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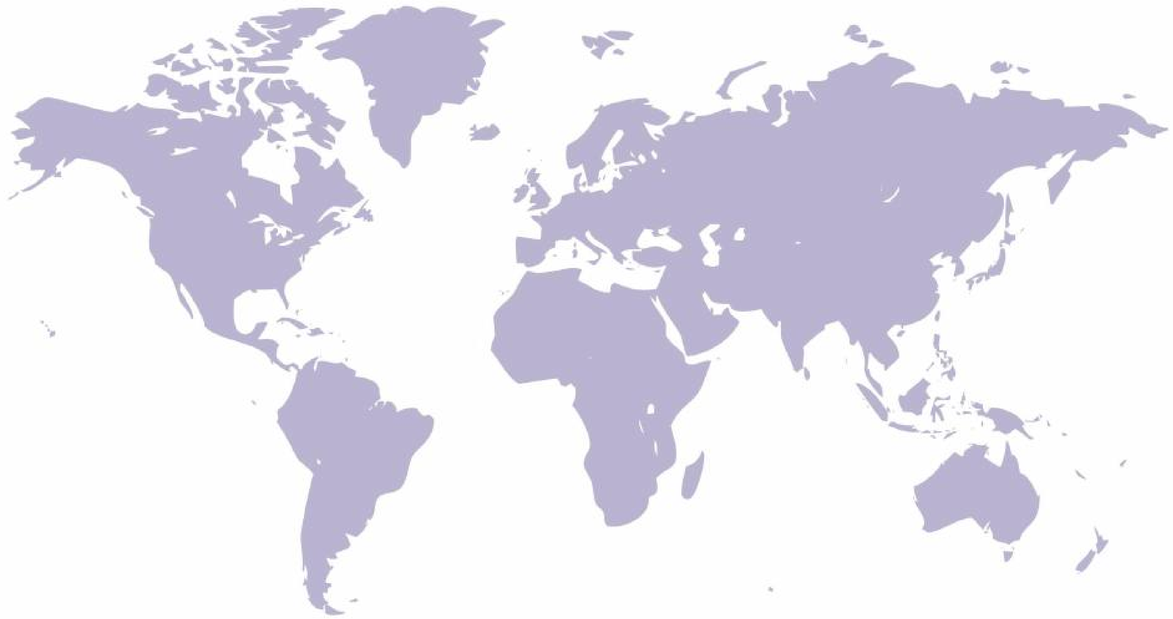
Hefei In-situ Technology.Co.,Ltd.



◆ Recent paper presentation of some clients

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DOI: 10.1002/adfm.202528280
DOI: 10.1002/adfm.202517862
DOI: 10.1016/j.cej.2025.170735
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DOI: 10.1002/adfm.202520271
DOI: 10.1002/adfm.202412730
DOI: 10.1021/acscatal.5c01411
DOI: 10.1002/anie.202503871
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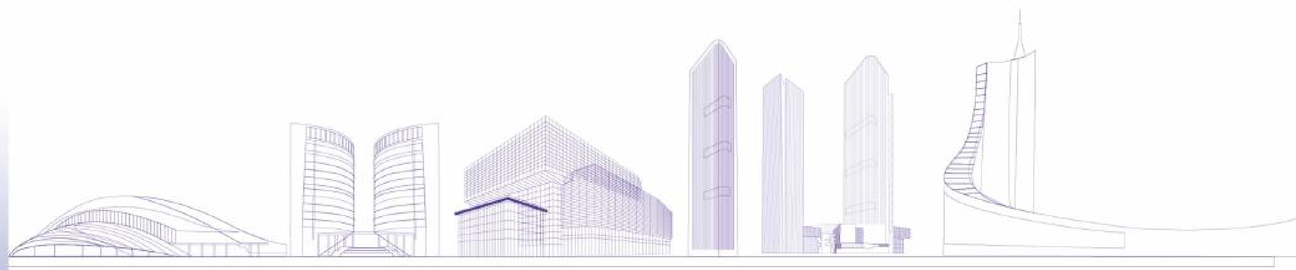


HeFei • China

ABOUT US

R&D
Production
Sales
After-Sales
Service

Founded in 2019, Hefei In-Situ Technology Co., Ltd. is a national high-tech enterprise dedicated to providing synthesis, characterization, and evaluation instruments and specialized equipment for clients in materials, chemical engineering, catalysis, energy, and scientific research industries. Headquartered in the Hefei Comprehensive National Science Center, the company has sales and technical support centers in Beijing and Chengdu, operates an in-house laboratory in Shenzhen, and maintains stationed sales personnel in multiple regions nationwide.

The company features four core product lines: in-situ characterization system solutions (including testing), Joule heating devices, catalyst evaluation devices, and battery fabrication platforms, meeting diverse customer requirements across R&D, lab-scale, and pilot-scale stages. Employing nearly 100 technical personnel, the company operates four laboratories and one dry room. The laboratories are equipped with advanced analytical instruments, including infrared spectrometers, Raman spectrometers, X-ray diffractometers, electrochemical differential mass spectrometers (DEMS), electrochemical workstations, gas chromatographs, dendrite microscopes, charge-discharge testers, and a complete suite of battery fabrication equipment.

Equipped with precision machining and inspection equipment—such as horizontal machining centers, vertical machining centers, gantry machining centers, CNC lathes, helium mass spectrometer leak detectors, and overhead cranes—the company provides high-efficiency, high-quality manufacturing services. Attuned to user demands and industry trends, the company adheres to a customer-centric philosophy, continuously innovating with cutting-edge technology to build a robust system across R&D, production, sales, and after-sales service.

The company is committed to becoming a world-class manufacturer of scientific instruments and specialized equipment, continuously creating value for customers across materials, chemical engineering, catalysis, energy, scientific research, and related fields.

TABLE OF CONTENTS

TEST SERIES

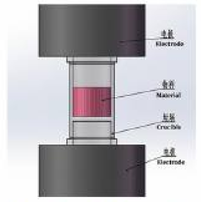
Category	Test Item	Test Details	Model
In-Situ Electrochemical Test	In-situ ATR Test	Battery, electrocatalysis, photocatalysis, thermal catalysis tests	IR Model: PerkinElmer Spectrum 3 / Thermo Nicolet iS50 Optical Accessory Model: Hefei In-Situ CIS-IRATROA-SD / PIKE VeeMAX 3
	In-situ Raman Test	Battery, electrocatalysis testing	Model: LabRAM HR Evolution Brand: HORIBA
	DEMS Test		Model: CIS-DEMS-DM Brand: Hefei In-Situ
	XRD Test		Model: SmartLab / DX-2700BH Brand: Rigaku / Dandong Dongda
In-Situ High Temp/Pressure Test	In-situ Diffuse Reflectance Test	Thermal catalysis, photocatalysis, photo-thermal catalysis, plasma, etc. testing	IR Model: PerkinElmer Spectrum 3 / Thermo Nicolet iS50 Accessory Model: Hefei In-Situ CIS-IRATROR-SD / Harrick Praying Mantis
	In-situ Raman Test	High-temperature, high-pressure testing	Model: LabRAM HR Evolution Brand: HORIBA
	XRD Test		Model: DX-2700BH Brand: Dandong Dongda
In-Situ Battery Test	Redefining Battery Test	Battery testing	IR Model: PerkinElmer Spectrum 3 / Thermo Nicolet iS50 Accessory Model: PIKE VeeMAX 3
	Battery Testing	Battery testing	Model: LabRAM HR Evolution Brand: HORIBA
	Lithium Battery In-Situ Test		Model: OPR-DM01 Brand: Hefei In-Situ
	High/Low Temp Lithium Battery In-Situ Test (-30–100°C)		
	Sodium Battery In-Situ Test		
	High/Low Temp Sodium Battery In-Situ Test (-30–100°C)		
	Zinc Battery In-Situ Test		
XPS Class	XPS (Within 5 Elements)	Cost, specific sample needs communication	Model: K-Alpha X-ray Photoelectron Spectrometer (XPS) System Brand: Thermo Scientific
	XPS (5 Elements or More)		
	NAP-XPS	Detectable elements include H, He and most light elements, detection depth less than 10 nm, sample element content requirement no less than 1%	Model: NAP-XPS Backfilling Brand: SPECS, Germany
		In-situ heating capability, temperature testing range: room temp–800°C	
		Various reaction atmospheres can be introduced according to experimental requirements. The working pressure is less than 1 mbar. It supports atmospheres including Ar, N_2, O_2, H_2, H_2O(g), CO_2, etc. Special gases or mixed gases require additional paid gas-ordering customization.	
		Equipped with high-energy ion gun, capable of cleaning and pre-treating sample surface	
		Equipped with xenophotonic light source for in-situ light-assisted XPS testing	
		Paid data processing service provided	
Fixed Bed Test (Thermal Catalysis Mode)	Catalytic Performance Evaluation	High-temp gas system below 600°C, high-temp liquid system at 1000°C, capable of gas-phase, liquid-phase, gas-liquid phase dual-phase reaction evaluation, catalyst loading volume 10 mL and below	
	Catalytic Stability Evaluation	Long-term stability testing under fixed reaction temperature/conditions, catalyst loading volume 10 mL and below	
Extreme Rapid Heating Reaction Test	Temp Ramp Reaction Evaluation (Heating rate up to 100℃/s)	Perform fast heating reaction tests within 400°C–1100°C temp range, catalyst load volume & technique require communication with technical team	

JOULE HEATING DEVICE SERIES

Continuous/high flux Joule heating material preparation platform

Product Introduction

The continuous/high-flux Joule heating material preparation platform combines the advantages of rapid heating, precise temperature control, and continuous production. It is suitable for material R&D and automated production, handling battery materials, magnetic materials, ceramics, metal compounds, two-dimensional materials, and especially materials requiring high-temperature heat treatment with large demand. Compared to traditional heat treatment equipment, its unique heating mechanism and rapid cooling characteristics offer superior energy efficiency. Meanwhile, its operating mode (small-batch, multi-channel, continuous) enables quick screening of target formulations to achieve rapid experimentation. It is widely used in the energy industry, materials & engineering, aerospace, chemical engineering, and other fields.



Heating Schematic

Specifications Table

Category	Item / Parameter	Specification
Model	Model	CIS-JHAM-M-2500-2
Main Components	Main Components	• Single-station glove box (N2 atmosphere) (Optional) • Automated heat treatment module • Electrical control system • Water chiller • Two-stage rotary vane vacuum pump • High-purity nitrogen cylinder
Basic Parameters (Heating System)	Total Equipment Power	Approx. 30 kW (Customizable)
	Heating Method	Graphite heating
	Flash Sintering Mode	Max temperature: 3000°C
	Thermal Holding Mode	Max temperature: 2500°C, Holding time: ⩽ 10s
	Fastest Heating Rate	⩽ 1000°C/s
	Temp Measurement Method	Infrared non-contact, Accuracy: ±1% FS
	Single Tube Batch Capacity	2 mL
	Single Batch Total Volume	2 tubes * 2 mL = 4 mL
	Processing Time	60s / batch (excluding heating)
	Cold-State Vacuum Degree	⩽ 10 Pa
	Vacuum Acquisition Method	Two-stage rotary vane vacuum pump
	Cooling Method	Water cooling
	Water & Oxygen Content	⩽ 100 PPM (Requires dehydration & deoxygenation purification system)
	Equipment Dimensions	L * W * H = 2400 * 1250 * 1500 mm
	Total Equipment Weight	Approx. 1500 kg
Operation & Control System	Operation & Control System	*(Parameters may vary slightly across batches and configurations; actual product shall prevail)* *• Uses PLC as core control, integrating automated execution and feedback for heating, vacuum, and auto-loading/unloading systems for coordinated, stable, and reliable operation.* *• System integrated on a touchscreen to display working conditions and set parameters (e.g., heating parameters, vacuum pressure).* *• Electrical control system features programmable miniature circuit breakers, reliable interlocking/lockout protection, and alarm functions.* *• Supports multiple parameter recipe settings for convenient thermal processing of various samples.* *• Automatic data upload and storage.*
Modular Customization	Modular Customization	Custom modules available per customer requirements, such as dosing, dispensing, mixing, heat treatment, and retrieval modules.

Product Features

●Improve Experiment Efficiency: Fully automated system integrating automatic loading/unloading, heating, vacuum, and glove box systems, significantly enhancing experimental efficiency and production capacity. Rapid screening technology greatly boosts research efficiency.

●Ensure Data Quality: Equipped with advanced real-time monitoring and feedback mechanisms throughout the experiment, allowing real-time parameter adjustments to ensure the accuracy and precision of results.

●Reduce Experimental Costs: Parallel processing across multiple workstations allows simultaneous processing of two samples per batch with precise control over heating atmosphere and heating/cooling rates, shortening experimental cycles while reducing labor and time costs.

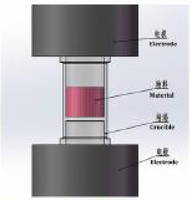
●Enhance Research Safety: Automated operation minimizes direct operator contact with hazardous environments, improving overall experimental safety.

●Promote Research Innovation: The continuous Joule heating device offers researchers more experimental opportunities and possibilities to rapidly explore new research directions and conditions.

The Youth Edition Mold-Type Ultra-Fast Joule Heat Heating and Tempering System (Manual Loading Type)

Product Introduction

The manual-feed mold high-efficiency heat treatment system integrates four core technologies: ultra-fast Joule heating, full-domain precise temperature control, multi-position mold bearing, and full-process real-time process monitoring. Equipped with an intelligent modular control system, it achieves multi-parameter linkage precise adjustment. The device features multi-position independent process configuration on a single tray, significantly enhancing flexibility and process adaptability. Combining high-throughput formula screening with standardized batch heat treatment capability, the system satisfies flexible testing needs in new material R&D while ensuring quality stability for batch high-temperature treatment. It fully covers scenarios from laboratory exploration to small-batch trial production, effectively shortening R&D cycles and lowering testing and development costs. Operating with stability and wide process applicability, it is widely used in cutting-edge research and industrial production fields including new energy storage, advanced materials, aerospace materials, optoelectronic semiconductors, fine chemicals, energy efficiency, and environmental protection.



Heating Schematic

Specifications Table

Parameter	Specification
Model	JHAM-M-RD20-HM
Tray Batch Processing Capacity	20 pcs / tray
Heating Method	Crucible heating
Single Crucible Capacity	1.0 mL (Effective constant temperature zone)
Maximum Temperature	3000°C
Heating Rate	⩽ 1000°C/s
Temperature Control Accuracy	±1°C
Temp Measurement Range	600 ~ 3200°C
Heating Mode	Temperature-controlled, constant current, multi-stage slope
Multi-Recipe Mode	Independent process configurable for the same batch
Heating Power Supply	380V (Three-phase) 25 kW (Peak)
Cooling Method	Water cooling
Vacuum Acquisition Method	Two-stage rotary vane vacuum pump
Vacuum Degree	⩽ 1 Pa (Cold state)
Atmosphere Environment	Supports Vacuum, H2, Ar
Intelligent Safety System	Comprehensive alarm system for overpressure, overtemperature, temp difference, water temp, gas pressure; Automatic pressure adjustment system; Tray vacancy intelligent detection system

Exploration Edition Mold-Type Ultrafast Joule Heating Heat Treatment System (Semi-Automatic Feeding)

Products Introduction

Equipped with a dual-channel independent synchronous heating architecture, the Exploration Edition Mold-Type Ultrafast Joule Heating Heat Treatment System integrates ultrafast Joule heating, precision constant-temperature control, and an intelligent modular control system to enable precise multi-parameter linked adjustment. The system can process 32 molds in a single batch with dual-channel parallel operation, allowing differentiated process settings—such as temperature and duration—for individual molds to adapt to various R&D conditions for advanced materials. Featuring a continuous tray loop conveyor mechanism, the equipment eliminates the need for manual loading/unloading, automatically completing the entire heating process based on preset parameters to achieve unmanned continuous operation.

Leveraging dual-channel parallel heating and fully automated continuous loop operation, the system balances high-throughput recipe screening with standardized batch heat treatment capabilities. It supports simultaneous comparative experiments for rapid iteration and optimization of process formulas during R&D debugging, while also delivering reliable batch heat treatment that ensures process and quality consistency—covering scenarios from process exploration and parameter verification to small-batch trial production.

Specifications Table

Parameter	Specification
Model	JHAM-M-RD32-SA
Tray Batch Processing Capacity	32 pcs/tray
Heating Channels	2 sets
Number of Trays	3 sets
Sample Loading Method	Continuous automated loading/unloading via tray loop conveyor
Heating Method	Crucible heating
Single Crucible Capacity	1.0 mL (effective constant temperature zone)
Maximum Temperature	3000 °C
Heating Rate	⩽ 1000 °C/s
Temperature Control Accuracy	±1 °C
Temperature Measurement Range	600–3200 °C
Heating Modes	Temperature-controlled, constant-current, multi-segment ramp
Multi-Recipe Mode	Process parameters can be individually set for the same batch
Heating Power Supply	380V (three-phase), 50 kW (peak)
Cooling Method	Water cooling
Vacuum Generation	Two-stage rotary vane vacuum pump
Vacuum Level	⩽ 1 Pa (cold state)
Atmosphere Environment	Supports vacuum, argon (Ar), and nitrogen (N_2)
Intelligent Safety System	Comprehensive alarm system for overpressure, overtemperature, temperature difference, water temperature, gas pressure, etc.; automatic pressure adjustment system; intelligent empty slot detection system for trays

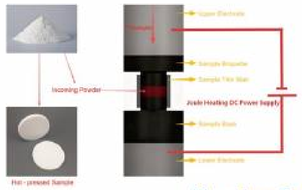
Hot pressing Joule apparatus

Product Introduction

Model :CIS-JHP-1030

Model :CIS-JHP-2050

Ultra-fast high-temperature hot-pressing sintering: Combining rapid heating (⩽ 2000°C/min) with high pressure (⩽ 10 T), it significantly shortens sintering time and ensures stronger bonding between powder particles, thereby fabricating materials with ultra-high density.



