



ECV^{PRO}™

Carrier Concentration Profiling for Complex Epitaxial Structures

The ECV Pro is the result of a total redesign that completely redefines ECV profiling. We have taken 25 years of profiling experience and coupled it with 25 years of advances in instrument control technology to produce the most precise, most reproducible, most highly-automated CV profiler ever. The ECV Pro was designed, from the ground up, to eliminate all operator dependent variations in the data. All the operator has to do is set the wafer on the stage. After initial setup, the ECV Pro takes care of everything else.

ECV Pro introduces the first ever in-situ camera for unprecedented levels of control. We call it ECVision™ and it allows real-time imaging of the semiconductor/ electrolyte interface. Now you can see exactly what occurs at the sample surface during a measurement.

For III-Nitrides, the ECV Pro GaN option extends the performance of the system for optimal profiling of GaN, InGaN and AlGaN.

- Elimination of data variation due to operator
- Dramatic improvement in reproducibility
- Integrated design leads to small footprint
- ECVision aids measurement diagnostics



Increased Productivity at Reduced Cost

Eliminate Operator Variability. Operator training time is reduced. Sample preparation is simplified and the intuitive software leads the operator through the measurement process step by step reducing the possibility of errors. Recipe-driven operation means no operator involvement when profiling complex structures.

Lower Consumable Cost. The novel design extends the sealing ring lifetime and eliminates the cost of expensive Calomel electrodes. Signal electrodes and contact sets need less frequent replacement.

Reduced Maintenance Costs. The new cell design and optics dramatically improves hardware reliability.

Smaller Footprint. The floor standing designs reduces footprint by approximately a factor of two compared with other profilers. As the electrolyte and waste are contained on the unit, there is no need for an adjacent wet-bench.

High Accuracy Measurement

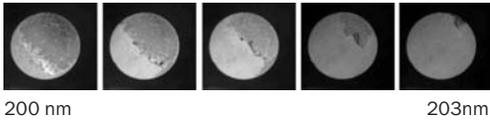
Automation only has value if the measurements are accurate – and the ECV Pro excels in this aspect. The ECV Pro's newly designed digital electronics eliminate drift and significantly improves signal to noise. Capacitance is accurately determined and is calibrated to built-in standards prior to every measurement. The ECV Pro introduces a novel dual-frequency measurement so that a complete solution is found to the three-term model. The ECV Pro can measure carrier concentrations from 10^{13}cm^{-3} to 10^{20}cm^{-3} (Dependent on material quality) over a depth range from $0.05\mu\text{m}$ to $50\mu\text{m}$ with an unparalleled depth resolution of 1nm . The ECV Pro will exceed your expectations in every respect.

Cells and Sealing Rings

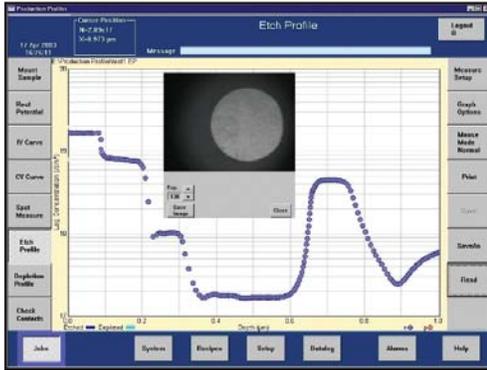
The cell is the heart of the machine and the sealing ring is its most critical component. On the ECV Pro, the proprietary electrochemical cell minimizes maintenance by fully integrating it into the system and optimizing the electrode configuration. The new cell design more than doubles the sealing ring lifetime. It also incorporates a novel electrolyte circulation system to ensure uniform etching. Modular design makes sealing ring replacement a 30-second job while eliminating the potential to distort or damage the ring.

ECV Pro: Hg Probe Alternative The ECV Pro's accuracy and reproducibility provide a viable, safe and environmentally friendly alternative to the Mercury probe. ECV Pro uses no Calomel reference electrode and is entirely Mercury free. The horizontal stage makes monitoring spatial distribution across a wafer simple and convenient. Using the depletion profile mode and the ultra-repeatable contacting area, ECV Pro can accurately measure the surface doping variations across a wafer.

ECV Pro: An Alternative to Hall. ECV Pro offers many advantages over Hall measurements. These include measurement of electrically activated dopants and individual structural layer information. Additionally, the ECV Pro can be applied to a wide range of materials and structures and is not limited to profiling only on Si or suitable PN structures.



Profile through the base of an InP HBT structure—
ECVision clearly shows the progress of the etch.



ECV Pro profile of a InP/GaInAsP Laser test structure.

ECVision™ “To See is To Believe”

Once you have used a profiler with ECVision you will never want to go back to “flying blind.” The ECV Pro uniquely features a camera that images the semiconductor/electrolyte interface. You can now be certain to eliminate data corruption due to bubbles or other disturbances, ECVision delivers novel insight of film removal or defect revelation during the etch process. ECVision can also make a permanent visual record of the semiconductor/ electrolyte interface at any pre-programmed depth. This invaluable information accelerates etch process development or troubleshooting.

By automatically measuring the etch area, in-situ, immediately after the profile, ECVision greatly improves data accuracy. Integrated SPC software tracks the change in etch area over time. Separate charts are provided for p-type and n-type and for different electrolytes. This useful facility improves measurement control and extends the lifetime of a sealing ring without compromising data quality.

ECV Pro Software

The ECV Pro user interface is built around Industry Standard SEMI E-95 guidelines. The ECV software is extremely intuitive and guides the user, step by step, through the measurement and analysis. User-defined recipes allow automated profiling of complex structures and eliminate the need for operator supervision during measurement. Recipe control of processes markedly improves reproducibility. In production operation the ECV Pro can be programmed to signal out-of-control situations should the carrier concentration exceed process tolerance limits. For structures requiring multiple electrolytes, the ECV Pro is programmable to allow efficient and automated changing of the electrolyte.

Specifications

Carrier Concentration	10 ¹³ cm ⁻³ to 10 ²⁰ cm ⁻³ *
Depth Range	0.05µm to 50µm*
Depth Resolution	1nm*
Carrier Frequency	0.3kHz to 50kHz
Signal Amplitude	0V to 400mV pk-pk
Bias Voltage	±10V
Current Integrator	±2% up to 1024µA total
Blast Voltage	40V AC
Light Source (ECV Pro, ECV Pro - GaN)	Quartz Halogen or High stability Mercury Xenon - with current control for variable illumination
Dimensions	W = 630mm, D = 800mm, H = 1730mm
Weight	Approximately 160kg
Software	Operating system NT4
Materials Measured	III-V, III-Nitrides, II-VI, Si, SiC
Service Requirements	Light Vacuum
Power	110VAC - 240VAC, < 5 Amps

*Dependent on material quality.

Nanometrics Incorporated
1550 Buckeye Drive
Milpitas, CA 95035
tel: 408.435.9600
fax: 408.232.5910
sales@nanometrics.com
www.nanometrics.com

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