



### CIQTEK - NMR, EPR, TEM, SEM & Diamond NV Microscopy - China

CIQTEK is the most advanced scientific instrument manufacturer in China. Products include:

- **NMR:** The CAN600 is a next-generation intelligent liquid-state **nuclear magnetic resonance (NMR) spectrometer**, equipped with an ultra-shielded, ultra-homogeneous **600 MHz** superconducting magnet. It is an advanced distributed system with a integrated modular console, and high-sensitivity, fully automated tuning probes. CAN600 features highly integrated transceiver RF channels, enabling multi-receiver experiments. Novel design supports rapid tuning and shimming, significantly reducing the time required for experiment setup. Accessories such as the intelligent control touchscreen makes system's control/monitor simple. By combining high-performance hardware with intelligent software, CAN600 delivers a more reliable and user-friendly NMR platform for researchers.
- Scanning Electron Microscope (**SEM, FIB-SEM, FE-SEM**): Nine different models are offered to suit all possible application needs
- Transmission Electron Microscope (**120 kV Field Emission TEM**): Users could operate in a separate room to reduce environmental interference to the experiment. Software integrates efficiently to provide fully automated processes, allowing efficient TEM interaction with real-time monitoring. System could be equipped with a field emission electron gun. Sufficient ports/interfaces are built for future needs.



NMR

TEM

EPR/ESR

- Electron Paramagnetic Resonance (**EPR/ESR**): Three models (X-Band Benchtop Electron Paramagnetic Resonance Spectrometer, X-Band CW-EPR Spectrometer, and X-Band Pulse EPR Spectrometer) are available.
- Widefield **Nitrogen Vacancy (NV) Microscope**: A wide-field magnetic microscope based on the principle of Nitrogen-Vacancy (**NV**) Optically Detected Magnetic Resonance (**ODMR**), which has the features of high spatial resolution, large field of view, large dynamic range of detectable magnetic field, and fast imaging speed. It's compatible with ambient environments to cryogenic & vacuum extreme environments.
- **Scanning Nitrogen Vacancy (NV) Microscope**: It is a **Nanomagnetic Imaging Microscope** that combines optically detected magnetic resonance (**ODMR**) of diamond nitrogen-vacancy centers with the scanning probe technique. This combination can be applied to the research of spintronics, multiferroic, 2D magnetic material, superconductors, etc **There are two versions: the ambient version and the cryogenic version.**
- **Many Others.....**



Scanning NV Microscope

Hi-Resolution FESEM

Widefield NV Microscope

# Semicon, Surface & Material Sciences

## One Basic Question: What is the isotope content of your samples?

Now, you have information of your sample's elemental results (C, H, N, and S). Then you may ask another question: what are the isotopes contents of these elements.

**Our complete solution is simple, yet with elegance:**

Liquid & Solid samples	 <p>EC 8020 CHNS Organic Elemental Analyzer</p>	 <p>IDMicro EA IRMS for C, N, O and S isotopic and elemental analysis. δ13C Analysis</p>	 <p>14C SCAR 14C Analysis</p>	Complete solution for $^{12}\text{C}/^{13}\text{C}/^{14}\text{C}$ isotope ratio in liquids and solids
	 <p>8070 Air CO<sub>2</sub> + Portable Sampler Atmospheric CO<sub>2</sub> analysis</p>			Complete solution for $^{12}\text{C}/^{13}\text{C}/^{14}\text{C}$ isotope ratio in atmospheric air
Air samples	<b><sup>12</sup>C Analysis with EA</b>	<b><sup>13</sup>C Analysis with EA - IRMS</b>	<b><sup>14</sup>C Analysis with EA - SCAR</b>	



**To begin with, your samples may be related to some of these:**

- Materials of any sort (solid, liquid and gas)
- Environmental investigation (ambient air)
- Pharmaceuticals
- Agri-food (Agriculture, Food/Feed)
- Chemicals (Pharma, Fertilizers)
- Geo-Environmental (CN in Soils & Sediments)
- Energy & Biomass (CHNS & CHN in Oil & Lubricants, C in Coal)
- Breath Analysis
- Oil/Gas fields mudlogging

Products from **NC Technologies**, **Compact Science Systems**, and **ppq sense** are here to work with you.