Heating Schematic

Specifications Table

Model	CIS-JHP-1030	CIS-JHP-2050
Electrical specification	380V 72KW,50/60HZ (Customizable)	
Overall size (mm) Width*Height*Depth	1600×2000×750	Electrical control cabinet 800×1920×1600 Cavity mounting frame 1000×2100×1200
Sample diameter	10mm，20mm，30mm	20m，50mm (Customizable)
Sample thickness	5-20mm	
Cavity size (mm) Width*Height*Depth	310×360×300	340×440×370
Temperature range	The maximum temperature of the mold shall not be lower than 2500°C	
Pressure range	3T	10T
Temperature control accuracy	±2°C	
Pressure control accuracy	±5kg	±20kg
The fastest controllable heating rate	⩽1400°C/min	⩽1000°C/min
System leakage rate	⩽5E-9 (He)	
Ultimate positive pressure of the cavity	0.02Mpa	
Electrode insulation resistance (with water)	⩾1MΩ	
Vacuum pump	VRD-24	VRD-30
Operating ambient temperature	⩽45°C	
Cooling method of the sample stage	Air-cooled (optional for normal-temperature inert gas/cold argon purging circulation)	
Chamber cooling method	Water cooling (requires a chiller)	
Chiller	Standard configuration	
Temperature measurement probe	The temperature measurement range is 600-3200°C, with an accuracy of ±1%FS	
Materials of vacuum chambers and structural components	SUS304	
Mold material	Graphite	
Observation window	Quartz window (sapphire and other lenses are optional)	
Safety function	It features multiple alarm functions such as over-temperature, over-pressure, over-limit and leakage alarm, as well as multiple protection functions including no water protection and load discharge protection, to ensure the safety of equipment and personnel	
Real-time monitoring	Multi-channel pressure detection achieves precise closed-loop control of mold pressure and temperature, improving the experimental effect	
Automated operation	One-click start, fully automated flow control throughout the process	
Operation mode	HMI touch screen operation, centralized data collection and processing	
Shell structure	Sheet metal type	
Gas line specification	2 intake channels,1 exhaust channel,1 vacuum channel, and 1 safety unloading channel (Other intake requirements can be customized)	

Application Fields

●Ceramic Manufacturing: Ultra-fast high-temperature hot-pressing sintering can prepare high-performance ceramics such as alumina and zirconia ceramics for high-temperature applications like furnace liners and heat exchangers.

●Solid-State Batteries: In the fabrication of solid-state battery electrolytes and electrode materials, ultra-fast high-temperature hot-pressing sintering achieves higher conductivity and stability.

●3D Printing Materials: Used to synthesize 3D printing materials, providing faster printing speeds and higher print quality.

●Metals and Composite Materials: Can also be applied to metal and composite material fabrication to enhance overall performance and wear resistance.

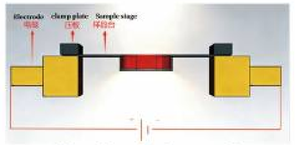
Joule Heating Device

Product Introduction

The Joule heating device is a novel ultra-fast heat treatment/synthesis equipment that allows materials to reach extremely high temperatures (1000–3000°C) within an ultra-short timeframe (milliseconds to seconds), with heating rates up to 10,000 K/s. By rapidly raising the material's temperature, it enables the investigation of physical property changes in extreme environments, as well as the fabrication of nanoscale particles, single-atom catalysts, high-entropy alloys, etc., via ultra-fast heating and cooling cycles. Currently, it is widely used in battery materials, catalysts, carbon nanomaterials, metallic materials, plastic degradation, biomass, and other fields.

Professional Edition

Flagship Edition



Heating Schematic

Specifications Table

Feature / Specification	Flagship Edition	Professional Edition
Model	CIS-JH-V4.0.0	CIS-JH-V3.5.0-Exp
Power Supply	Three-phase 380V / 40A	Three-phase 380V / 50A
Output Voltage	0–40 V	0–60 V
Output Current	0–500 A	0–1000 A
Current Trigger Time	2 ms	20 ms
Min Pulse Width Setting	1 ms	—
Pulse Count Setting	15 s	—
Data Acquisition Period	5 ms	5 ms
Data Communication	RS485 + Ethernet + USB	RS485 + Ethernet + USB
Data Acquisition Mode	Touchscreen + PC	Touchscreen + PC
Control Mode	Touchscreen + Software	Touchscreen
Data Acquisition Content	Real-time Temperature, Real-time Voltage, Real-time Current	Real-time Temperature, Real-time Voltage, Real-time Current
Fixture Electrode	Fixed type	Adjustable gap
Max Temperature	3000°C *(Varies by sample features, short-circuit, and special properties)*	3000°C *(Varies by sample features, short-circuit, and special properties)*
Long-Term Thermal Holding	Long-term within 2000°C *(Taking 100 × 20 × 1 mm rectangular graphite strip as example)*	Long-term within 2000°C *(Taking 100 × 20 × 1 mm rectangular graphite strip as example)*
Control Modes	Gradient thermal holding (2000°C, 18h), constant-flow program control (no step extreme cooling/surge needed), G-value temp control slope mode (expandable), temp thermal	Constant temp, current control, slope mode, manual, thermal shock, fast mode
Temperature Measurement Method	Infrared pyrometer	Infrared pyrometer
Temperature Measurement Range	250–2000°C / 700–3200°C / 550–3000°C (Imported)	250–2000°C / 700–3200°C
Power Supply Cooling Method	Water cooling	Water cooling
Vacuum Chamber	304 Stainless steel. Square. Φ16 mm optical window, sapphire/quartz, volume approx. 400 mL, water-cooled chamber	304 Stainless steel. Square. Φ16 mm optical window, sapphire/quartz, volume approx. 400–800 mL
Gas Configuration	1 inlet, 1 high-vac, 1 vacuum, 1 exhaust	2 inlets, 1 vacuum, 1 exhaust
Vacuum Degree	Standard Value VRD-8, vacuum pumping controlled via touchscreen	Standard Value VRD-8, vacuum pumping controlled via touchscreen
Standard Sample Stage Material	Flexible graphite paper, graphite plate, graphite felt, graphite boat, etc. *(Other sample types optional)*	Graphite plate, graphite felt, graphite boat, graphite tube
Sample Size (Customizable)	⩽ 100 mm × 15 mm × 0.2 mm	⩽ 100 mm × 20 mm × 1 mm
Sample Test Weight	500 mg (Specific gravity 1)	500 mg
Overall Dimensions	Approx. 750 × 610 × 660 mm *(Subject to actual product)*	Approx. 1160 × 850 × 610 mm *(Subject to actual product)*
Optional Extras	Collimated defect isolation / thermal degradation	—

Key Features

●High-Precision Temperature Measurement & Control

●High-Response Curve Tracking

●High-Repeatability Thermal Shock

●Rich & Practical Sample Options

●Long-Term Insulation & Energy Saving

●Water-Electricity Separation for Equipment Safety

●Multiple Alarms for Personnel Safety

Accessories Introduction

Online Infrared Pyrometer (Jointly developed with pyrometer manufacturer):

●Laser points to measurement location; standard focus lens focuses down to min. 2 mm;

●Rugged sensor head meets IP65 (NEMA4) standards;

●LED temperature display, field emissivity adjustment, optional 4–20 mA and digital outputs;

●Response time: 0.5 ms;

●Measurement accuracy: ±1% or ±2°C (whichever is greater);

●Repeatability: ±0.5% or ±1°C (whichever is greater);

●Multiple temp ranges optional: 100–1400°C, 250–2000°C, 700–3200°C.

Optris CT 1M/2M High-Temperature Pyrometer :

●Temperature range: 550–3000°C;

●Spectral range: 1.0 µm (1M); 1.6 µm (2M);

●Response time: 1 ms.00°C.

JH Series Accessory:

●Name: JH Series Accessory;

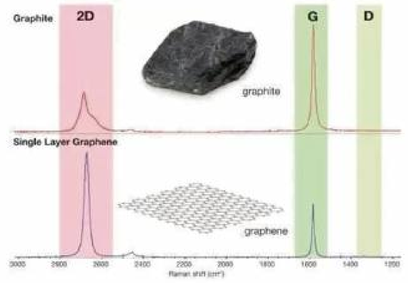
●Model: JHex-001;

●Purpose: Provides a compact vacuum environment with heating functionality;

●Application: Used for sample transfer and testing in clean environments such as glove boxes.

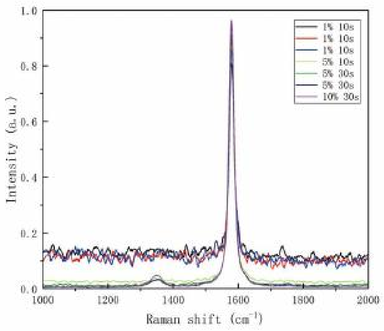
Application Case - Analysis of Graphene Results from Flash Flash-Speed Carbon Flash Sintering

The figure below shows a comparison of Raman spectra between graphite and graphene, which allows determination of whether the material is graphene based on the key 2D peak.



(Raman spectra graph comparing Graphite and Single Layer Graphene showing D, G, and 2D peaks)

Our Experimental Results are as Follows (3000K Preparation)



(Raman intensity vs. Raman shift graph showing spectra for 1% 10s, 1% 18s, 1% 100s, 5% 10s, 5% 30s, 5% 100s, 10% 30s)

Like the D peak, the 2D peak is also a Raman active mode, possessing a resonant structure. Therefore, the position and spectral line shape of the 2D peak change with excitation wavelength. In addition, for single-layer graphene, the 2D peak is a single symmetric peak. Single-layer graphene can be distinguished by the line shape of the 2D peak. At the same time, the ratio of the integrated intensity of the D peak (defect peak) to the G peak (ID/IG) serves as a parameter to measure the defect density of graphene.

Fewer D peaks indicate fewer defects. For graphene layer counts, 2D/G = 1 indicates bilayer, less than 1 indicates multilayer, and greater than 1 indicates monolayer.

Application Case - Science! Zhejiang University Team (Gao Chao / Liu Yingjun / Xu Zhen) Develops Aerogels with Ultrahigh-Temperature Superelasticity Below Extreme Temperatures, Breaking New Limits!

The Zhejiang University team developed an innovative 2D-domain-confined chemical strategy, constructing an ultralight aerogel with a "dome-celled" structure. This aerogel exhibits excellent elasticity over an ultra-wide temperature range (4.2 K to 2273 K), as well as extremely high thermal stability and fatigue resistance, demonstrating immense application potential for structural materials under extreme thermal environments.


Science

Dome-celled aerogels with ultrahigh-temperature superelasticity over 2273 K

The relevant research result titled "Dome-celled aerogels with ultrahigh-temperature superelasticity over 2273 K" was published in the internationally renowned journal Science.

Customer Papers (Partial)

- DOI: 10.1126/science.adw5777
- DOI: 10.1002/adfm.75876
- DOI: 10.1039/D6EE01390B
- DOI: 10.1002/anie.1688371
- DOI: 10.1016/j.jcis.2026.140490
- DOI: 10.1021/acsaem.5c04140
- DOI: 10.1016/j.matt.2026.102727
- DOI: 10.1002/anie.2299436
- DOI: 10.1016/j.ensm.2026.104984
- DOI: 10.1016/j.matt.2025.102566
- DOI: 10.1016/j.nanoen.2026.111745
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- DOI: 10.1016/j.cej.2026.172716
- DOI: 10.1002/aic.70139
- DOI: 10.1021/acscatal.5c08597
- DOI: 10.1039/D5QI02294K
- DOI: 10.1039/D5CC06085K
- DOI: 10.1016/j.jechem.2025.11.047
- DOI: 10.1002/adfm.202528280
- DOI: 10.1002/adfm.202517862
- DOI: 10.1016/j.cej.2025.170735
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- DOI: 10.1016/j.cej.2026.172857
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- DOI: 10.1016/j.matt.2025.102322
- DOI: 10.1016/j.apcatb.2025.125720
- DOI: 10.1016/j.nanoen.2025.110843
- DOI: 10.1016/j.jechem.2025.07.018
- DOI: 10.1021/jacs.5c05372
- DOI: 10.1021/acssuschemeng.4c10443
- DOI: 10.1002/adma.202506936
- DOI: 10.1002/adfm.202506415
- DOI: 10.1039/d5ee01691f
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- DOI: 10.1021/acscatal.4c06833
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- DOI: 10.1016/j.apcatb.2024.124976
- DOI: 10.1002/anie.202504084
- DOI: 10.1002/adfm.202420933
- DOI: 10.1002/adfm.202425156
- DOI: 10.10007/s40242-025-5010-3
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- DOI: 10.1038/s41467-025-56975-8
- DOI: 10.1021/jacs.3c07541
- DOI: 10.1016/j.cej.2025.160387
- DOI: 10.1007/s12598-024-03066-0
- DOI: 10.1021/acsanm.4c06192
- DOI: 10.1002/anie.202425257
- DOI: 10.1021/acsmaterialslett.4c02448
- DOI: 10.1039/D4EE04941A

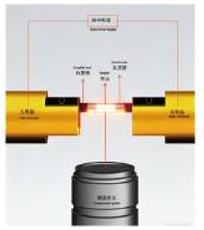
Flash Joule Heating Device

Product Introduction

The Flash Joule heating device adopts an innovative pulse rapid discharge mode to rapidly heat and cool experimental samples, enabling controllable temperature rise and fall. It is widely used for instantaneous high-temperature sintering of powdered and sheet-like new materials, and can heat samples under vacuum, non-vacuum, or atmospheric gas conditions. It accurately collects peak voltage, peak current, peak resistance, and other data during heating, while supporting manual discharge voltage and automatic discharge voltage modes to maximize voltage control precision. It achieves high heating rate repeatability, small temperature difference, fast speed, and low fluctuation.

The equipment is simple to assemble and safe to operate. The transparent body allows effective observation of temperature rise changes. It supports up to -0.1 MPa vacuum environment and permits flowing gases. The heating curve is displayed, and voltage parameters are controlled.

Product Features


Heating Schematic

- Ultra-Fast Pulse: Rapid heating within 40 ms, rapid cooling within 600 ms;
- Full-Environment Compatibility: Operates stably under vacuum, atmospheric, and positive pressure environments;
- High Process Repeatability: Intelligent temperature control with temperature variance ⩽ ±100°C; supports manual/automatic modes;
- Real-time Data Monitoring: Precise collection and real-time display of voltage, current, resistance, and heating curves;
- Safe & Intuitive Operation: Adjustable quartz body gap for transparent, visible observation of the sample's heating process; supports flowing gas and vacuum environments.

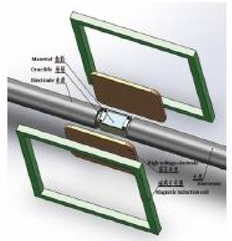
Specifications Table

Feature / Parameter	Specification
Model	CIS-JH-CDI-V1.0.0
Power Supply	AC220V 3kW, Three-hole socket
Output Voltage	20–400 V
Capacitance	Expandable capacity according to needs
Data Acquisition Speed	1 ms
Data Acquisition Method	Touchscreen + PC
Data Control Method	Touchscreen
Data Acquisition Content	Time, Maximum Temperature, Peak Current, Peak Voltage
Resistance	0.8–1.5 Ω
Inrush Current	Adjustable
Maximum Temperature	3200°C
Power Source	Air-cooled pulse power supply
Temperature Measurement Method	Monochromatic pyrometer
Temp Measurement Range	700–3200°C
Probe Cooling Method	Air cooling
Vacuum Degree	Quartz tube controllable vacuum body
Gas Device	1 inlet, 1 vacuum, 1 exhaust
Water Line Device	One inlet and one outlet (Optional)
Sample Stage Material	Φ5 inner diameter graphite tube
Sample Size	⩽ 2 * 60 * 2 mm
Sample Test Weight	80 mg
Pulse Duration	⩽ 40 ms

Outfield-assisted Joule Heating / Self-propagating Material Preparation Platform

Product Introduction

The outfield-assisted Joule heating material preparation platform provides external field heating environments for material thermal processing. By controlling the external field strength, it assists in material synthesis and control; thermal processing methods include Joule heating, combustion synthesis, etc. The whole machine is designed modularly with a high degree of automated control; it consists of the reaction body, electrical control system, external magnetic field coils, and water cooling system.



