop TMP)
- Built-in user control pad
- Lamp life 1000 hr