### The concept of Modern Biogenic and Fossil

The C14-SCAR analyzer measures the CO<sub>2</sub> produced by burning the sample and retrieves the concentration of <sup>14</sup>C by measuring the spectral area of a given molecular transition of the <sup>14</sup>CO<sub>2</sub>. If the sample is taken from a modern living being, the measured <sup>14</sup>C concentration will be close to the so-called Natural Abundance or Modern Carbon (MC) Concentration. This corresponds to 100 percent of Modern Carbon, i.e. 100 pMC. A similar measurement taken on a sample containing only fossil carbon will not show any signal corresponding to the <sup>14</sup>CO<sub>2</sub> transition, since no <sup>14</sup>C is present, as this corresponds to 0 pMC (percent of Modern Carbon).

Therefore, any result falling in the range of 0 pMC – 100 pMC will give you a direct measurement of the bio-based carbon content of the sample.

This method is totally matrix-independent, since the measurement is taken always on the CO<sub>2</sub> produced by burning the sample, therefore not depending on the chemical composition of the original material.

Current applications are related to analysis of Fuels (such as Seaweed Energy solutions (SES), Bio-diesel, SAF), Plastics (Garments, Shoes), Chemicals (Real vs. Synthetic Leather), Graphite (Nuclear Waste), Pharma (New Drug Development), etc.

# Semicon, Surface & Material Sciences

## Epitaxy Tech - Epitaxy Instruments - China

Thin film coating instruments with atomic scale precision is devoted for quantum materials research and application. All these are results came from patented inventions and advanced processing techniques in areas of vacuum control, vacuum heating, motion and laser control.

### Products and technologies include:

- Laser Molecular Beam Epitaxy
- Pulse Laser Deposition
- UHV Magnetron Sputtering
- Chemical Vapor Deposition
- RHEED System
- **Many Others.....**



**UHV Magnetron Sputtering**

### UHV Magnetron Sputtering

**Load-lock:** Compatible with magnetron sputtering and glove box

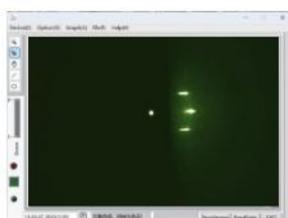
**Turbo pump:** 700 L/s  
Transfer arm length: 600 - 1000 mm

**Roughness:** RMS <0.1 nm

**Sample size:** 1-8 inch

**Mode:** ON/Off Targets

**Pressure:**  $5 \times 10^{-9}$  Torr



**Pulse Laser Deposition**

### Pulse Laser Deposition

**Target:** Patented special target holder greatly extends the lifetime of the target stage and guarantee precise positioning control.

**Heater:** Infrared laser heating solves the problem of easy breakage of resistance heater heating wires.

**Chamber:** Carefully designed chamber structure and layout allow users to produce high-quality epitaxial films even without the assistance of RHEED system



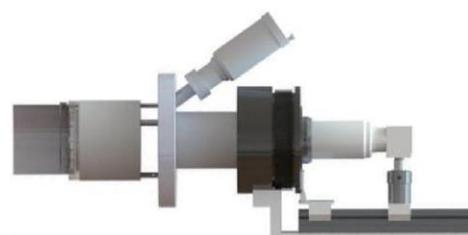
**Laser Molecular Beam Epitaxy**

### Laser Molecular Beam Epitaxy

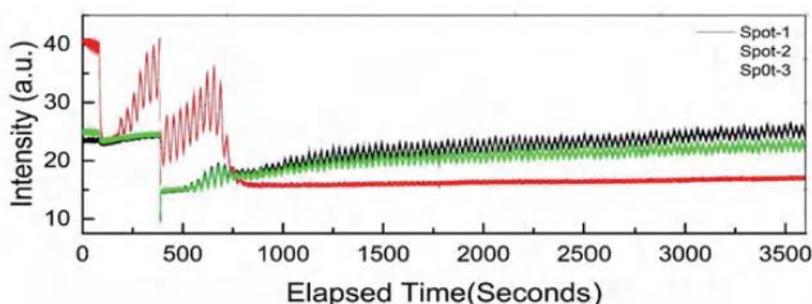
**Chamber:** UHV chamber, including an in-situ laser energy monitor, vacuum control and measurement system, sample stage with laser heating system, scanning target stage system.