Heating Schematic

Specifications Table

Category / Mode	Parameter	Specification
Model	Model	CIS-SHS-JH1.0
System Composition	System Composition	Reaction chamber, external magnetic field coil, electrical control system, water chiller
Flash Mode	Temperature Range	⩽ 3000°C
Joule Heating	Max Heating Rate	⩽ 500°C/s
	Temp Holding & Accuracy	2500°C holding time ⩽ 1 min, temperature control accuracy: ±1°C
	Temp Measurement Method	Infrared non-contact, Accuracy: ±1% FS
	Cold-State Vacuum Degree	⩽ 10 Pa
	Atmosphere Environment	Air, Vacuum (Automatic purging, vacuuming, gas filling)
	Graphite Crucible Size	48 * 20 * 10 mm; Capacity: 2 mL
	Note	*(Parameters across batches may vary slightly; actual product shall prevail)*
Combustion Synthesis	Thermite Mode	Work Method: Ignites the top of the sample to reach ignition temperature, and the sample undergoes an overall thermite reaction.
		Sample Nature: Solid block/pellet
		Graphite Crucible Size: 48 * 20 * 20 mm (with cover); Capacity: 7.5 mL
	Self-Propagating Mode	Work Method: Ignites the top or side of the sample, auto-ignites to form a self-propagating reaction.
		Sample Nature: Solid block/pellet
		Graphite Crucible Size: 48 * 20 * 20 mm (without cover); Capacity: 7.5 mL
Quenching Function	Quenching Function	After various synthesis modes complete, the graphite crucible quickly and automatically drops into the water basin inside the chamber for rapid water-quenching treatment.
Operation & Control System	Operation & Control System	Uses PLC as core control, with integrated touchscreen setting parameters for automated execution and feedback control. The control system is simple, stable, and reliable.
		Standard data recording available; Quenching function optional; Deep customization supported.

Discharge plasma Joule heating device

Product Introduction

The discharge plasma Joule heating device replaces the chamber of a standard Joule heating device with a plasma reactor, and adds a plasma generator. This equipment meets normal Joule heating requirements while also operating as a plasma reactor with plasma generated inside the reaction chamber. It can form different plasma atmospheres using air, Ar, N2, low-concentration H2 mixtures, and other mixed gases. The device can reach a maximum temperature of 3000°C.

Specifications Table

Item / Parameter	Specification
Model	CIS-JH4.0-LCP
Overall Dimensions (W * D * H)	710 mm * 610 mm * 650 mm
Main Unit Weight	125 kg
Sheet Metal Material	Q235B
Vacuum Chamber Material	SUS304 / Hastelloy C276, etc.
Power Supply Specs	Three-phase five-wire 380V ± 10% 50Hz
DC Power Output Specs	40V 500A
Plasma Power Output Specs	0–30 kV, 0–500 W
Frequency Range	5 kHz – 20 kHz
Center Frequency	Approx. 10 kHz
Discharge Gap	8 mm

Plasma Torch Ablation Platform

Product Introduction

The plasma torch ablation platform provides specialized thermal processing working conditions for samples. Featuring a plasma power supply and plasma torch as core heat sources, it ionizes working gas through arc discharge to produce a high-temperature plasma jet, simulating high-temperature and high-velocity environments on extreme surfaces. It is equipped with a precise temperature measurement system for real-time temperature monitoring and closed-loop control, reserving vacuum and gas interface ports for controllable experimental environments. Integrating a linear motion mechanism, it flexibly adjusts the distance between the torch and specimen, matching different specimen fixtures. Meanwhile, it supports user-defined process parameters, freely setting temperature, pressure, time, heating rate, and other indicators to satisfy various plasma ablation thermal processing test demands. It is widely used in aerospace, defense & military, materials preparation, chemical engineering, solid waste treatment, and other fields.

Heating Schematic

Specifications Table

Parameter	Specification
Model	CIS-LTHP-15-N2Air
Overall Dimensions	900 mm * 700 mm * 1500 mm (Excluding water cooling / power supply)
Vacuum Chamber Material	304 Stainless Steel
Power Supply Spec	Three-phase 380V 30 kW
Maximum Temperature	3300°C *(Varies by sample features / short circuit / special properties)*
Vacuum Pump	VRD-24
Temp Measurement Method	Infrared pyrometer
Temp Measurement Range	800–4000°C (±1% FS)
Mold Size	Φ30 * 10 mm (Customizable)
Full Load Pulse Voltage	200V
Max Output Current	80A (Continuously adjustable)
Max Output Power	22 kW
Frequency Stability	1%
Output Power Precision	1%
Max Open Circuit Voltage	500V
Operating Efficiency	⩾ 93% (Full load)
Operating Temperature	1°C – 40°C
Cooling Method	Water cooling
Ignition Voltage	6–8 kV
Ignition Arc Gap	Air / N2 approx. 3 mm
Gas Flow Rate	2–4 m³/h (Air / N2 gas)
Operating Mode	Non-transferred arc / Transferred arc
Torch Nozzle Outlet Water Temp	⩽ 35°C
Torch Anode Outlet Water Temp	⩽ 40°C
Torch Cooling Water Flow Rate	⩾ 1.0 m³/h
Water Quality Requirement	Deionized water
Torch Electrode Life	> 300 h
Torch Nozzle Life	⩾ 500 h (In air atmosphere)

Insulated Joule heating device / Ultra-high temperature furnace

Product Introduction

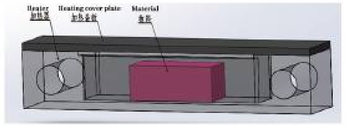
The insulated Joule heating device is an energy-saving heating device featuring rapid heating and long temperature-holding functions. It provides extended temperature holding times, precise temperature control, and large single-batch capacity. The equipment has a fully sealed stainless steel heating body, with a dual-layer integrated structure featuring internal water cooling. It comes standard with a water-chilled power supply to guarantee reliable heating performance. The system supports vacuum atmospheres, inert gas protection atmospheres, and low-concentration hydrogen atmospheres to meet diverse testing requirements.

Upgrade & Expansion Options:

1.Supports adding Joule heating modules (dual-control shared power supply, water cooling, vacuum, etc.);

2.Standard gas rotameter upgradable to digital mass flow controller & meter;

3.Temperature measurement upgradable to an infrared pyrometer, with support for infrared thermal imagers.

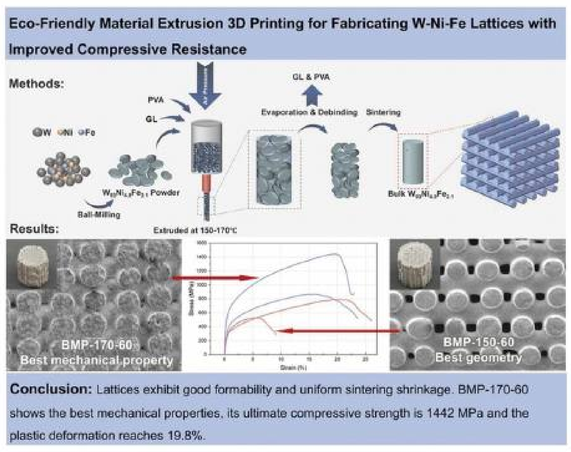


Heating Schematic

Specifications Table

Item / Feature	Specification
Model	CIS-JHMM-2505
Highest Temperature of Crucible Sample (Graphite)	2500°C (Vacuum environment, holding 30 min; Nitrogen atmosphere, holding ≤ 100 h); Heating temperature 2400°C (Vacuum environment, holding 5 h)
Total Equipment Power	64 kW (Including heating equipment 54 kW, vacuum pump 1.1 kW, water chiller 8.9 kW)
Power Supply	AC 380V 50Hz
Sample Capacity	50 mL
Heating Rate	≤ 40°C/s
Measurement Method	Infrared pyrometer
Temperature Control Precision	±2°C
Gas Line Paths for Temp Control	Two inlet gas lines, one outlet gas line, one true vacuum port
Cooling Method	Temp controller & power supply use water cooling, heater uses natural heat dissipation
Equipment Dimensions (D * W * H)	1200 mm * 1110 mm * 1850 mm *(Subject to actual product)*

Application Case - Eco-Friendly Material Extrusion 3D Printing for Fabricating W-Ni-Fe Lattices with Improved Compressive Resistance



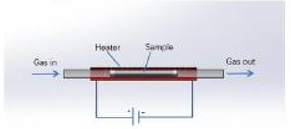
The Advanced Refractory Metal Materials Research Center of Northeastern University used direct ink writing technology to prepare tungsten alloy porous materials. Through 3D printing parameter adjustment and optimization of the sintering process, tungsten alloy porous frameworks with excellent mechanical properties were obtained. The related paper titled "Eco-friendly material extrusion 3D printing for fabricating W-Ni-Fe lattices with improved compressive resistance" was published in Additive Manufacturing, a top international journal in the additive manufacturing field.

DOI: 10.1016/j.addma.2024.104399

Rapid heating furnace / Joule heat pipe furnace

Product Introduction

The Joule rapid heating furnace is a new type of high-efficiency laboratory heat treatment equipment. This equipment provides ample sample capacity and a large constant-temperature heating zone with expandable special gas environments. It features clean, energy-saving, and stable operation, while its heating rate can reach tens of thousands of times that of ordinary tube furnaces. Paired with a unique liquid nitrogen cooling system, it enables rapid cooling of the heating environment. Rapid heating and cooling assist significantly in evaluating sample thermal shock resistance, shrinking thermal decomposition magnet length, and reducing catalyst deactivation. Therefore, it is widely used in new material preparation, plastic pyrolysis, biomass, and other fields.



Heating Schematic

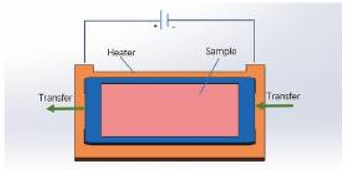
Specifications Table

Item / Feature	Specification	
Model	CIS-JHTF-1220	CIS-JHTF-2005
Design Temperature	1200°C	Graphite tube 1200°C, Quartz tube 1700°C, Alumina tube (Corundum) 2000°C
Max Heating Rate	40°C/s	Graphite tube 150°C/s (customizable higher), Quartz tube (Corundum) 60°C/s, Drop temp 1°C/s
Electrical Grid Specs	380V 60KW, 50/60Hz Compatibility	380V 60KW, 50/60Hz Compatibility
Reaction Tube Material	Quartz tube	Quartz tube / Corundum tube / Alumina tube / Steel tube
Vacuum & Atmosphere Environment	Vacuum, positive pressure	Vacuum, positive pressure
Max Sample Processing Volume	200 mL	50 mL
Measurement Method	Infrared non-contact, Accuracy: ±1% FS	Infrared non-contact, Accuracy: ±1% FS
Auxiliary Cooling System	—	Optional liquid nitrogen cooling system for rapid cooling
Overall Dimensions (L * W * H)	1300 mm * 800 mm * 1900 mm *(Subject to actual product)*	1000 mm * 800 mm * 1900 mm *(Subject to actual product)*
Others	Standard with water chiller, vacuum pump	Standard with water chiller, vacuum pump

High temperature plate furnace

Product Introduction

The plate furnace is a widely used high-temperature heat treatment furnace suitable for processing powder, sheet, and block samples. It provides a large-area constant temperature zone and high target temperatures for large-throughput, long-duration high-temperature thermal processing. Featuring a unique rectangular heating zone and graphite mold design, it offers high thermal field uniformity and long service life, remaining stable during long-term high-temperature operation. The water-cooled sealed chamber provides a vacuum or inert gas atmosphere environment, and can pair with a circulating feeding/discharging system to achieve automated continuous operation.



Heating Schematic

Product Introduction

●Large Capacity Processing: Large-size heating zone for efficient processing of large-sized or high-batch samples to meet scaling needs;

●Stable High-Temperature Operation: Supports 2500°C high-temperature conditions with stable operation for no less than 100h, offering reliable performance;

●High-Uniformity Thermal Field: Heating zone temperature uniformity ±10°C, ensuring consistent heating of samples to improve processing precision;

●Continuous Operation: Can pair with circulating feed/discharge systems to realize automated continuous workflow, reducing manual intervention and boosting production efficiency.

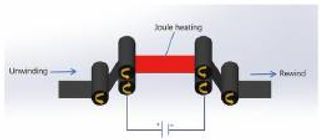
Specifications Table

Parameter	Specification
Model	CIS-JHAM-F-2300-4040
Electrical Specifications	380V 90 kW, 50Hz
Maximum Temperature	2500℃
Heating Zone	300 * 400 * 5 mm
Max Temp Deviation in Heating Zone	⩽ ±10℃
Chamber Pressure (Operating)	Vacuum / Near atmospheric
Chamber Atmosphere	Vacuum / Inert / Reducing gas, etc. *(Please confirm upon ordering)*
Chamber Vacuum Degree	⩽ 10 Pa
Chamber Leak Rate	< 1 × 10⁻⁴ Pa·m³/s
Pressure Rise Rate	⩽ 1.33 Pa/h
Holding Time	2500°C holding time no less than 100 h
Cooling Method	Natural cooling / Gas blow cooling
Water Chiller	CW-8000
Vacuum Pump	VRD-65
Chamber Dimensions (L * W * H)	1060 * 930 * 560 mm
Overall Machine Dimensions (L * W * H)	1200 * 1200 * 2700 mm (Excluding power supply and control cabinet)

Roll-to-roll Joule heating device

Product Introduction

The electrode-type roll-to-roll Joule heating device is a high-efficiency heat treatment equipment that operates winding and heating synchronously. Its roll-to-roll structure supports both intermittent and continuous operation, offering excellent controllability and high efficiency. Its heating system utilizes the Joule heating principle to energize and heat roll materials, featuring a large heating area and rapid heating speed for stable heating during continuous operation. It can be applied in heat treatment scenarios such as coil material thermal processing, solution flash evaporation, and alloy growth, achieving efficient and continuous production.



Heating Schematic

Product Features

●Continuous & Intelligent Operation: Winding and heating systems operate in synergy, enabling intermittent or continuous automatic operation;

●Ultra-Fast Heating Technology: Based on the Joule heating principle, target temperatures can be reached in a short time;

●Large Heating Area: Both maximum width and heating length can be customized;

●High-Precision Stable Control: Closed-loop line speed and tension control ensure accurate regulation and stable heating; optional deviation correction systems enhance winding quality.

Specifications Table

Item	Parameter
Model	JHAM-C-W52
Electrical Specifications	380V 50Hz
Coil/Roll Material	Conductive materials, such as nickel mesh, carbon cloth, carbon fiber yarn, etc.
Coil/Roll Shape	Cloth-like, mesh-like
Maximum Width	Customizable
Heating Zone Length	Customizable
Maximum Temperature	2000°C
Electrode Material	Stainless steel / copper / graphite (depending on working conditions)
Chamber	Customizable atmosphere chamber
Winding/Unwinding Device	Supports continuous or intermittent operation
Operating Line Speed	0–50 mm/s
Line Speed Control Accuracy	±0.4% FS
Tension Control Range	0–49 N
Tension Control Accuracy	±0.4% FS
Tension Control Mode	Constant tension / gradient tension

CATALYST EVALUATION DEVICE SERIES

(Desktop) micro fixed bed

Product Introduction

The Hefei In-Situ (desktop) micro fixed-bed reactor is designed for laboratory benchtop use, featuring a compact footprint, tight structure, and modular design that facilitates easy assembly and modification. Reaction channels, gas-liquid flow lines, separation device types & sizes, and sampling analysis methods can be customized according to the reaction system, perfectly matching customers' actual needs.

Product Features

●Modular Design: Desktop micro-modular design allows free assembly, expansion, and improvement based on experimental systems;

●High Precision: Pressure accuracy ±0.25% F.S., flow rate accuracy ±1% F.S., constant temperature zone temp difference ±1℃, temperature control accuracy ±1℃;

●Broad Applicability: Capable of multi-gas phase, gas-liquid two-phase, and gas-liquid-solid three-phase reactions; can be coupled with GC/MS/IR for online detection;

●Convenience: Temperature is PID-controlled to ensure reaction temperature stability, supporting constant output to examine reaction heat changes. Data acquisition and control are integrated on the touchscreen for a simple, user-friendly, and fast interface. Product automatic sampling and analysis enable 24/7 continuous operation without manual intervention;

●Safety: Electrical safety interlocking with hardware-software combined safety design, including overpressure and overtemperature alarms, as well as automatic gas supply and heating shut-off functions.

