

WORLD'S FIRST FULLY INTEGRATED EC-RAMAN SYSTEM

RAMSITU EC-RAMAN MICROSCOPE

Simultaneous electrode morphology, Raman spectra, and electrochemical signals — from the **same spot, same time**.
Factory-aligned. Glove-box ready. Zero spatial drift.



≤4

CM⁻¹
RESOLUTION

3

SIGNALS AT
ONCE

±10V

ELECTROCHEMICAL

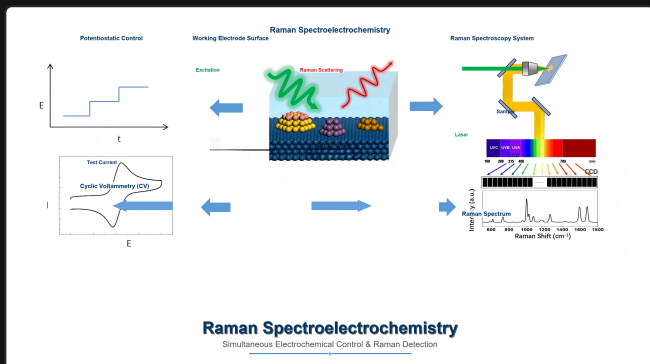
<2μm

AUTO-
POSITIONING

WORKING PRINCIPLE

HOW RAMSITU WORKS

RamSitu integrates Raman spectroscopy, optical microscopy, and a built-in electrochemical workstation into one factory-aligned platform. The excitation laser targets the electrode surface; scattered Raman photons and electrochemical signals are acquired simultaneously at the exact same point — no drift, no alignment uncertainty.



RESEARCH DOMAINS

APPLICATION FIELDS

Designed for advanced electrochemical and materials research:

- ♦ **Battery & Energy Storage** — Monitor SEI formation, electrolyte decomposition, and electrode interfaces in real-time during charge/discharge cycles.
- ♦ **Catalysis & Electrochemistry** — Track reaction pathways and surface intermediates with synchronized EC-Raman measurements.
- ♦ **2D & Novel Materials** — Characterize graphene, MoS₂, and layered materials with micron-scale spatial precision.
- ♦ **Corrosion Science** — In-situ characterization of passivation films and corrosion products at metal surfaces.
- ♦ **Pharmaceutical Polymorphs** — Rapidly identify crystal forms and ensure batch consistency.
- ♦ **Life Sciences** — AI-powered automated screening of bacteria and single cells.



SAME-SPOT TRIMODAL

Optical, Raman & electrochemical signals co-registered from the exact same electrode location.



MAGNETIC CELL

Plug-and-play magnetic cell — no manual wiring, eliminates runaway risk.



AI AUTO-POSITIONING

AI particle recognition and auto-positioning to <2 μm for unattended batch operation.



GLOVE BOX READY

Compact design fits standard glove boxes (Ar, N₂) for air-sensitive handling.

INSTRUMENT & SPECIFICATIONS

Research-grade Raman. Compact integrated design.



RAMAN MICROSCOPE MODULE

Grating	1800 grooves/mm, rotatable
Cooling	Two-stage cooling, < -20°C
Spectral Resolution	Better than 4 cm ⁻¹ (@1800 g/mm)
Signal-to-Noise Ratio	5000:1
Microscope	Upright reflected-light, built-in LED, bright-field, 8 MP camera
Objectives	5-position turret: 10×, 50×, 100×

TRANSLATION STAGE

Travel Range	≥ 75 × 50 × 50 mm (X/Y/Z)
Minimum Step	≤ 0.05 μm
Accuracy	±1 μm
Imaging Resolution	Better than 1 μm

ELECTROCHEMICAL WORKSTATION

Voltage Range	±10 V
Voltage Accuracy	0.1% * FS ± 1 mV
Potential Acquisition Error	0.2% * FS ± 2 mV
Current Range	±250 mA
Current Accuracy	0.1% * FS
Current Acquisition Error	±0.2% * FS
Reference Input Impedance	> 1 × 10 ¹² Ω
Cell	Matching magnetic spectral electrolysis cell

SYSTEM

FEATURED MODULES

Four integrated capabilities in one platform.

🔗 Deep EC-Raman Integration

Synchronous acquisition of morphology, Raman spectra, and electrochemical data. Acquisition delay ≤100 ns — supports CV, potential step, and transient characterization.