**Load-lock:** Cylindrical vacuum chamber, including vacuum pump, ultra-high vacuum window, main chamber interconnection port, magnetic transfer rod, etc.

**Optional:** Torr-RHEED, High-throughput system



**RHEED System**



**Performance of the RHEED System**

# Semicon, Surface & Material Sciences



## Product Gallery



Laser Molecular Beam Epitaxy



Nano Pulse Laser Deposition



UHV-Magnetron Sputtering



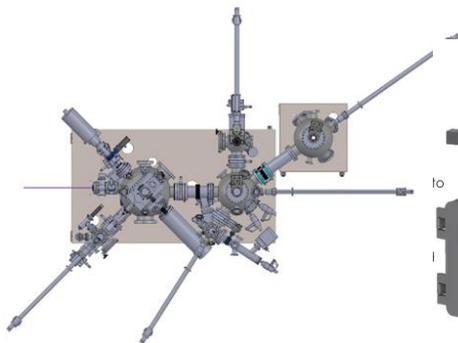
Pulse Laser Deposition



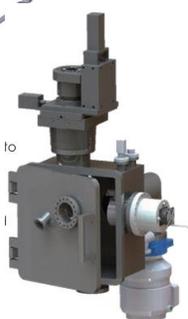
Molecular Beam Epitaxy



Desk Top Magnetic Sputtering



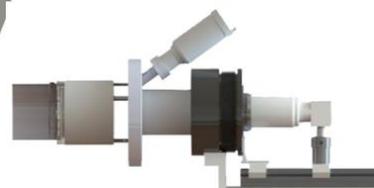
Chambers & magnetic rods interconnection



Ion Coating



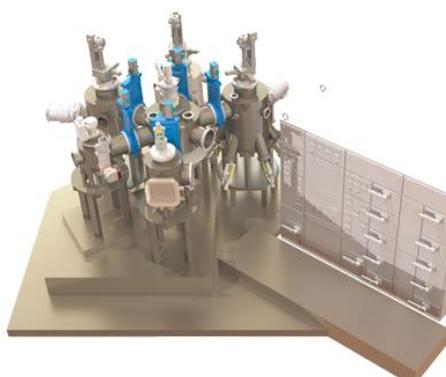
Standard CVD



RHEED System



Synchrotron Characterization (in-situ)



UHV Multi-chamber Interconnect System



Controllers: Turbo Pump, Laser Heater



Controllers: Stepper Motor, Solenoid Valve



Controllers: Temperature, Laser Actuator

# Semicon, Surface & Material Sciences

## SPCREATION - XAFS - China

XAFS mainly measures the absorption rate changes at and near the K/L absorption edge of elements. This is widely used to diagnose the local characteristics of materials, such as the valence state, coordination number, configuration and bond length of core atoms.