Specifications Table

Category	Item	Parameter / Specification
Reaction Channels	Number of Channels	1–2
Reaction Conditions	Max Operating Temp (℃)	1000℃ or customized per material
	Max Operating Pressure (MPa)	9.8 MPa
Feed Module	Feed Lines	Single gas line, multi-gas split lines, gas-liquid dual lines, gas-liquid-solid triple lines
	Feed Pretreatment Method	Filtering, pre-mixing, preheating, vaporization/evaporation, line degassing, etc.
	Gas/Liquid Feed Method	Mass flow controller / dual-plunger pump, syringe pump, peristaltic pump
	Gas Feed Line Count	2–6
	Liquid Feed Line Count	1–2
	Feed Accuracy Error	1%
Reaction Module	Catalyst Loading Capacity (mL)	0.1–10
	Reaction Tube Inner Diameter (mm)	10 mm or customized
	Catalyst Bed Form & Height (mm)	Straight rod / 10–200 mm
	Catalyst Form	Powder, granules, honeycomb, and monolithic structures
	Reaction Tube Material	Quartz, 316L, 310S, Hastelloy, GH superalloy, or customized per customer requirement
	Temp Control Mode	PID
	Heating Method	Joule heating or conventional electric heating, single or multi-channel optional
Product Separation Module	Separation Mode	Gas-solid, gas-liquid separation
	Separation Device	Cyclone separator, temp-controlled condenser / hot trap
Product Analysis Module	Sampling Method	High/low pressure sampling, online GC/MS/IR sampling
Control Mode	Electrical Control Mode	Digital display meter control / touchscreen microcomputer software control
System & Auxiliary Parameters	Power Supply	16A, AC220V, 50Hz
	Gas Metering Pipeline	Customized per customer request
	Dimensions (m)	1.2 * 0.7 * 1.0
	Safety	Electrical safety interlocking, combined software-hardware safety design, overpressure/overtemperature alarms, auto stop gas & heating actions

Multi-channel fixed bed reactor

Product Introduction

The Hefei In-Situ multi-channel fixed-bed reactor is a high-temperature, high-pressure multi-station reaction device designed to maximize experimental efficiency. It enables rapid, efficient, and parallel screening of catalytic materials, reaction evaluations, and process optimizations. Each channel reactor can operate in integrated, independent, or rapid-switching modes.

Product Features

●High Customizability: Process flows, process parameters, and standard component selections are fully customized according to customer requirements.

●Precise Calculation & Design: Based on customer data, accurate material and heat balance calculations are performed to compute and design dimensions and parameters for non-standard parts, including reactors, separation devices, and heat exchangers.

●High-Precision Control: Pressure ±0.25% F.S., flow rate ±1% F.S., constant temperature zone temp difference ±1°C, inter-channel temp difference ±1°C, temperature control accuracy ±1°C.

●High Automation: Data acquisition and control for pressure, temperature, and flow rate are integrated on the touchscreen, featuring a simple, friendly interface that is quick and easy to use. Enables automatic product sampling analysis and 24/7 continuous operation. Supports arbitrary switching between evaluation stages such as pretreatment, purging, and reaction across different channels to maximize researcher efficiency.

●Excellent Parallelism: Independently set reaction parameters, real-time monitoring status, and product analysis for each channel; features independent flow meter selection, temperature control, and separately configured product separation and sampling analysis modules to minimize inter-channel parameter errors.

Specifications Table

Category	Item / Indicator	Parameter / Specification
Reaction Channels	Channel Count	2–12 or per customer request
Reaction Conditions	Max Operating Temp (℃)	1000 or determined by material
	Max Operating Pressure (MPa)	9.8 MPa
Feed Module	Feed Composition	Single gas phase, multi-component gas phase, gas-liquid two-phase, gas-liquid-solid three-phase
	Feed Pretreatment Method	Filtering, pre-mixing, preheating, vaporization then re-mixing, degassing then vaporization, etc.
	Gas/Liquid Feed Method	Mass flow controller / liquid pump generator, syringe pump, plunger pump
	Gas Feed Line Count	2–N
	Liquid Feed Line Count	1–N
	Feed Distribution Error	1%
Reaction Module	Catalyst Loading Capacity (mL)	0.5–100 per customer request
	Reaction Tube Inner Diameter (mm)	10–60 based on process calculation
	Catalyst Bed Form & Height (mm)	Cylindrical, annular, or perforated particles of various shapes / 10–500 based on process calculation
	Catalyst Form	Powder, granules, molded, and monolithic structure
	Reaction Tube Material	Quartz, 316L, 310S, Hastelloy, GH superalloy, or hyperstructural titanium
	Heating Method	Electric heating (electric furnace), light heating (solar/infrared furnace), thermal oil circulation (jacketed constant temp circulation)
	Heating Method (Alternative)	Joule heating tube or heating single/multi-channel
Product Separation Module	Separation Mode	Gas-solid separation, gas-liquid separation, gas-liquid-solid separation
	Separation Device	Cyclone separator, temp-controlled condenser / hot trap, collector, extraction separation
Product Analysis Module	Sampling Method	High-pressure sampling, online GC/MS/IR routine
System & Auxiliary Parameters	Power Supply	Specified according to actual conditions
	Exhaust	Customized per customer request
	Dimensions (m)	Confirmed based on assembly line
	Safety	Electrical safety interlocking, software-hardware combined safety design, overpressure/overtemperature alarms, power-off auto stop / power-off protection / gas shutoff logic upon overtemp

Joule-heated fixed reactor

Product Introduction

The Joule-heated fixed reactor controls a Joule heating power supply to output pulsed or steady/controllable direct current (DC). Utilizing the Joule heating effect of the catalyst bed or its conductive support, the catalyst bed rapidly and controllably reaches the set reaction temperature. Paired with a front-end multi-component gas mixing device, liquid pump vaporization device (optional), and preheating/heating conditions, it meets the required reaction conditions. Compared to traditional heating methods, the Joule-heated fixed reactor significantly accelerates the heating rate (≥ 100°C/s), reduces preparation time, improves evaluation efficiency, and lowers operating costs. Meanwhile, traditional electric heating reactors can be retained for comparison/reference by researchers or for series/coupled reaction setups.

This device can be equipped with multi-component gas and liquid feeding. It is suitable for gas phase, gas-solid two-phase, or gas-liquid-solid three-phase reaction modes. By equipping a condenser + cold trap or hot trap / heat-traced pipeline at the rear end of the reactor, it achieves gas-liquid separation, gas-liquid-solid separation, or full-component analysis of reaction off-gas materials. It can evaluate various reaction systems such as synthesis, cracking, and reforming.

New Features

In addition to the structure and functions of a conventional fixed bed, this device features the following capabilities:

●Remote Control: The system monitors reaction parameters in real-time via IoT, supporting remote adjustment of reaction temperatures and gas/liquid line flow rates. It allows remote heating shutdown and gas valve closing to ensure experimental safety.

●Instantaneous Power & Energy Consumption Recording: Outputs instantaneous power and energy consumption logs for different reactions, with a temperature curve recording function (customized as needed).

Category	Item / Indicator	Parameter / Specification
Reaction Channels	Channel Count	Customized as needed
Reaction Conditions	Max Operating Temp	1200°C
	Max Operating Pressure	10 MPa
Feed Module	Feed Composition	Single gas phase, multi-component gas phase, gas-liquid two-phase
	Feed Pretreatment Method	Filtering, vaporization, preheating, mixing
	Gas Feed Method	Mass flow controller
	Liquid Feed Method	Plunger pump
	Gas Feed Line Count	Customized as needed
	Liquid Feed Line Count	Customized as needed
	Feed Distribution Error	1%
Reaction Module	Catalyst Requirement	Molded granules (conductive), powder (with conductive support)
	Sample Loading Capacity	Customized as needed
	Reaction Tube Material	Quartz tube (inner), stainless steel tube (outer)
	Stainless Steel Grade	310S, 316L, 304
Heating Module	Heating Method	Joule heating
	Device Components	Carbon rod, carbon cloth / silicon carbide granules, quartz inner tube, stainless steel outer tube, cooling system
	Total Device Power (kW)	4
Product Separation Module	Separation Mode	Gas-liquid separation
	Separation Device	Condenser, gas-liquid separator
Product Analysis Module	Sampling Method	Offline sampling, online GC/MS/IR sampling
Control Mode	Electrical Control Mode	Touchscreen control
System & Auxiliary Parameters	Power Supply	32A, AC220V, 50Hz
	Dimensions (cm)	< 150 * 80 * 190 (L * W * H), special customization available if needed
	Safety	Electrical safety interlocking, combined software-hardware safety design, overpressure/overtemperature alarms; exhaust compartment ultra-positive pressure protection

DISTILLATION DEVICE SERIES

Continuous distillation device

Product Introduction

Bench-scale continuous distillation device, used for product separation and purification, reagent recovery, liquid mixture purification, etc., providing data support for process scale-up.

Product Features

●High-Precision Temperature Control: Built-in central heating rod combined with external heating jacket achieves high-precision temperature control of kettle materials;

●Space & Cost Saving: Special bottom structure enhances circulation flow of increment materials, saving space and cost compared to traditional forced circulation or thermal convection circulation methods;

●Broad Operational Flexibility: Sectional design offers high elasticity, enabling wide-load operation and separation of various complex material systems.

Application Fields

Suitable for distillation and purification of organic solvents, pharmaceutical intermediates, fine chemicals, and other materials, achieving product purity of over 99%.

Continuous distillation separation device

Product Introduction

The continuous distillation separation device features high-efficiency structured packing and sectional packing designs, realizing high-efficiency separation of complex material systems with high load fluctuation tolerance. Product purity ⩾ 99.9%, meeting high-end demands in pharmaceuticals, electronic-grade chemicals, etc.

Product Features

●High-Efficiency Packing: Uses high-efficiency structured packing to ensure a high specific surface area and low pressure drop, improving separation efficiency;

●High-Efficiency Distributor: Uses a high-efficiency distributor design to ensure uniform liquid distribution, enhancing mass transfer efficiency and column processing capacity;

●Complex Heat Exchanger Network: Features a complex heat exchanger network design for high-efficiency heat recovery, such as heat pump distillation and double-effect distillation;

●Falling Film Reboiler: Uses a falling film reboiler design to strengthen kettle heat transfer and lower product energy consumption;

●Broad Material System Adaptability: High vacuum design enables efficient separation when handling diverse complex material systems.

PILOT SCALE-UP DEVICE SERIES

Organic synthesis device

Product Introduction

Continuous synthesis equipment suitable for process route optimization, catalyst performance evaluation, and small-batch chemical production, with an annual processing capacity reaching ton-scale or above. Provides a stable and reliable experimental platform for continuous synthesis process research in the bench-scale stage, helping researchers efficiently explore reaction laws and process parameters.

Product Features

●Dual-Reactor Design: Dual-reactor structural design allows independent operation or synergistic coordination, enabling flexible parallel experiments or series reaction studies;

●Zoned Temperature Control: Heating system utilizes zoned temperature control technology, enhancing system integration and operational economy;

●Special Internal Fixtures: Reactor features internal special structural fixtures to support catalysts and filter broken catalyst particles;

●Comprehensive Safety Safeguards: Equipped with multiple safety protection devices including overpressure alarm, pressure inlet system, and overtemperature protection, effectively reducing safety risks during experiments;

●Off-Gas Purification & Recycling: Equipped with off-gas purification and off-gas recycling capabilities, saving raw material costs.

Application Fields

Suitable for university laboratories, fine chemical enterprise pilot workshops, research institute laboratories, and other scenarios. Its compact structure fits limited laboratory spaces, making it a capable tool for experimental and scientific research projects.

Hydrogen storage/discharge pilot test platform

Product Introduction

The organic liquid hydrogen storage technology device adopts microchannel, capillary, and other reactor formats. Adapting various reactors on the experimental platform, it conducts research and engineering operations, providing process design data for large-capacity hydrogen storage operations.

Product Features

●Skid-Mounted / Containerized Design: Adopts skid-mounted combination or standard container embedded design, accommodating operation, lifting, and transportation;

●Intelligent Operation: Intelligent design enables one-key operation and unattended monitoring;

●High-Efficiency Heat Exchange: Utilizes high-efficiency heat exchange technology to optimize equipment efficiency and energy performance;

●Real-time Online Monitoring: Equipped with real-time online monitoring systems to interlock and shut down hazard sources in emergencies, ensuring intrinsic safety;

●Heat Recovery: Optimized heat exchanger network design achieves high-efficiency heat recovery and utilization.

Application Fields

Hydrogen energy storage & transport, technology development verification, etc.

THOUSAND-TON CONTINUOUS PRODUCTION EQUIPMENT SERIES

Fixed bed continuous synthesis device

Product Introduction

The fixed bed continuous synthesis device is suitable for gas-solid, liquid-solid, gas-liquid-solid, and other synthesis production processes, and is widely applied in continuous production scenarios such as pharmaceutical intermediates, hydrogen/ammonia storage, and organic synthesis.

Product Features

●Dual-Reactor Structure: Uses a dual-reactor structural design to improve continuous operational capability of the production system;

●Internal High-Efficiency Distribution: Built-in high-efficiency distribution structure strengthens mass transfer effects and improves product yield;

●Intelligent Temperature Control: Intelligent temperature control system (proprietary IP) monitors and regulates multi-point temperatures in radial/axial directions within the reactor in real-time, achieving fast and precise system temperature adjustments;

●Broad Adaptability: Multi-adaptability design allows switching raw materials for instant production line changeovers tailored to different reaction systems;

●Intrinsically Safe Design: Intrinsically safe design uses automated interlocking systems to execute heat source shut-off and other safety functions under production and emergency conditions.

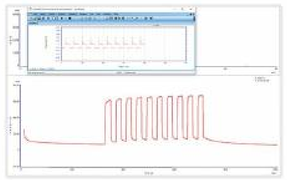
IN SITU DIFFERENTIAL ELECTROCHEMICAL MASS SPECTROMETRY

In-situ differential mass spectrometry system

Product Introduction

The in-situ differential mass spectrometry system connects the electrochemical cell with the mass spectrometer system online to realize dynamic monitoring and real-time tracking of electrochemical reactions. Within milliseconds during electrochemical reactions, this system provides qualitative or quantitative analysis of generated gases, volatile intermediates, and final products.

(Model :CIS-DEMS-DM
*L * W * H: 550 mm * 400 mm * 420 mm)*



(Experimental Spectrum)

Product Features

●**Fully Sealed Structural Design:** Protects internal components from contamination to ensure a clean measurement environment, preventing external interference and significantly improving equipment sensitivity and stability.

●**Multi-Instrument Interconnection Capability:** Connects online with infrared, Raman, adsorption instruments, thermobalances, and reactor equipment for real-time dynamic electrochemical reaction monitoring and analysis.

●**High-Performance Vacuum System:** Uses Pfeiffer imported dry turbomolecular pump units (split molecular pump + diaphragm pump) to guarantee high vacuum environments, extending multiplier lifespan and lowering background noise.

●**Ultra-Fast Scanning Speed:** Scanning speed up to 1 ms/amu, leading the industry, allowing capture of dynamic intermediates during fast reactions.

●**Networked Control:** Supports static IP address assignment and network cable control, with transmission speeds up to 100 Mbit/s for remote operation and data transmission.

●**Data Linkage with Workstation:** Synchronous control design ensures seamless connection between mass spectrometry testing and workstation operation, improving experimental efficiency and data accuracy.

Application Fields

Energy materials, electrocatalysis, corrosion & protection, environmental science, bioelectrochemistry, material synthesis & characterization, etc.

Product Specifications (By Component Model)

Universal Mass Spec Cell (Model: CIS-DMS-UTC)

- Sampling Method: Capillary sampling, vacuum sampling;
- Cell Body Material: PEEK;
- Sealing Ring: FKM;
- Design Temperature: Ambient;
- Design Pressure: Atmospheric;
- Observation Window: Quartz glass, L 30 mm, W 25 mm, Thickness 1.5 mm;
- Working Electrode (WE): Catalytically loaded foam nickel, foam copper, foam titanium, etc.;
- Reference Electrode (RE): Silver chloride electrode;
- Counter Electrode (CE): Platinum wire electrode;
- Anode Chamber: Accepts user-supplied ion exchange membrane to effectively prevent side reactions;
- Gas Line: Lower chamber equipped with a gas inlet to allow water vapor permeable membrane and porous ceramic frit assembly.

Electrochemical Mass Spec Cell (Model: CIS-DMS-EC-SD)

- Main Material: PMMA + PEEK;
- Sealing Ring: FKM;
- Design Temperature: Ambient;
- Design Pressure: Atmospheric;
- Device Features: Liquid inlet/outlet ports for flow circulation during static/dynamic gas production research in electrolysis;

Infrared-Mass Spec Combined Cell (Model: CIS-MEC-IRATR&DMS-EC)

- Cell Body Material: PMMA + PEEK;
- Sealing Ring: FKM;
- Design Temp: Ambient; Design Pressure: Atmospheric;
- Device Features: Liquid inlet/outlet ports for flow circulation during static/dynamic gas production research in electrochemistry;
- WE: Catalytically loaded foam nickel/foam titanium/foam copper/glassy carbon electrode/glassy carbon/gold/platinum; RE: Silver chloride electrode/silver-silver ion electrode/mercury oxide electrode/mercury sulfate electrode; CE: Platinum wire electrode/graphite rod/platinum net electrode; suitable for load-type catalysis research.

Raman-Mass Spec Combined Cell (Model: CIS-MEC-Raman&DMS-EC)

- Main Material: PEEK;
- Test Conditions: Ambient temp and pressure;
- Observation Window: High-purity quartz, light diameter 37 mm;
- Counter Electrode: Platinum wire electrode / graphite rod electrode;
- Reference Electrode: Silver-silver chloride electrode / mercury-mercuric oxide electrode;
- Working Electrode: Catalytically loaded foam nickel, foam titanium, glass carbon electrode; minimum sample size 5 mm;
- Anode Chamber: Accepts user-supplied ion exchange membrane to effectively prevent side reactions;
- Gas Line: Lower chamber equipped with a gas inlet to allow water vapor permeable membrane and porous ceramic frit assembly.