🤖 Automated Intelligent Algorithm

Image recognition, auto-focus, and auto-positioning for micron-sized particles. One-click batch analysis with intelligent noise reduction and baseline correction.

🧲 Magnetic Electrochemical Cell

Plug-and-play cell with magnetic adsorption — no manual wiring, eliminates runaway risk, and reduces signal noise from cable mechanical stress.

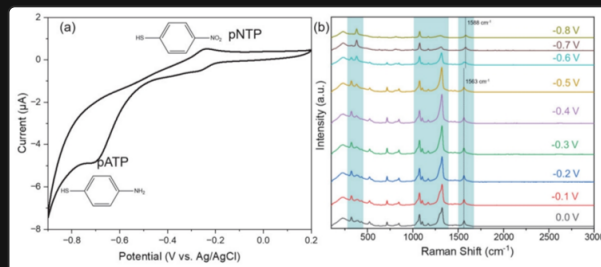
💻 Unified Software Platform

Microscopy + Raman imaging + electrochemical modules in one interface. Real-time data display directly correlates applied potential with spectral response.

APPLICATION CASE STUDIES

pNTP Electroreduction on Au Nanoparticles

Potential-controlled in-situ SERS tracking of p-nitrothiophenol (pNTP) electroreduction to p-aminothiophenol (pATP) on gold nanoparticles. As potential shifts negative (0 → -0.5 V), the nitro peak (~1330 cm⁻¹) decays while the amino peak (~1593 cm⁻¹) grows, perfectly matching the CV reduction window.



Zn Battery Anode Interface (Roughened Cu)

In-situ SERS on roughened Cu working electrode in Zn-based electrolyte. Real-time tracking across charge/discharge potentials (0.1 V ~ -0.3 V) reveals electrolyte decomposition products and interfacial layer evolution at the molecular level.

Intelligent Particle Particle recognition + auto-positioning, accuracy <2 μm

Software EX-Raman control & analysis software

Dimensions 33 × 62 × 48 cm

LASER OPTIONS

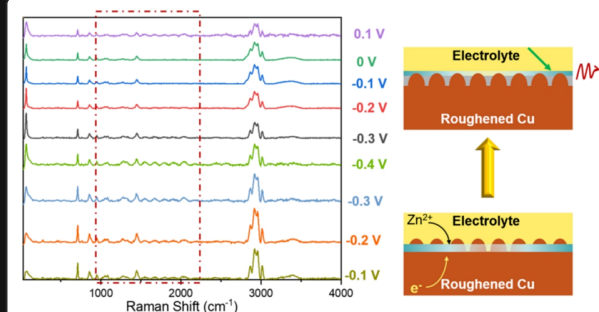
532 nm TEM₀₀ mode, ≥ 100 mW; 170–3900 cm^{-1}

633 nm TEM₀₀ mode, ≥ 30 mW; 170–3900 cm^{-1}

785 nm TEM₀₀ mode, ≥ 100 mW; 170–3400 cm^{-1}

RAMSITU VS. CONVENTIONAL

Capability	RamSitu	Conventional
Integration	Single factory-aligned unit	3+ separate instruments
Spatial Correlation	Exact same spot by design	Drift & uncertainty
Setup Time	Same-day operation	Weeks of alignment
Glove Box	Fits standard glove box	Bulky, incompatible
EC Control	Built-in, synchronized	External, manual trigger
Automation	AI-driven, unattended	Manual, operator-dependent



► EC Interface Analysis

► Battery Material Characterization

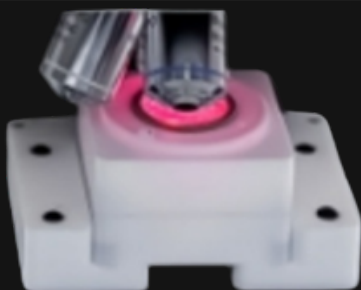
► Catalysis Reaction Mechanism

► Corrosion Science

► SEI Formation Monitoring

► pNTP Electroreduction Tracking

PATENT-PROTECTED MAGNETIC CELL DESIGN



- 1. Magnetic Adsorption Design** — No manual wiring required. The cell attaches magnetically to the instrument base, enabling instant, tool-free installation and removal.
- 2. Prevents Electrochemical Runaway** — Eliminates wiring errors that can cause uncontrolled electrochemical reactions, short circuits, or instrument damage.
- 3. Noise-Free Signal** — Avoids mechanical stress and vibration from cable clips and alligator clamps, ensuring cleaner electrochemical and Raman data acquisition.