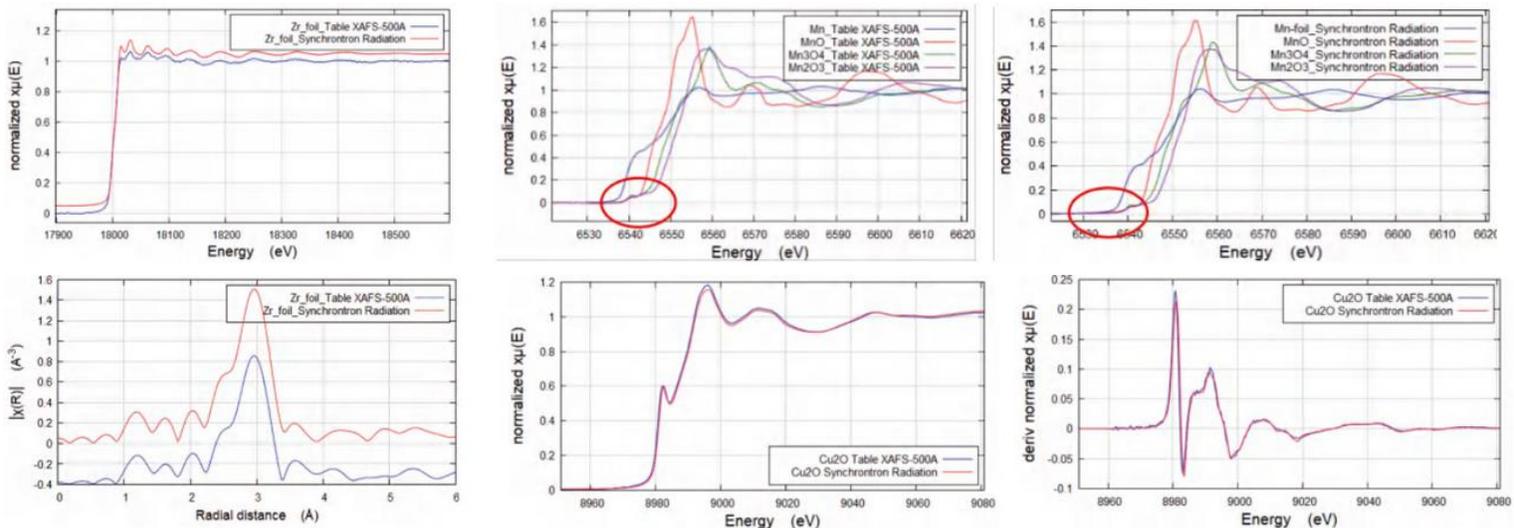
The spectrometer system adopts a Rowland circle structure and large-sized curved crystal components, and uses conventional X-ray sources to achieve spectral measurement of "Testable" XAFS freedom.



XAFS

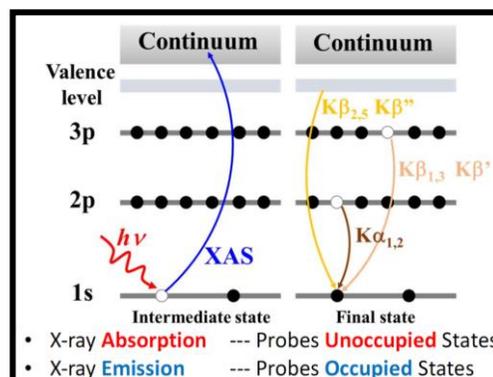
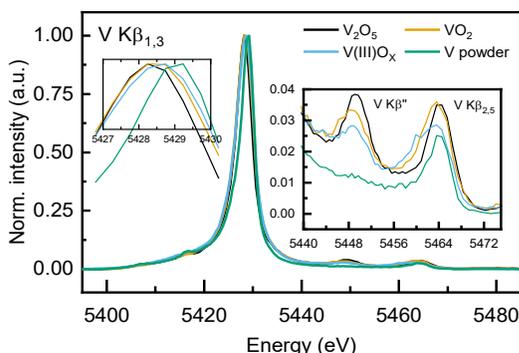
### Product Features

- Supports near-side quick scan function
- One-click automatic switching between different samples and different measurement modes
- Supports extended functions such as in-situ testing & XES
- Remote data transmission, real-time display of experimental status. Supports unattended testing
- Ergonomically engineered, convenient to operate
- Professional application and technical support including data analysis support
- Built-in patented software and preset experimental parameters to achieve fast measurement
- Instrument has radiation exemption qualifications and multiple safety protection interlocks to ensure Operation Safety.