Pouch Cell In-situ Mass Spec Cell (Model: CIS-DMS-LB-P)

- Features: Easy assembly inside glove boxes;
- Adjustable Pressure: Manually adjustable compression pressure on pouch cells;
- Adjustable Cavity Space: Flexible internal volume accommodates pouch cells of varying thickness;
- Durable Construction: PEEK and 316 stainless steel materials, corrosion-resistant;
- Gas Testing Compatibility: Pairable with gas line accessories for online gas testing;
- Sample Size: MAX 70 * 56 mm, customizable;
- Max Thickness: MAX 12 mm thickness adjustable, customizable for other thicknesses;
- Reaction Cell Size: L * W * H: 110 * 86 * 20 mm;
- High-Temp Resistance: Optional high-temperature resistant version available.

Coin Cell In-situ Mass Spec Cell (Model: CIS-DMS-LB-C)

- Features: Easy assembly inside glove boxes;
- Adjustable Cavity Space: Fits coin cell electrodes of varying thickness;
- Durable Construction: PEEK and 316 stainless steel, corrosion-resistant;
- Gas Testing Compatibility: Pairable with gas line accessories for online gas testing;
- Electrode Sheet Dimensions: Anode Φ16 mm, Cathode Φ12 mm, Negative Φ14 mm, customizable;
- Material: Stainless steel + PEEK;
- Reaction Cell Size: Φ34.6 * 13.5 mm (excluding gas section);
- Optional: High-temperature resistant version available.

Mass Spec Test Cold Trap Chiller Attachment (Model: CIS-DMS-CT (-150-RT))

- Design Temperature: -100℃ to ambient, programmed temperature control;
- Design Pressure: Atmospheric;
- Wetted Materials: 316 Stainless Steel;
- Applicable Types: Suitable for testing liquid state conditions across all electrolytes;
- Cooling Method: Uses semiconductor refrigeration technology for quick cooling, paired with heating methods to ensure precise temperature uniformity;
- External Dimensions: Approx. L 149 * W 113 * H 228 mm (Cold trap main body only, excludes control box);
- Includes: Cold trap main body + control section (liquid nitrogen trap + liquid nitrogen tank + temp control box) + filter section (micro-particle filter) + accessories.

MULTI-ENVIRONMENT IN-SITU INFRARED REACTION SYSTEM

In situ infrared electrochemical system

Product Introduction

In-situ infrared electrochemical ATR provides information on the orientation, arrangement, and coverage status of surface-adsorbed species, serving as an effective means to study electrode processes at the molecular level. Attenuated Total Reflection (ATR) mode offers thin-layer light path advantages, simple selection rules, high signal strength, easy mass transfer, and minimal interference from bulk solution, making it ideal for real-time monitoring of electrode surface dynamic processes. This reaction system integrates three-electrode and gas interface ports, enabling CO_2, N_2, or other reactant gases to pass through the solution under applied bias to perform real-time electro(photo)catalytic infrared spectroscopy characterization. Surface enhancement effects can be introduced by sputtering thin metallic (or gold/platinum) layers on single-crystal surfaces to amplify in-situ signals.

ATR Crystal Types and Selection Standards Table

Crystal Material	pH Range	Wavenumber Range (cm^{-1})
ZnSe	5–9	520–4000
Ge	1–14	575–4000
Si	1–12	1200–4000
ZnS	5–9	520–4000
CaF2	5–8	1100–7700

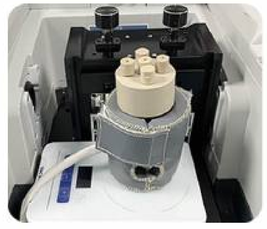
Fixed-Angle ATR Attachment (Model: CIS-IRATROA-SD)

- Single-reflection ATR mode, incident angle fixed at 60° ;
- Compatible with multi-reflection ATR modes;
- Uses flat selenium and crystal windows to ensure high throughput;
- Incident angle design allows penetration depth to change continuously with crystal material, incident angle, and infrared light wavelength;
- Compact design reduces interference from water vapor and carbon dioxide;
- Pairable with in-situ ATR single-reflection electrochemical cells and infrared ATR lithium batteries;
- Custom crystal selections available per experimental requirements.

Adjustable-Angle ATR Attachment (Model: CIS-IRATROA-FVA)

- Single-reflection ATR mode, incident angle variable from 30° to 75° ;
- Uses flat selenium and crystal windows to ensure high throughput;
- Incident angle design allows penetration depth to change continuously with crystal material, incident angle, and infrared light wavelength;
- Compact design reduces interference from water vapor and carbon dioxide;
- Pairable with in-situ ATR single-reflection electrochemical cells and infrared ATR lithium batteries;
- Custom crystal selections available per experimental requirements.

New Heated & Thermostatic Photoelectrochemical ATR Reaction Cell (Model: CIS-IRATR-PEC-T200)



- Temperature: Ambient to 200℃;
- Heating Method: Dual-heating jacket heating;
- Pressure: Atmospheric, closed system;
- Cell Body: Corrosion-resistant, light-assisted, heatable;
- Sample: Clean sample, liquid-state;
- Min Sample Volume: 30 mL;
- Stirring Method: Magnetic stirring;
- Crystal: Optional (Silicon crystal pH 1 – 14 suitable for aqueous solutions; Zinc selenide crystal pH 5 – 9 suitable for oil systems).

High-Temperature High-Pressure ATR Reaction Cell (Model: CIS-IRATR-T200-P30)

- Temperature: Ambient to 200℃;
- Heating Method: Dual-heat-pipe double-pass heating;
- Pressurization Method: Gas pressurization (heatable), auto-pressurization on heating;
- Pressure: Atmospheric to 3 MPa;
- System: Gas-liquid-solid three-phase catalysis;
- Sample: Clean sample, liquid-state;
- Crystal: Optional.

In-situ Infrared External Reflection (H-Type) (Model: CIS-IRATR-HS)

- Material: PTFE and quartz cell body, chemical corrosion resistance;
- Sealability: Excellent reaction cell sealing performance, allows reactant gas flow;
- Crystal Selection: Si / ZnSe / Ge / ZnS and other crystals optional, easy to disassemble;
- Features: 5-port design to meet various reaction needs;
- Angle Range: Continuously adjustable from 30° to 80° to ensure maximum light throughput for different electrocatalysts.

ATR Heating Chamber Body (Model: CIS-IRATR-CH-T200)

- Temperature: Ambient to 200℃;
- Pressure: Atmospheric pressure, open system;
- Sample: Clear sample (viscous / pasty / low-fluidity samples);
- Sample Coating Area: Exposed crystal area 10 mm;
- Crystal: Optional (Ge / Si crystals suitable below 135℃; ZnSe crystals suitable for ambient to 200).

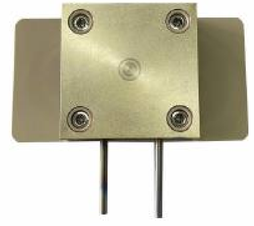
In-situ Infrared External Reflection (Model: CIS-IRATR-ER)

- Material: PEEK;
- Target Temperature: Ambient;
- Environment Handling: Clean sample;
- Reaction Cell Internal Pressure: Atmospheric;
- Reference Electrode: Ag/AgCl (18/2) / crystal;
- Electrodes (Optional): Working electrode (glassy carbon electrode), reference electrode (Ag/AgCl electrode),
counter electrode (platinum wire ring electrode).

In-situ Infrared Multi-Reflection (Model: CIS-IRATR-MR)

- Material: PEEK, quartz assembled or integrated, corrosion-resistant;
- Angle Range: Adjustable from 40° to 50° ;
- Sealability: Hermetically sealed system;
- Crystal: Si / Ge and other crystals optional;
- Features: Equipped with one inlet and one outlet for gas passage.

Pouch Cell In-situ Infrared External Reflection Test Cell (Model: CIS-ATR-LB)



- Material: Metal part of the cell body is high-line titanium material to ensure corrosion resistance and strength;
- Diameter: $\Phi \leqslant 16$ mm;
- Aperture Limit: $\Phi \leqslant 20$ mm;
- Sealability: Sealed with FKM O-rings to ensure overall system air-tightness;
- Compatibility: Requires use with In-Situ Tech or PIKE ATR optical path systems;
- Ease of Use: Convenient and fast assembly/disassembly, easy to clean components;
- Application: Suitable for secondary battery infrared external reflection testing (reusable);
- Functional Features: Capable of online IR spectral data acquisition during normal battery charge/discharge
(equipped with micro-subtractive gold reflection optics);
- Customizable high/low temperature versions available.

On-line Monitoring System Based on Infrared Optical Fiber Probe

Product Introduction

The online monitoring system based on infrared optical fiber probes is a cutting-edge analytical tool for online, in-situ monitoring of chemical reaction processes. Based primarily on infrared spectroscopy technology, the system inserts a specially designed fiber optic probe directly into the reaction vessel, utilizing principles such as Attenuated Total Reflection (ATR) to acquire molecular bond information in real-time, thereby achieving non-destructive monitoring of reactants, intermediates, and products.

Product Advantages

●In-situ & Online, Real & Accurate: The probe directly inserts into the reactor, avoiding time delays and sample changes caused by sampling to obtain the most authentic reaction information.

●Plug & Play, Simple Maintenance: Modular design requires no optical path adjustments, no consumables, and no special maintenance.

●High Adaptability, Comprehensive Coverage: Combinations of various probes and crystals adapt to reaction conditions ranging from ambient temperature/pressure to high temperature/pressure.

●Powerful Functionality, Rich Information: Tracks reactant consumption and product generation while capturing reaction intermediates.

●Safe & Efficient, Enhanced Yields: Non-invasive measurement reduces personnel risk of exposure to hazardous chemicals while saving time and raw material costs through precise endpoint judgment.

Fiber Optic ATR Accessory

- Equipped with detachable fiber optic connectors (SMA905/FC), customizable according to user requirements;
- Uses aluminum-coated dark box polished mirrors, pairable with mid-infrared fibers with NA 0.3 – 0.4;
- Addable gas purging function to reduce interference from water vapor and carbon dioxide;
- Pairable with corresponding liquid cells or reaction kettles and fiber optic probes for online process monitoring;
- Equipable with various fiber optic probes based on experimental needs;
- Uses mid-infrared PIR fiber with a wavelength range of 4 um – 18 um.

In situ infrared diffuse reflection system

Product Introduction

Fourier transform infrared spectrometers are equipment used for in-situ evaluation of catalyst or material performance under multi-environmental conditions. They easily track and identify reaction intermediates and products, providing direct evidence for investigating reaction mechanisms in catalytic reaction systems.

In-situ infrared diffuse reflection is primarily used for gas-solid catalysis characterization and catalytic reaction studies, such as catalyst surface hydroxyl group measurements, catalyst surface species adsorption state research, and catalyst surface acidity/basicity characterization. This reaction system can be applied in realistic to high-pressure environments at temperatures up to 500℃ (under vacuum), making it an ideal choice for research directions such as heterogeneous catalysis, gas-solid interactions, photochemical reactions, and oxidation mechanisms. Currently, it has been applied to infrared spectroscopic studies of interfacial reactions in gas-phase organic photocatalytic degradation, thermal catalysis ($CO+H_2$, CO_2+H_2), and other fields.

Diffuse Reflection Attachment (Model: CIS-IRDROA-SD)

Employs two 6.3:1, 90° off-axis ellipsoidal mirrors with gold coating for higher reflectivity and better corrosion resistance;
Reduces the effect of specular reflection;
Baseplate equipped with slide rails allows adjustment of the diffuse reflection accessory position to enhance throughput;
Gold-plated flat mirror fine-tuning mechanism adjusts diffuse reflection throughput, reducing specular reflection component and associated spectral distortion;
Adapts to diffuse reflection reaction chambers to record infrared spectra of powder materials under various environments.

High-Temp High-Pressure Diffuse Reflection Attachment (Model: CIS-IRDR-SD)

- Cell body made of 316L stainless steel, max temp 500℃, max pressure 3 MPa; Hastelloy version max temp 800℃, corrosion resistant;
- Equipped with thermocouple temp sensor feedback control meter for precise temp control and heating, using a cooling circulation system to cool external cell walls;
- Chamber features 3 windows: 2 IR optical windows and 1 quartz window for external light source input (photocatalytic excitation source) or observation;
- Features 3 inlet/outlet ports for evacuation and gas feed; reactant gases such as VOCs and CO_2 are safely bubbled through bottom solutions before exhaust, with flows controlled via mass flow controllers;
- Customizable optical windows; cell body thickness reducible; equipped with Raman top cap, compatible with various Raman spectrometers.

Joule-Heated Diffuse Reflection (Model: CIS-IRDR-JH-T1000)

- Temperature Advantage: Ambient to 1000℃, max heating rate 350℃/s, temperature measured via infrared probe, supports programmed temp control and touchscreen operation, equipped with dedicated control software;
- Pressure Adaptability: Atmospheric pressure environment;
- Core Materials: Cell body and lid fasteners made of 316L corrosion-resistant material; temp sensor plate made of quartz for stability and precision; heating element made of high-purity graphite to ensure rapid heating;
- Gas Line Design: Equipped with independent inlet/outlet ports for flexible gas introduction to meet in-situ reaction demands;
- Thermal Protection: Reserved water-cooling ports paired with a water chiller effectively control outer cell temperature to prevent burns/damage.

High-Temp Low-Temp Diffuse Reflection (Model: CIS-IRDR-LT)

- Design Temperature: -150℃to 300℃;
- Design Pressure: Negative pressure (-150℃ to RT), 3 MPa (RT to 300℃);
- Cell Body Material: 316L Stainless Steel;
- Window Material: Quartz;
- Temp Control Device: Programmed temperature control, touchscreen operation (including software);
- Equipped with gas inlet/outlet ports for gas introduction;
- Reserved water-cooling ports paired with a water chiller to protect outer cell temperature;
- Equipped with liquid nitrogen pump and manifold to control liquid nitrogen flow rate;
- Turbomolecular pump evacuation / molecular pump gas circuit assembly accessories to evacuate chamber, reduce frosting, and protect low-pressure zones;
- Equipped with gas purge piping for gas purging on the outer side of the cell body.

Electric Field Diffuse Reflection Cell (Model: CIS-IRDR-EF)

- Design Temperature: Ambient to 400℃ (customizable up to 650℃);
- Design Pressure: 3 MPa;
- Cell Material: Hastelloy + ceramic;
- Light Window: Quartz;
- Infrared Windows: ZnSe×2;
- Electrodes: Copper-aluminum electrodes;
- Gas Ports: Equipped with inlet and outlet ports for gas flow.

High Temperature Plasma Diffuse Reflection Cell (Model: CIS-IRDR-PA-T500)

- Design Temperature: 500° C or ambient selectable;
- Design Pressure: Atmospheric;
- Cell Material: 316 Stainless Steel + ceramic;
- Light Window: Quartz;
- Infrared Windows: CaF_2×2;
- Electrodes: Central high-voltage electrode, ring electrode;
- Gas Ports: Equipped with inlet and outlet ports for gas flow.

in situ infrared transmission system

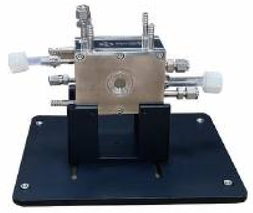
Product Introduction

The in-situ infrared transmission reaction system is primarily used to study the infrared spectral characteristics of samples under different temperatures and gas environments. The product mainly consists of three parts: a reaction cell, a gas mixing control system, and a temperature control system. The main body of the reaction cell is made of 316L stainless steel and equipped with infrared windows. The gas mixing control system uses mass flow controllers to accurately control and mix gas flow lines, while the temperature control system uses various sensors to regulate the temperatures of the gas lines, gas mixing tank, and reaction cell.

Photocatalytic Infrared High-Temperature Transmission Cell (Model: CIS-IRTR-PC-T500)

- Gas Adaptability: Supports input of various gases;
- Sealing Performance: Excellent gas-tight seal;
- Temp Control System: Heating rod heating + high-precision touchscreen temp controller;
- Maximum Temperature: 500° C;
- Maximum Pressure Resistance: 3 MPa;
- Auxiliary System: Equipped with a water cooling system;
- Core Function: Enables photocatalytic infrared transmission testing.

High/Low Temperature Transmission Cell (Model: CIS-IRTR-LT-V1.0.0)



- Target Temperature: -150° C to 500° C (liquid nitrogen cooling, heating rod heating);
- Sample Handling: Pelletized samples, diameter 13.00 mm, thickness 1.00 mm;
- Material: 316L;
- Windows: Zinc Selenide (customizable material);
- Reaction Cell Pressure: Atmospheric to 2 MPa (different pressures fit different window thicknesses).

In-situ Infrared High-Temperature Electromagnetic Adsorption Transmission Cell (Model: CIS-IRTR-PDA)

- Design Temperature: Ambient to 500° C;
- Design Pressure: Negative pressure to high pressure 3 MPa;
- Cell Material: 316 Stainless Steel;
- Infrared Windows: ZnSe×2 (other materials optional);
- Temp Control Device: Programmed temperature control, touchscreen operation (including software);
- Gas Ports: Gas phase inlet and outlet ports for gas flow or evacuation to meet negative pressure sampling;
- Aperture & Sample Size: Light window diameter 10.00 mm; sample thickness 1.00 – 1.50 mm, sample diameter 13.00 mm;
- Lifting Attachment: Bottom of the cell can connect to an optional lifting device for cell positioning.

Infrared plasma transmission cell

- Design temperature: ambient temperature;
- Design pressure: atmospheric pressure;
- Product materials: 316L stainless steel, PEEK, ceramic;
- Infrared window: ZnSe*2;
- Electrode: Stainless steel electrode
- The device is equipped with inlet and outlet ports, allowing air to be introduced.

IN SITU XRD REACTION DEVICE SERIES

In situ XRD electrochemical reaction cell (Model: CIS-XRD-EC)

Product Introduction

The in-situ XRD electrochemical reaction cell is primarily used to study phase structure evolution of electrode materials in liquid-phase three-electrode or two-electrode environments.

Product Parameters

- Liquid-phase three-electrode (or two-electrode) electrochemical reaction, sample size Φ5–10 mm electrode sample (loaded on carbon paper);
- Equipped with gas inlet and outlet ports to ensure gas flow during reactions;
- Equipped with Ag/AgCl reference electrode, glassy carbon electrode, and platinum wire electrode (working electrode is glassy carbon);
- Excellent sealing performance;
- Diffraction angle range: 10° <2θ<100° ;
- PEEK or PTFE material (optional);
- Compatible with various brands and models of diffractometers.

Photoelectrocatalytic XRD reaction cell (Model: CIS-XRD-PEC)

Product Introduction

Applied to in-situ XRD characterization of photoelectrocatalytic reactions. The top of the cell features a quartz window, and the left/right sides feature polyimide windows. Equipped with reference, counter, and working electrodes, it enables in-situ XRD testing under different illumination wavelengths and electrical conditions to observe structural changes in materials. The cell allows gas purging into the solution, and an optional temperature control system provides precise temperature regulation during testing.

Product Parameters

- Cell Material: PEEK;
- Light Window: Quartz;
- X-ray Window: Polyimide film;
- Detection Angle: 10° <2θ<100° ;
- Sealing Ring: PTFE / FFKM, etc.;
- Temp Test Range: Ambient;
- Working Electrode: Glassy carbon, platinum sheet electrode clip.

High temperature photocatalytic XRD reaction cell (Model: CIS-XRD-T900)

Product Parameters

- Cell Material: GH2747;
- Temperature Range: Ambient to 900℃;
- Detachable Sample Stage: Aluminum nitride;
- Windows: Optical sapphire / polyimide film;
- Temperature Control Accuracy: ±0.1℃;
- Temperature Uniformity: ±1℃;
- Outer Surface Temp: ≤40℃;
- Atmosphere: Gas flow supported;
- Water Cooling: 1200W recirculating water chiller;
- Temp Control Configuration: Custom temp controller, programmed control, touchscreen operation (software included).

In situ XRD low temperature reaction tank (Model: CIS-XRD-T-53-PO)

Product Introduction

The in-situ low-temperature XRD reaction tank is primarily used to study material structural evolution under low temperature (low humidity) environments.

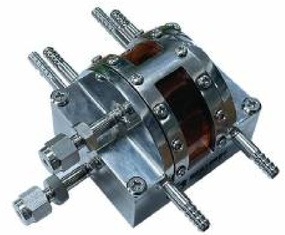
Product Parameters

- Modular Design: Requires no liquid nitrogen during temperature variation; compact cell body suitable for laboratory light sources and synchrotron radiation beamlines;
- Polyimide Film: Protective layer isolating air to prevent condensation on samples during testing;
- Refrigeration: Five-stage ceramic Peltier refrigeration without liquid nitrogen;
- Temperature Range: -53℃ to ambient;
- Cold End Size: Φ15 mm.

In situ XRD high-temperature reaction tank

Product Parameters

- Cell Material: SUS316L;
- Window: Polyimide;
- Sealing Ring: Silicone;
- Test Conditions: Ambient to 600℃;
- Pressure Range: 0 – 0.3 MPa;
- Temp Control Accuracy: 0.1℃;
- Temperature Uniformity: ±1℃;
- Atmosphere: Corrosive gas flow supported (e.g., ammonia, sulfur dioxide);
- Water Cooling: 270W recirculating water chiller;
- Temp Control: Custom temp controller, programmed temperature control, touchscreen operation.



Model: CIS-XRD-T600

Product Parameters

- Cell Material: GH2747;
- Detachable Sample Stage: Aluminum nitride;
- Window: Polyimide film;
- Test Temperature: Ambient to 1000℃ (air or oxygen environment);
- Temp Control Accuracy: ±0.1℃;
- Temperature Uniformity: ±1℃;
- Outer Cell Surface Temp: ≤40℃;
- Atmosphere: Gas flow supported;
- Water Cooling: 1400W recirculating water chiller;
- Temp Control Configuration: Custom temp controller, programmed control, touchscreen operation (software included).

Model: CIS-XRD-T1000

Product Parameters

- Cell Material: Hastelloy C276 (ceramic lining) / SUS316 electric tube (ceramic lining);
- Window: Imported PI film;
- Temp Test Range: Ambient to 1200℃ (inert gas environment);
- Temp Control Accuracy: ±0.1℃;
- Temperature Uniformity: ±1℃;
- Outer Cell Surface Temp: ≤40℃;
- Atmosphere: Gas flow supported;
- Water Cooling: 1200W recirculating water chiller;
- Temp Control Configuration: Joule heating power supply system, programmed control, touchscreen operation (software included).

Model: CIS-XRD-T1200

In-situ XRD High-Low Temperature Reaction Cell (Model: CIS-XRD-LT)

Product Parameters

- Temperature: -150℃ to 600℃;
- Pressure: Atmospheric;
- Sample: Powder pellet (diameter 15 mm, thickness 0.5 mm);
- Environment: Sample must be in an inert gas environment;
- Testing Requirement: XRD testing;
- Cell Material: Cell body, cell lid, inner cavity SUS316L;
- Window Material: Imported polyimide film;
- Temp Control Device: Heating rod, liquid nitrogen pump, programmed control, touchscreen operation (software included);
- Device Features: Gas inlet/outlet for gas flow (inlet flow rate adjustable);
- Gas Terminal: SUS316L ferrule fitting 1/8 in;
- Water Cooling: 270W recirculating water chiller;
- Detection Angle: 10° <2θ<100° .

IN SITU RAMAN REACTION DEVICE SERIES

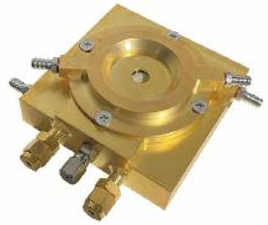
In situ Raman high temperature reaction cell

Product Introduction

The in-situ Raman high-temperature reaction cell is primarily used to observe Raman spectral changes of samples under high-temperature conditions to investigate the effects of high temperature on sample structures. The device mainly consists of the cell body (high-temperature furnace body), heating system, water cooling system, temperature control system, sample stage, and other components. It utilizes an annular heating method to adjust reaction cell temperature in real time, ensuring samples stay at constant temperature points.

Product Parameters

- Design Temperature: 1000℃;
- Main Material: 310S / GH2747 (if corrosive gas is present, material can be replaced with Hastelloy C276, temp reduced to 900℃);
- Temp Control Device: Programmed control, touchscreen operation (software included);
- Temp Control Accuracy: ±0.1℃;
- Window Material: Optical sapphire;
- Detachable Sample Stage: Sample stage material aluminum nitride ceramic;
- Others: Gas flow supported, vacuum evacuation supported;
- Water Cooling: 1400W recirculating water chiller.



Model: CIS-Raman-DSS-T1000

Product Parameters

- Design Temperature: 600° C (if pressure required, can be made with two flange covers, high-pressure cell lid pressure up to 2 MPa);
- Main Material: SUS316 (if corrosive gas is present, material can be replaced with Hastelloy C276);
- Temp Control Device: Programmed control, touchscreen operation (software included);
- Temp Control Accuracy: ±0.1℃;
- Window Material: Optical sapphire;
- Detachable Sample Stage: 3 sets of sample stages made of aluminum nitride ceramic;
- Others: Gas flow supported, vacuum evacuation supported;
- Water Cooling: 300W recirculating water chiller.

Model: CIS-Raman-DSS-T600

Product Parameters

- Design Temperature: 600℃, max 800℃ (Hastelloy C276 material);
- Main Material: SUS316 + electroplating / injection molding;
- Window Material: Quartz (sapphire optional);
- Sealing Ring: PTFE;
- Temp Control Accuracy: ±0.1℃;
- Temperature Uniformity: ±1℃;
- Outer Cell Surface Temp: ≤40℃;
- Others: Compatible with mildly corrosive gases such as vaporized ammonia, fluorinated gases, etc.

Model: CIS-Raman-T600

In-situ Raman High-Low Temperature Reaction Cell (Model: CIS-Raman-LT-T600)

Product Parameters

- Temperature: -150℃ to 600℃;
- Pressure: Atmospheric to 3 MPa;
- Sample: Powder pellet (diameter 8 mm, thickness 3 mm, thickness adjustable);
- Environment: Sample must be in an inert gas environment;
- Testing Requirement: Raman testing;
- Cell Material: Cell body, cell lid SUS316L;
- Window Material: Sapphire window;
- Temp Control Device: Heating rod, liquid nitrogen pump, programmed control, touchscreen operation (software included);
- Device Features: Gas inlet/outlet for gas flow;
- Gas Terminal: Ferrule fitting 1/8 in;
- Water Cooling: 1000W recirculating water chiller;
- Optical Window Size: Diameter 12 mm.

in situ raman electrochemical reaction cell

Product Introduction

The in-situ Raman electrochemical cell is primarily used to observe in-situ spectral changes of electrode materials during electrochemical experiments, thereby exploring changes in chemical structure during reactions. Equipped with reference and counter electrodes, the device supports three-electrode system electrochemical experiments and reserves gas/liquid interfaces for various high-temperature and gas/liquid circulation in-situ Raman spectra. The electrochemical cell features quick assembly and disassembly for convenient cleaning.

I. U-Series In-Situ Raman Electrochemical Cell (Suitable for self-supporting samples)

Model: CIS-Raman-EC-U1

Product Features

- Main body material: PEEK / PMMA / PTFE / PI;
- Working electrode (WE): Planar electrodes such as catalyst-loaded carbon paper, foam nickel, etc.;
- Planar electrode dimensions and thickness are adjustable, easy and quick to disassemble;
- Reference electrode (RE): Optional Ag/AgCl, mercurous sulfate, Hg/HgO, and saturated calomel electrodes;
- Counter electrode (CE): Optional platinum wire ring and graphite rod electrodes;
- Supports static and dynamic studies with gas flow and electrolyte, good overall cell sealability;
- Optical window: Optional quartz, sapphire, and fluoride windows, window diameter 37 mm;
- Distance from WE surface to optical window is less than 6 mm.

Product Features

- Main body material: PEEK / PMMA / PTFE / PI;
- Working electrode (WE): Planar electrodes such as catalyst-loaded carbon paper, foam nickel, etc.;
- Planar electrode dimensions and thickness are adjustable, easy and quick to disassemble;
- Reference electrode (RE): Optional Ag/AgCl, mercurous sulfate, Hg/HgO, and calomel electrodes;
- Counter electrode (CE): Optional platinum wire ring and graphite rod electrodes;
- Supports static and dynamic studies with gas flow and electrolyte, good overall cell sealability;
- Cathode and anode chambers separated by an ion-exchange membrane (user-supplied) to effectively prevent potential side reactions between the two electrode compartments;
- Optical window: Optional quartz, sapphire, and fluoride windows, window diameter 37 mm;
- Distance from WE surface to optical window is less than 6 mm.

Model: CIS-Raman-EC-U1-H

Product Features

- Main body material: PEEK / PMMA / PTFE / PI;
- Working electrode (WE): Optional gas diffusion electrode and catalyst-loaded carbon paper;
- Substrate dimensions and thickness are adjustable, easy and quick to disassemble;
- Reference electrode (RE): Optional Ag/AgCl, mercurous sulfate, Hg/HgO, and calomel electrodes;
- Counter electrode (CE): Optional platinum wire ring and graphite rod electrodes;
- Supports gas and solution mobile phase reaction studies, good overall cell sealability;
- Cathode and anode chambers separated by an ion-exchange membrane (user-supplied) to effectively prevent potential side reactions between the two electrode compartments;
- Gas diffusion chamber added below the cathode chamber to provide gas diffusion functionality;
- Optical window: Optional quartz, sapphire, and fluoride windows, window diameter 37 mm;
- Distance from WE surface to optical window is less than 6 mm.

Model: CIS-Raman-EC-U2-H (Gas Diffusion)

II. P-Series In-Situ Raman Electrochemical Cell (Suitable for powder samples)

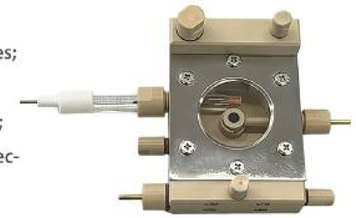
Product Features

- Main body material: PEEK / PMMA / PTFE / PI;
- Working electrode (WE): Disk electrodes such as glassy carbon electrodes;
- Reference electrode (RE): Optional Ag/AgCl, mercurous sulfate, Hg/HgO, and saturated calomel electrodes;
- Counter electrode (CE): Optional platinum wire ring and graphite rod electrodes;
- Supports static and dynamic studies with gas flow and electrolyte, good overall cell sealability;
- Optical window: Optional quartz, sapphire, and fluoride windows, window diameter 36 mm;
- Distance from WE surface to optical window is less than 6 mm.

Model: CIS-Raman-EC-P1

Product Features

- Main body material: PEEK / PMMA / PTFE / PI;
- Working electrode (WE): Disk electrodes such as glassy carbon electrodes;
- Reference electrode (RE): Optional Ag/AgCl, mercurous sulfate, Hg/HgO, and calomel electrodes;
- Counter electrode (CE): Optional platinum wire ring and graphite rod electrodes;
- Supports static and dynamic studies with gas flow and electrolyte, good overall cell sealability;
- Cathode and anode chambers separated by an ion-exchange membrane (user-supplied) to effectively prevent potential side reactions between the two electrode compartments;
- Optical window: Optional quartz, sapphire, and fluoride windows, window diameter 36 mm;
- Distance from WE surface to optical window is less than 6 mm.



Model: CIS-Raman-EC-P1-H

Product Features

- Main body material: PEEK / PMMA / PTFE / PI;
- Working electrode (WE): Disk electrodes such as glassy carbon electrodes;
- Reference electrode (RE): Optional Ag/AgCl, mercurous sulfate, Hg/HgO, and calomel electrodes;
- Counter electrode (CE): Optional platinum wire ring and graphite rod electrodes;
- Supports static and dynamic studies with gas flow and electrolyte, good overall cell sealability;
- Cathode and anode chambers separated by an ion-exchange membrane (user-supplied) to effectively prevent potential side reactions between the two electrode compartments;
- Optical window: Optional quartz, sapphire, and fluoride windows, window diameter 36 mm;
- Distance from WE surface to optical window is less than 6 mm;
- Cathode chamber features a bubble discharge outlet to exhaust bubbles generated during gas-evolving electrochemical reactions.

Model: CIS-Raman-EC-P1-H-V2

Product Features

- Design Temperature: Ambient to 80° C;
- Design Pressure / Volume: Atmospheric / 5 mL;
- Product Materials: PEEK + 316 stainless steel + red copper;
- Window: Quartz window 1 mm;
- Optical Window Diameter: 24 mm; Sample thickness: 0 – 1.5 mm, Sample dimensions: 10 * 10 mm;
- Electrodes: Counter electrode: Platinum wire ring electrode;
- Reference Electrode: Ag/AgCl electrode;
- Working Electrode: Glassy carbon electrode.

Model: CIS-Raman-EC-P1-T80

High-temperature plasma Raman cell (Model: CIS-Raman-PA-T500)

Product Parameters

- Material: Polyimide, 316;
- Dimensions: L 90 mm, W 90 mm, H 27 mm;
- Test Conditions: 500° C, atmospheric pressure;
- Observation Window: High-purity quartz, optical window diameter 40 mm;
- Electrodes: High-voltage electrode: 316 stainless steel; Low-voltage electrode: 316 ring electrode, copper wire;
- Focal Distance: Minimum 2 mm;
- Piping: PTFE tubing.

Ambient temperature plasma Raman cell (Model: CIS-Raman-PA)

Product Parameters

- Material: PEEK;
- Dimensions: L 60 mm, W 60 mm, H 20 mm;
- Test Conditions: Ambient temperature and atmospheric pressure;
- Observation Window: High-purity quartz, optical window diameter 30 mm;
- Electrodes: High-voltage electrode: 316 stainless steel; Low-voltage electrode: 316 ring electrode, copper wire;
- Focal Distance: Minimum 2 mm;
- Piping: PTFE tubing.