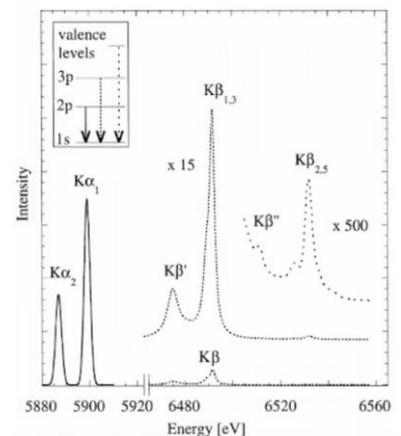


### XES Measurement Mode

XES comes from the fluorescence produced by orbital electron de-excitation. It is an important supplement to XAFS. XAFS + XES = absorbs the full orbital electronic structure information of atoms.



### MnF<sub>2</sub> XES



# Semicon, Surface & Material Sciences

## Products provided by XAFS



XAFS mainly measures the absorption rate changes at and near the K/L absorption edge of elements, and is widely used to diagnose the local characteristics of materials, such as the valence state, coordination number, configuration and bond length of core atoms.

This low-energy X-ray absorption spectrometer uses X-ray fluorescence spectroscopy (XRF) technology to excite fluorescence by irradiating X-rays onto the sample. It uses Johansson bent crystals to gather the fluorescence onto the detector, which can detect real-time spectra. At the same time, the bent crystals move linearly to change the Bragg angle at different positions to obtain the full energy spectrum.

A high-precision 2-D crystal orientation instrument uses the principle of X-ray diffraction (XRD) to invert the angle  $\Delta\theta$  between the local crystal surface and the mirror by measuring the Bragg angle change when the crystal rotates around the normal line to different azimuth angles, and achieves this through 2-D scanning. The depiction of the entire crystal plane  $\Delta\theta$  ultimately enables two-dimensional, crystal plane error detection.



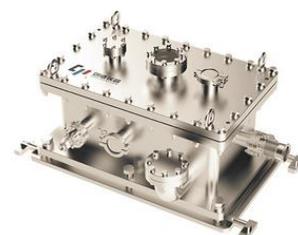
Electrochemical in-situ cell is designed for carrying out desktop XAFS experiments. It is mainly used in XAFS transmission mode. Equipped with Kapton film window, three-electrode design, and adjustable liquid layer thickness. It is equipped with an ion exchange membrane, it realizes the function of H-type electrode and compatible with strong acid/alkali electrolytes to carry out various experiments.

### In-situ sample cells

A high-temperature in-situ cell is designed for gas-solid in-situ XAFS experiments such as Fischer-Tropsch synthesis at high temperature. It is equipped with a heating resistor water cooling system and a control system to achieve a high temperature environment of up to 500°C.



This vacuum UV spectrophotometer uses a D<sub>2</sub> lamp source and have the light focused to the monochromator under vacuum. It uses dual PMT detectors to collect signals. Dedicated software is used to analyze the collected signals to measure the absorption spectrum and get sample characteristics.



### Vacuum UV spectrophotometer

### Extreme UV polarization detector

This polarization detection system uses the reflectivity and phase delay characteristics of extreme ultraviolet light of the film to accurately measure the polarization of the light source. Its core component is the analyzer. Energy information at different angles can be obtained by rotating the analyzer, and combined with theoretical analysis, information on the total intensity, long axis, and short axis of elliptically polarized light can be obtained.

## SAJ - Sputtering Device & Supercritical Fluid Dryer - China

This **Sputtering Device** is specially designed for SEM sample Preparation. Device comes with Au target (Pt, Cu are optional).

The **Supercritical Fluid Dryer** is specially designed for drying of delicate materials such as wafers (from 4" to 12"), MEMS or others.

Device is assembled in cleanroom environment.