BATTERY IN-SITU CHARACTERIZATION SERIES

In situ XRD test cell for lithium batteries(Model: CIS-XRD-LB)

Product Introduction

The in-situ XRD test cell for lithium batteries is mainly used for online acquisition of XRD spectral data of electrode materials in lithium-ion reaction systems, enabling real-time and online observation of phase transitions during chemical reactions of lithium battery electrode materials.

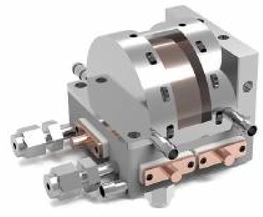
Product Parameters

- Cell Body Material: 316L Stainless Steel;
- Temperature: Ambient;
- Pressure: Atmospheric;
- Sample Types: All samples suitable for lithium battery materials, cathode and anode;
- Diameter: Φ≤16 mm;
- Separator Diameter: Φ≤20 mm;
- Detection Angle: 10° <2θ<100° .

High-Temperature Thermal Battery In-Situ XRD Cell(Model: CIS-XRD-HC)

Product Parameters

- Design Temperature: 500℃, heating rate 25 – 30℃/min, temperature difference between temperature measurement point and upper sample surface is approx. 20℃ – 60℃;
- Reaction Cell Pressure: Atmospheric;
- Cell Body Material: Cell body SUS316 electroplated;
- Window Material: Polyimide film;
- Battery Dimensions: Diameter 18 mm, thickness 2 mm (customizable);
- Temp Control Device: Custom temp controller, programmed control, touchscreen operation (software included);
- Water Cooling: 270W recirculating water chiller.



High and low temperature lithium battery XRD testing cell

Product Parameters

- Design Temperature: -150℃ to 100℃ / -30℃ to 100℃ , temp control accuracy ±1℃ , programmed control;
- Design Pressure: Atmospheric;
- Cell Body Material: 316 Stainless Steel;
- Sample Types: All samples suitable for lithium battery materials, cathode and anode diameter Φ≤16 mm;
- Separator Diameter: Φ≤19 mm;
- Cooling Method: Employs liquid nitrogen cooling, surrounding heat conduction heating to ensure sample temp uniformity;
- Test Window: Single-layer beryllium window;
- External Dimensions: Approx. 80 * 80 * 30 mm;
- Vacuum Evacuation: Yes, connected to vacuum pump via KF25 flange (other specs customizable);
- Includes: A temp-adjustable vacuum chamber, a temp controller, a set of in-situ XRD lithium-ion in-situ cells, and other components.

In-Situ Three-Electrode Aqueous Zinc-Ion Battery XRD Test Cell(Model: CIS-XRD-ZB)

Product Introduction

The in-situ three-electrode aqueous zinc-ion battery XRD test cell is mainly used for in-situ XRD testing and characterization of recirculating flow three-electrode aqueous zinc-ion batteries under ambient temperature and atmospheric pressure.

Product Parameters

- Design Temperature: Ambient;
- Design Pressure: Atmospheric;
- Cell Body Material: Cell cover SUS316L; cell body PEEK / PTFE;
- Window Material: Imported polyimide film (high-transmission quartz);
- Reference Electrode: Ag/AgCl electrode / Ag/Ag electrode / mercurous sulfate electrode / Hg/HgO electrode;
- Counter Electrode: Platinum sheet;
- Working Electrode: High-purity titanium electrode, test powder samples can be pasted onto the titanium electrode;
- Liquid Circuit: Enables circulating flow of gas and electrolyte.

In-situ Raman testing cell for fuel cell(Model: CIS-Raman-SOFC)

Product Parameters

- Design Temperature: Ambient to 600℃ (customizable ambient to 800℃ / customizable dual-chamber fuel cell);
- Design Pressure: Atmospheric to 1 MPa;
- Cell Body Material: Cell body SUS316 electroplated;
- Window Material: Sapphire window diameter 28 mm, thickness 1 mm (3 pcs);
- Temp Control Device: Custom temp controller, programmed control, touchscreen operation (software included);
- Gas Line Feature: Device equipped with gas inlet and outlet for gas flow, meeting negative pressure sample injection requirements (gas inlet adjustable/addable);
- Gas Terminal: SUS316 ferrule fitting 1/8 in;
- Water Cooling: 270W recirculating water chiller.

High and low temperature lithium Raman testing cell(Model: CIS-Raman-LB (-100-100))

Product Parameters

- Cell Body Material: 316 Stainless Steel;
- Design Temperature: -150℃to 100℃, temp control accuracy ±1℃, programmed control;
- Design Pressure: Atmospheric;
- Sample Types: All samples suitable for lithium battery materials, cathode and anode diameter Φ≤16 mm;
- Separator Diameter: Φ≤19 mm;
- Focal Distance: < 10 mm;
- Cooling Method: Employs liquid nitrogen or semiconductor refrigeration technology, surrounding heat conduction heating to ensure sample temp uniformity;
- Test Window: Double-layer quartz window, diameter 6 mm;
- External Dimensions: Approx. 130 * 90 * 35 mm;
- Vacuum Evacuation: Yes, connected to vacuum pump via KF25 flange (other specs customizable);
- Includes: A temp-adjustable vacuum chamber, a temp controller, a set of in-situ Raman lithium-ion in-situ cells, and other components.

High Temperature Thermal Battery Raman In Situ Cell(Model: CIS-Raman-TB)

Product Parameters

- Design Temperature: 500℃;
- Reaction Cell Pressure: Atmospheric;
- Cell Body Material: Cell body SUS316 electroplated;
- Window Material: Sapphire window diameter 28 mm, thickness 1 mm (3 pcs);
- Battery Dimensions: Diameter 18 mm, thickness 1.2 mm (customizable);
- Focal Distance: Approx. 5 mm;
- Temp Control Device: Custom temp controller, programmed control, touchscreen operation (software included);
- Water Cooling: 270W recirculating water chiller.

Lithium battery in situ Raman test cell(Model: CIS-Raman-LB)

Product Introduction

The lithium battery in-situ Raman test cell is mainly used for Raman spectral data acquisition of materials in lithium-ion reaction systems, enabling research on electrode structures during chemical reaction processes of lithium battery electrode materials.

Product Parameters

- Cell Body Material: 316L Stainless Steel / TA2 / 3003A1;
- Temperature: Ambient;
- Pressure: Atmospheric;
- Sample Types: All samples suitable for lithium battery materials, cathode and anode diameter Φ≤16 mm;
- Separator Diameter: Φ≤20 mm;
- Focal Distance: < 8 mm, meeting test requirements of mainstream Raman spectrometers on the market, customizable as needed;
- Window: Quartz window, diameter ≥6 mm, customizable per customer request.

Lithium air battery in situ Raman test cellModel: CIS-Raman-LBK)

Product Introduction

The lithium air battery in situ Raman test cell is primarily used for online acquisition of Raman spectral data of the air electrode during charging and discharging processes of lithium-air batteries, enabling real-time, online monitoring of phase transitions during chemical reactions of air electrode materials.

Product Parameters

- Cell Body Material: 316L Stainless Steel;
- Temperature: Ambient;
- Pressure: Atmospheric;
- Applicability: Suitable for lithium-air battery testing systems, ensuring normal application of lithium-air batteries, etc.;
- Gas Line Design: Gas ports are provided on both sides of the cell body to facilitate gas control during experiments;
- Focal Distance: < 8 mm, meeting test requirements of mainstream Raman spectrometers on the market;
- Window: Quartz window, diameter > 6 mm, customizable per customer requirements.

Li-sodium battery ultraviolet electrolyte test cell(Model: CIS-UV-LB)

Product Parameters

- Design Temperature: Ambient;
- Design Pressure: Atmospheric;
- Cell Body Material: PEEK + quartz + PTFE;
- Cell Dimensions: 26 * 26 * 66 mm;
- Sample Type: Square shape, size < 10 * 8 mm;
- Features: The reaction cell can test changes in UV spectral data in situ during charging and discharging, specifically for in-situ characterization of lithium-sulfur battery electrolytes.

(Solid-state) in situ AFM battery(Model: CIS-AFM-LB)

Product Introduction

The (solid-state) in-situ AFM battery is mainly applied to in-situ AFM characterization of electrode materials in solid-state lithium battery systems. After solid-state lithium battery materials undergo argon ion beam cross-section polishing, in-situ AFM testing and performance testing can be conducted without disassembling the cell.

Product Parameters

- Cell Body Material: PEEK;
- Design Temperature: Ambient;
- Design Pressure: Atmospheric (customizable pressure);
- Current Collector Material: Titanium alloy, brass (customizable material);
- Sample Types: All samples suitable for solid-state lithium battery materials;
- Dimension Parameters: Internal PEEK cell design dimensions 10 * 9 * 3 mm, positive/negative electrode dimensions 5.5 – 6.5 mm.

In situ AFM on Water-based Battery(Model: CIS-AFM-ZB)

Product Introduction

The in-situ AFM cell for water-based batteries is mainly used for in-situ AFM characterization of electrode materials in water-based battery systems, enabling online visualization studies of interfacial morphology evolution. The AFM probe needs to penetrate into the liquid to measure the surface morphology of the electrode.

Product Parameters

- Cell Body Material: PEEK + stainless steel;
- Design Temperature: Ambient;
- Design Pressure: Atmospheric;
- Cell Height: 8 mm;
- Electrode Material Diameter: Φ ⩽22 mm.

Lithium battery in-situ XAFS test cell(Model: CIS-XAFS-LB)

Product Introduction

The lithium battery in-situ XAFS test cell features X-ray penetration windows on both the top and bottom. During charging and discharging, X-rays can enter the interior of the product in a vertical direction through the windows to monitor phase changes of battery materials in real time, allowing a deeper understanding and analysis of experimental phenomena and influencing factors.

Product Parameters

- Cell Body Material: 316L Stainless Steel / TA2 / 3003A1;
- Temperature: Ambient;
- Pressure: Atmospheric;
- Sample Size: Electrode sheet ⩽ Φ16 mm, separator ⩽ Φ19 mm;
- Applicable Scope: All samples suitable for lithium battery materials;
- Cell Dimensions: ≈ Φ46*16 mm.

Lithium batteries in situ high and low temperature XAFS transmission test cell (Model: CIS-XAFS-LB (-180-80°C))

Product Introduction

The reaction cell adopts a coin-cell-mimicking structural design, applied to in-situ synchrotron radiation testing and characterization of lithium (sodium) electrode materials during charge-discharge processes at -180° C to 80° C under atmospheric pressure.

Product Parameters

- Design Temperature: -180℃ to 80℃;
- Design Pressure: Atmospheric;
- Cell Body Material: SUS316;
- Sample Types: Samples for conventional lithium battery materials, positive and negative electrode diameter Φ ⩽16 mm;
- Separator Diameter: Φ ⩽19 mm;
- Cell Dimensions: 80 * 43 * 80 mm.

In situ XAFS testing pool for fuel cells(Model: CIS-XAFS-PEMFC)

Product Introduction

The fuel cell in-situ XAFS test cell features X-ray penetration windows (graphite) on both the top and bottom. During charging and discharging, X-rays can enter the interior of the product in a vertical direction through the windows to monitor phase changes of battery materials in real time, allowing a deeper understanding and analysis of experimental phenomena and influencing factors.

Product Parameters

- Cell Body Material: 316 Stainless Steel + copper + graphite (customizable with other materials);
- Temperature: Ambient to 80℃ (customizable temperature);
- Pressure: Atmospheric (customizable pressure);
- Gas Chamber: Dual inlet & dual outlet, dual gas chamber;
- Electrodes: Dual-electrode, customizable to three-electrode, four-electrode, etc.;
- Cell Dimensions: Customized dimensions.

Zinc-air in-situ three-electrode XAFS reaction cell

Product Parameters

- Design Temperature: Ambient;
- Reaction Cell Internal Pressure: Atmospheric;
- Material: PEEK;
- Window Material: Kapton film;
- Sample Loading Method: Magnetic attachment;
- Electrode System: Three-electrode system.

Solid-State battery XRD test cell(Model: CIS-XRD-SSB)

Product Introduction

The reaction cell features a button-cell-mimicking structural design, applied to in-situ XRD testing and characterization of solid-state electrode materials under ambient temperature and 0 – 30 MPa pressure (customizable to higher pressure) during charge-discharge cycling processes.

Product Parameters

- Design Temperature: Ambient (customizable temperature);
- Design Pressure: Atmospheric pressure (air pressure);
- Cell Body Material: SUS316, PEEK;
- Sample Types: All samples suitable for solid-state battery materials, cathode/anode diameter ≤ 10 mm;
- Solid Electrolyte Diameter: Φ ≤ 10 mm;
- Detection Angle: 10° <2θ<100° ;
- Cell Dimensions: Diameter approx. 60 mm, height approx. 23 mm, sample height 20.5 mm.

Solid state button battery testing fixture(Model: OPR-SE-01)

Product Introduction

The solid-state button battery testing fixture is a mechanical fixture specifically designed to secure solid-state battery or liquid battery test kits and apply pressure to the battery. It can also be paired with weights and thickness gauges to measure the expansion pressure and swelling rate of solid-state battery materials.

Product Parameters

- Fixture Material: Manufactured from stainless steel;
- Material: Seals made of PEEK material, O-rings rubber-based, other materials selectable;
- Standard Specs: Φ10 mm, customizable for other dimensions;
- Central Space: 90 mm L * 70 mm W * 120 mm H, fixture dimensions customizable per customer request;
- Outer Fixture Dimensions: Φ90 mm×150 mm H;
- Maximum Pressure: 150 MPa.

TEM in-situ liquid system(Model: CIS-TEM-LC)

Product Introduction

Employs two high-strength titanium alloy plates as top/bottom cover plates for the sample slot, paired with perfluoroelastomer (FFKM) O-rings for auxiliary sealing. Simultaneously uses two silicon oxide chips as the liquid cell, encapsulating liquid within the silicon oxide membrane to enable liquid sample observation in transmission electron microscopy (TEM).

Product Parameters

- Compatibility: Compatible with TEM vacuum levels;
- Liquid Zone Membrane Thickness: Minimum 100 nm;
- Sample Loading Capacity: Capable of loading liquid samples;
- Pressure Resistance: Capable of withstanding 1 atm inside the cell;
- Vacuum Adaptability: Meets electron microscope vacuum requirements outside the cell.

In-situ lithium dendrite observation system

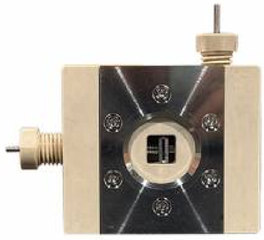
In-situ Microscopic Observation Cell Series

Product Parameters

- Material: Quartz;
- Volume: Approx. 5 mL;
- Electrode Material: Pure titanium;
- Electrode Spacing: 3 mm;
- Outer Casing: PTFE, sealed with FKM rubber;
- Application: Suitable for zinc-zinc batteries.

Model: CIS-OM-002

Model: CIS-OM-003



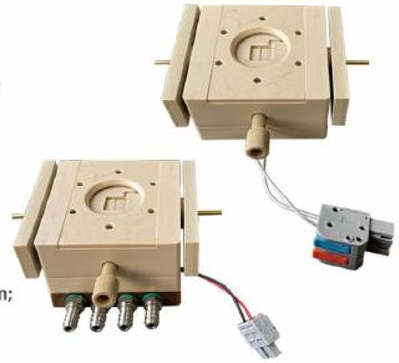
Model: CIS-OM-003-1

Product Parameters

- Material: PEEK;
- Electrode: High-purity titanium electrode standard (customizable with other materials);
- Window Material: Quartz;
- Functional Features: Features gas-pushing capability, supports online liquid addition;
- Sealability: Excellent;
- Optical Window Diameter: 24 mm;
- Minimum Working Distance: 1 mm;
- Sample Space Dimensions: 10 * 10 mm rectangle, thickness applicable range: 0.6 – 2 mm;
- Applicable Scope: Various secondary batteries;
- CIS-OM-003: Optional pressurized solid-state dendrite testing module available, max pressure 60 kg (6 MPa), customizable for higher pressure;
- CIS-OM-003-1: Can be placed horizontally or inverted to reduce manual operation bubbles and satisfy cavity battery testing.

Product Parameters

- Material: PEEK;
- Electrode: High-purity titanium electrode standard (customizable with other materials);
- Window Material: Quartz;
- Sealability: Excellent;
- Functional Features: Features gas-pushing capability, supports online liquid addition;
- Optical Window Diameter: 24 mm;
- Minimum Working Distance: 1 mm;
- Sample Space Dimensions: 10 * 10 mm rectangle, thickness applicable range: 0.6 – 2 mm;
- Overall Thickness: ⩽35 mm;
- Temperature Control Range: -30℃ to 150℃ (customizable for other temperatures);
- Temperature Control Accuracy: ±1℃;
- Applicable Scope: Various secondary batteries;
- Control Method: Programmed control (bottom cooling stage and heating stage are independent structures, swapped as needed without affecting observation cell sealability);
- Optional pressurized solid-state dendrite testing module available, max pressure 60 kg (6 MPa), customizable for higher pressure.



Model: CIS-OM-004
(High and Low Temperature In-Situ Cell)

Model: CIS-OM-005

Product Parameters

- Design Temperature: -100° C to 100° C (split cooling and heating units);
- Design Pressure: Atmospheric pressure, positive and negative pressure;
- Cell Body Material: PEEK + copper;
- Cell Body Dimensions: Approx. 60 * 70 * 50 mm;
- Sample Types: Lithium battery materials (liquid lithium batteries or polymer batteries),
- cathode/anode separator dimensions all smaller than 10 * 10 mm;
- Focal Distance: < 2 mm;
- Window: Quartz window, diameter 10 mm.

Dendrite Observation Optical System (Model: OPR-DM01)

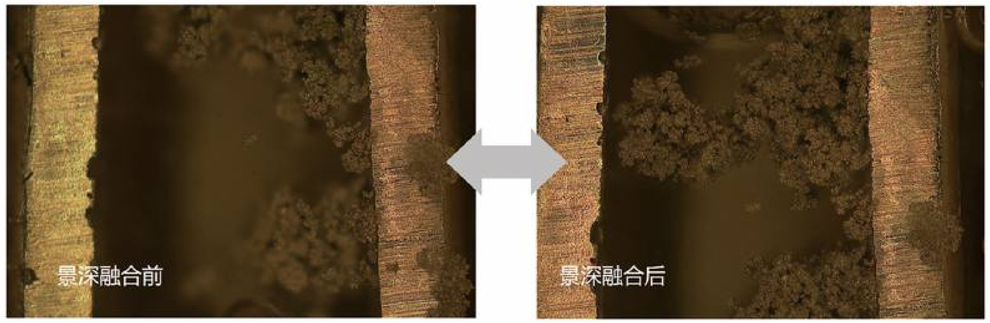
The standard is equipped with a special stage for dendrite observation, as well as a number of special fixtures with different functions, which can be applied to a variety of different specifications of electrolytic cells.

Category / Component	Parameter / Specification
Optical System	Excellent microscope objective optical system
Zoom Objective	Continuous zoom objective, magnification 0.7–4.5X, working distance 82–179 mm, detent zoom: 0.7, 0.8, 1.0, 1.5, 2.0, 3.0, 4.0, 4.5X
Microscope Objective	Plan achromatic objective 10X
	Plan achromatic objective 20X
	Plan achromatic objective 40X
	Plan achromatic objective 50X
Objective Nosepiece	Four-hole manual nosepiece
Focusing Mechanism	0.01 mm fine adjustment, coarse/fine coaxial adjustment, bilateral handwheel operation
Translational Stage	Dimensions 140 * 140 mm, travel range 75 * 50 mm
Observation Head	Erect image trinocular head, 30° inclination, bilateral diopter adjustment, camera compatible, beam split ratio 80:20
Light Source	High-brightness LED reflected light source system specifically designed for electrochemical structure research
Camera Adapter	0.5X C-mount adapter
Camera	UI520, SONY CMOS, 16 Mpx (1/2.3" CMOS)

Application-Oriented Software Processing Features

Depth of Field Fusion

Acquires multiple images at different focal distances through fine focus adjustment, and merges them into a single output image. Suitable for samples requiring a specific depth of field or poorly prepared samples.

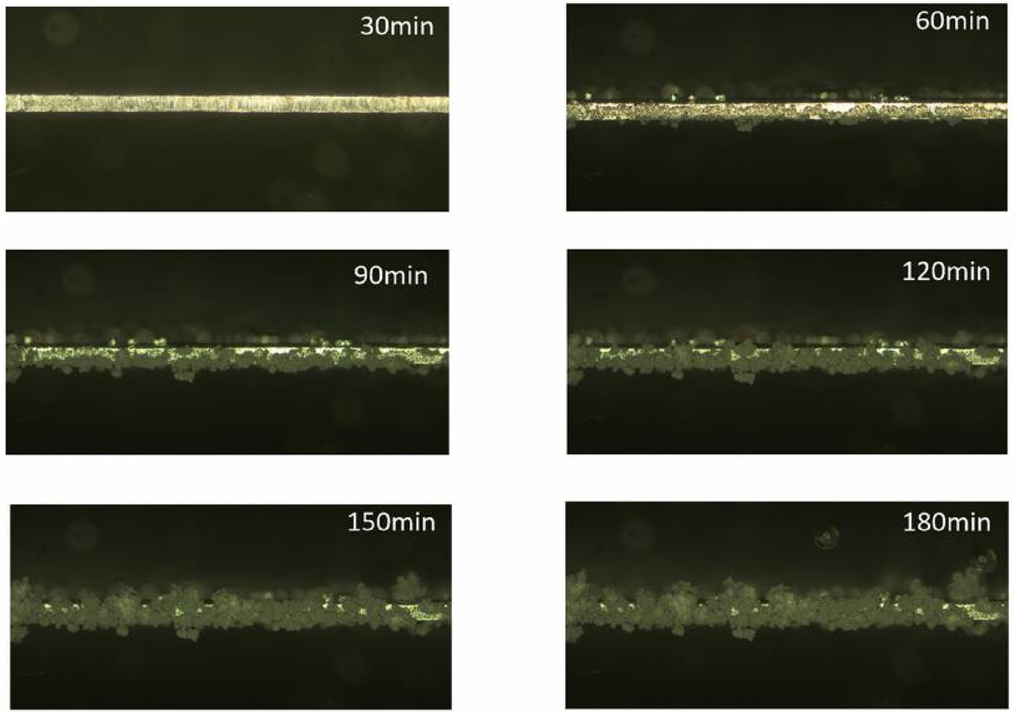


Before depth of field fusion

After depth of field fusion

Time-Lapse Photography

Full-resolution video recording consumes massive computer memory. Time-lapse photography allows arbitrary setting of total frame count, interval time, and delay time, which ensures image resolution while freeing up computer memory.

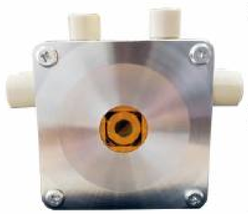


SYNCHROTRON RADIATION IN-SITU DEVICE SERIES

Heterogeneous photocatalytic in situ XAFS reaction cell (Model: CIS-XAFS-PEC)

Product Introduction

Mainly used for in-situ XAFS data collection during photocatalysis, electrocatalysis, and photoelectrocatalysis reaction processes. Integrating light, electricity, and other multi-external field conditions, this reaction cell can perform multiphase catalytic reactions such as liquid-phase, gas-phase, and solid-phase, including photo(electro)catalytic degradation of VOCs, water splitting, CO_2 reduction, nitrogen fixation, etc.



Product Parameters

- Interfaces & Controls: Device equipped with electrode interfaces, gas inlets/outlets, and control components to introduce various related experimental conditions;
- Customization: Reaction volume, electrodes, and gas interfaces customizable according to customer needs;
- Compatibility: Small cell volume, easy to couple with synchrotron radiation beamlines, easy operation, compatible with benchtop systems such as QD, Chuangpu, etc.;
- Gas Path Control: Provides gas path control units tailored for photo(electro)catalytic VOCs degradation reactions;
- Liquid Layer Adjustment: Adjustable liquid layer thickness for liquid-phase reactions like water splitting (liquid layer absorbs X-rays);
- Product Analysis: Provides mini chromatography for reactions like VOCs degradation, water splitting, CO_2 reduction, N_2 fixation, allowing detection of various gas products during XAFS analysis.

High temperature and high pressure XAFS reactor (Model: CIS-XAFS-SD)

Product Introduction

The high-temperature and high-pressure XAFS reactor can be coupled with beamlines such as BSRF (Beijing Synchrotron Radiation Facility), SSRF (Shanghai Synchrotron Radiation Facility), SSLS (Singapore Synchrotron Light Source), etc., enabling in-situ online XAFS testing of samples under high-temperature and high-pressure environments. Test modes include transmission mode and fluorescence mode.

Product Parameters

- Process Control: Enables gas flow and temperature control during testing;
- Temperature & Flow Control: Gas flow rate controlled via mass flow controller, heating via heating rods, temperature controlled by high-precision touchscreen temp controller;
- Max Temperature: 600℃;
- Max Pressure Resistance: 3 MPa.

High-temperature XAFS transmission reaction cell (Model: CIS-XAFS-T6-V1.0.0)

Product Introduction

The high-temperature XAFS transmission reaction cell can be coupled with beamlines such as BSRF (Beijing Synchrotron Radiation Facility), SSRF (Shanghai Synchrotron Radiation Facility), SSLS (Singapore Synchrotron Light Source), etc., or paired with benchtop XAFS, enabling in-situ online XAFS testing of samples under high-temperature and atmospheric pressure environments. Test mode is transmission mode.

Product Parameters

- Material: Hastelloy;
- Window: Beryllium window (14 * 0.3) / polyimide film;
- Target Temperature: 600° C (heating rod heating);
- Sample Preparation: Pressed pellet sample, diameter 13.00 mm, thickness 1.00 mm;
- Reaction Cell Internal Pressure: Atmospheric pressure.

High Temperature Transmission-Fluorescence Dual Mode XAFS Cell (Model: CIS-XAFS-TFM-PC-T1000)

Product Introduction

The high-temperature transmission-fluorescence dual-mode XAFS cell can be coupled with beamlines such as BSRF (Beijing Synchrotron Radiation Facility), SSRF (Shanghai Synchrotron Radiation Facility), SSLS (Singapore Synchrotron Light Source), etc., enabling in-situ online XAFS testing of samples under high-temperature and atmospheric pressure environments. Test modes include transmission mode and fluorescence mode.

Product Parameters

- Material: Quartz;
- Volume: Approx. 5 mL;
- Electrode Material: Pure titanium;
- Electrode Spacing: 3 mm;
- Outer Casing: PTFE, sealed with FKM rubber;
- Application: Suitable for zinc-zinc batteries.

GENERAL INSTRUMENTS / CUSTOMIZED REACTION TANK

High Temperature -800°C Four-Probe Station

Product Introduction

The High Temperature (-800℃) Four-Probe Station integrates high-temperature precision temperature control, vacuum environment, and gas atmosphere protection into a multi-functional electrical testing platform. It can function independently as a probe testing system to complete basic electrical tests, and can also be flexibly coupled with microscopes, spectrometers, and other optical instruments to enable in-situ photo-electric collaborative testing. It is widely applied for characterization of various electrical properties of semiconductor materials, thin film devices, micro-nano electronic devices, etc., under high-temperature, vacuum, and controllable gas atmosphere conditions.

Product Parameters

- Temperature Range: Room temperature to 800℃;
- Temperature Control Method: PID precision temp control, programmable heating, supports variable heating rate settings and programmed heating curves;
- Temperature Stability: ±0.1℃;
- Vacuum Chamber Body: Sealed chamber body design, supports vacuum pumping and protective gas backfilling;
- Probe Material: Tungsten / gold-plated tungsten pin;
- Probe Mobile Stage (XYZ Travel): Travel distance and movement precision customizable;
- Probe Interface: BNC/SMA connector, triaxial interface optional (supports pA-level weak current testing);
- Sample Stage Size: 32 mm × 32 mm (customizable).

In-Situ High-Temperature Transmission Tensile Stage

Product Parameters

- Heating/Cooling Method: Resistance heating.
- Temperature Control Range: Ambient to 500℃.
- Temperature Stability: ±0.1℃.
- Temperature Control Rate: 50℃/min.
- Sample Stage: Copper; 44mm × 20mm.
- Top Window Size: φ40mm × 2mm.
- Window Material: Calcium fluoride (CaF_2) window, manually detachable and replaceable.
- Distance from Top Window Surface to Sample Stage Top Surface: 14mm.
- Sample Chamber Height: 2mm.
- Tensile Force: 0 – 2000N; Accuracy: 0.5% F.S.
- Displacement Range: 30mm.
- Tensile Speed: 2 – 800 μm/s.
- Mechanical Modes: Tension and Compression.
- Chamber Type: Controlled Atmosphere.
- Dimensions: 300mm × 170mm × 77mm.
- Net Weight: 4.5kg.
- Standard Configuration: In - situ high - temperature transmission tensile stage × 1, integrated controller × 1, recirculating water chiller × 1, connecting cables, piping, accessories, etc.
- Optional Accessories: Adapter plate / customized recirculating water chiller / customized temperature control software, etc.

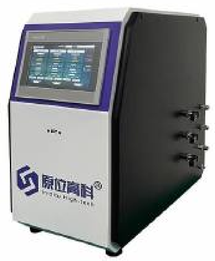
Air mixing plant

Product Introduction

The air mixing plant is primarily used to provide gas atmosphere environments, applicable to tube furnaces, in-situ reaction cells, etc.

Product Parameters

- Gas Channels: Supports 1 – 6 channels of gas mixing, gas type for each channel is replaceable (corrosive gas customizable);
- Touchscreen Control: Rapid setting of gas type and flow rate for each channel, with direct output of real total flow rate after mixing;
- Data Processing: Processes data, generates tables and curves, supports data download;
- User-Friendly: Saves time and effort for researchers, device operation is simple and fast.



Molecular pump group/vacuum system(Model: CIS-JZ-80G)

Product Introduction

The molecular pump group / vacuum system is a high-vacuum acquisition device. It consists mainly of a molecular pump, mechanical pump, vacuum measurement system, and electrical control system. The equipment connects via standard stainless steel KF interfaces and features touchscreen operation and display, high ultimate vacuum, fast response time, and convenient operation.

Product Parameters

- Power Supply: AC 220V 50/60Hz;
- Power: 1 kW;
- Ultimate Vacuum: 9×10⁻⁵ Pa (without load);
- Pumping Speed: 85 L/s;
- Pumping Interface: KF25;
- Operating Temperature: 5 – 32℃;
- Touchscreen Control: One-key start/stop control, simple and convenient operation;
- Multi-Mode Switching: Supports multiple operation modes to meet distinct vacuum requirements;
- High Vacuum: Ultimate vacuum up to 9×10⁻⁵ Pa, meeting most vacuum usage requirements;
- Data Export: Full process data exportable.

Gas diffusion cell

Product Parameters

- Internal Dimensions: 10×10×15 mm;
- Sample Contact Area: 10×10 mm;
- Product Materials: PTFE, acrylic, PEEK, titanium, etc., customizable per user requirements;
- Product Description: Can be used in conjunction with a three-electrode electrochemical workstation to perform performance testing for CO_2 electrocatalytic reduction. Equipped with a chromatograph, online activity detection of CO_2 electrocatalytic reduction can be realized; can also be used jointly among the chromatograph, electrochemical workstation, and cell.

High-low Temperature Fluorescence Constant Temperature Cell (Model: CIS-LiqPL-LT(-70)-HT400)

Product Introduction

The high-low temperature fluorescence constant temperature cell can be paired with fluorescence instruments (Model: FluoroMax+), meeting real-time spectral monitoring needs for scenarios such as material synthesis, catalytic reactions, biomolecular conformational changes, etc. It combines dual functions of temperature gradient experiments and steady-state fluorescence signal acquisition.

Product Parameters

- Temperature: -70℃ to 400℃;
- Pressure: 1×10⁻³ Pa (molecular pump) to atmospheric pressure;
- Gas Ports: Two gas inlets;
- Cooling: Liquid nitrogen;
- Compatibility: Compatible with various UV spectrometers on the market.

EPR reaction tank(Model: CIS-EPR-EC)

Product Introduction

The EPR reaction cell consists of a flat cell, quartz cell, connecting parts, cell lid, and other components. It is equipped with a silver-silver chloride electrode as the reference electrode, a platinum wire electrode as the working electrode, and a platinum sheet electrode as the counter electrode. The reaction cell can be applied to in-situ EPR testing and characterization of three-electrode electrochemical reactions.

Transient Absorption Spectroscopy Cell

Product Introduction

The transient absorption spectroscopy cell is a reaction device assembled from materials such as stainless steel and quartz to measure transient absorption spectral signals under thermal catalysis low-pressure processing conditions.

Product Parameters

- Design Temperature: 300℃;
- Design Pressure: 0.3 MPa;
- Cell Body Material: Stainless steel 316, 310S;
- Window Material: Quartz;
- Gas Line Feature: Device equipped with gas inlet and outlet for gas flow;
- Injection Port: Device features a sample injection port, enabling injection under high-temperature environments;
- Glass Slide: 25×40 mm L × W, thickness 1 mm;
- Gas Terminal: Ferrule fitting;
- Basic Dimensions: Rectangular cell body 100×60×84 mm.

Battery complete solution

To meet the diverse needs of solid-state battery researchers, Hefei OPR Instruments Technology Co., Ltd. combines the three most common battery fabrication schemes (button cell, pouch cell, and cylindrical cell) with four solid-state electrolyte preparation methods (sol-gel, solid-state synthesis, mechanical synthesis, and electrospinning/tape casting). Relying on the company's signature hot-press Joule heating device and in-situ battery characterization laboratory, it can prepare all-solid-state, semi-solid-state, and various conventional lithium-ion batteries, providing complete solutions from raw material synthesis and battery assembly to mechanism research.

Pouch cell pilot testing scheme

Button cell fabrication scheme

Cylindrical cell pilot testing scheme

Preparation scheme for button battery

Preparation scheme for soft-pack battery

Fabrication of Cylindrical Cell battery

Pilot Line Solutions

Pilotscale experiment scheme of soft pack battery

Pilotscale experiment scheme of aluminum battery

Pilotscale experiment scheme of cylinder battery