Sputtering Device

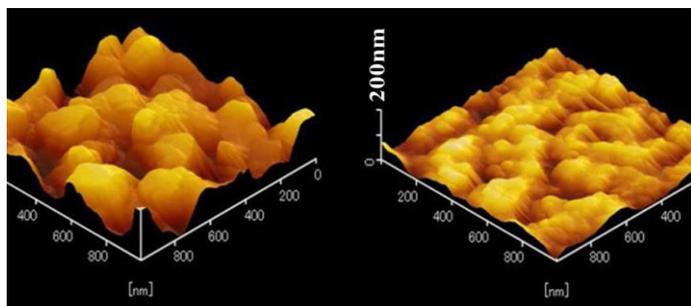


SF Dryer for Wafer & MEMS

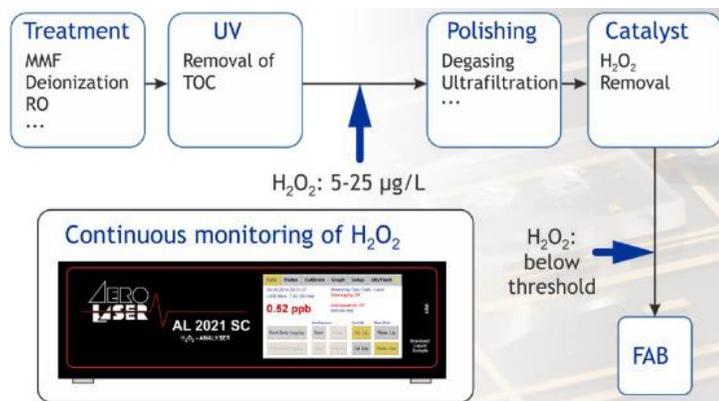
# Semicon, Surface & Material Sciences

## Aero Laser - H<sub>2</sub>O<sub>2</sub> Measurement for UPW - Germany

**Semiconductors:** As the semiconductor industry pushes the boundaries of miniaturization and efficiency, the purity of ultrapure water (UPW) used in production becomes increasingly critical. The AL2021 H<sub>2</sub>O<sub>2</sub> monitor ensures that the water used in the creation of semiconductors is free from H<sub>2</sub>O<sub>2</sub> residues, safeguarding the integrity of these microscopic marvels.



AFM images of a Cu-surface after rinsing with UPW containing H<sub>2</sub>O<sub>2</sub> (left) and without H<sub>2</sub>O<sub>2</sub> (right)  
D. Yano, et al., ECS Transactions, 58 (6) 151-158 (2013)



H<sub>2</sub>O<sub>2</sub> Monitor for UPW

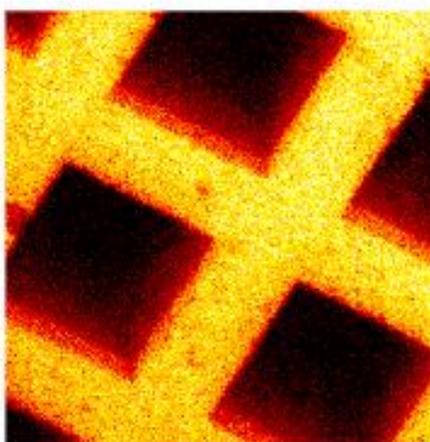
## Kore - TOF-SIMS - UK

Providing surface analysis with imaging and chemical mapping (with optional profiling too).

- Mass resolution >3000 m/δm
- Sensitivity > 1x10<sup>9</sup> atoms/cm<sup>2</sup>
- Spatial resolution ≤ 0.5 µm
- Affordable TOF-SIMS technology
- High sensitivity
- 25kV liquid metal ion gun

### Applications

- Surface Chemistry
- Microstructure surfaces
- Patterned devices (semiconductor, etc)
- Failure analysis at mm scale
- Surface contamination
- Trace analysis (ppm in surface)



Copper grid with 12.7µm repeat unit



Surfacer I

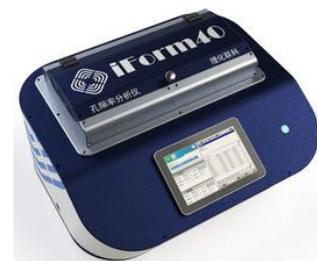
## PhysiChem - Gas & Vapor Absorption Instruments - China

Surface characterization technologies include:

- Physisorption Analyzer
- Chemisorption Analyzer
- Helium Pycnometer
- Capillary flow Porometer
- Porosity Analyzer
- Sample Preparation



Physical & Chemical Sorption



Helium Pycnometer

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