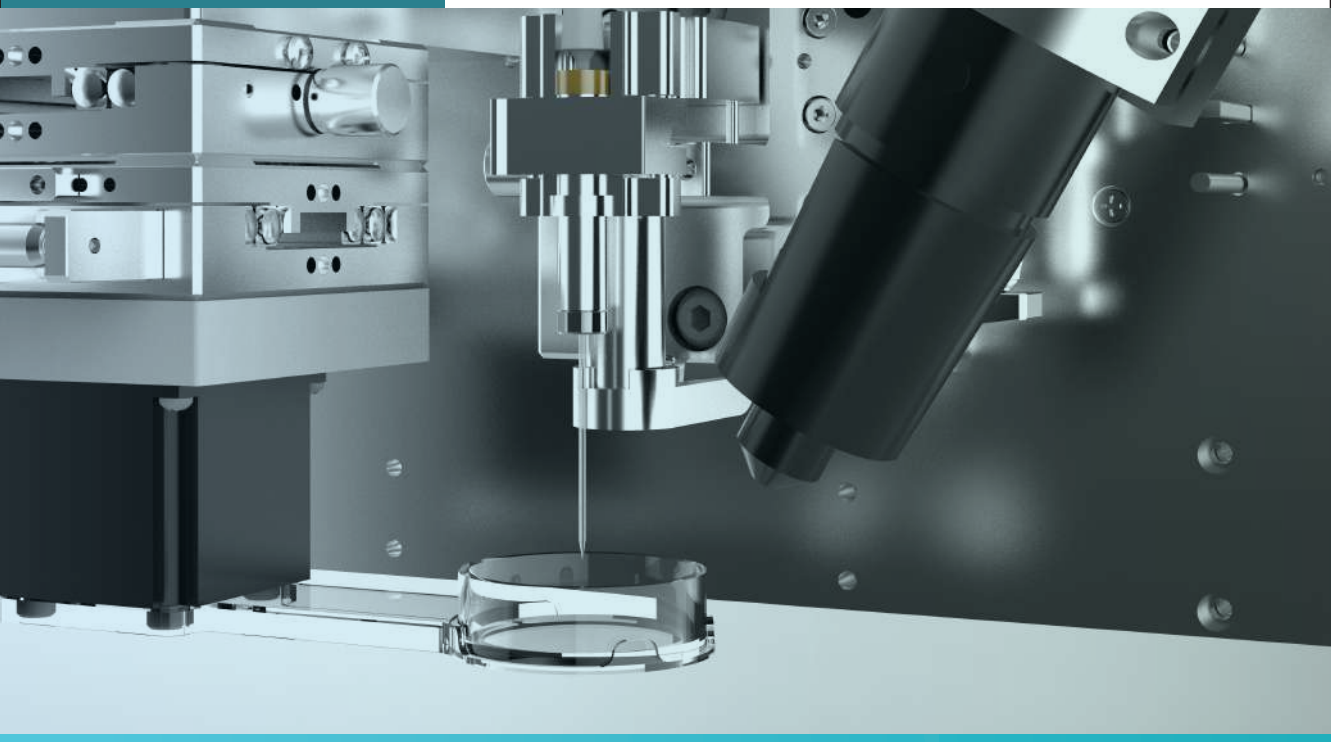
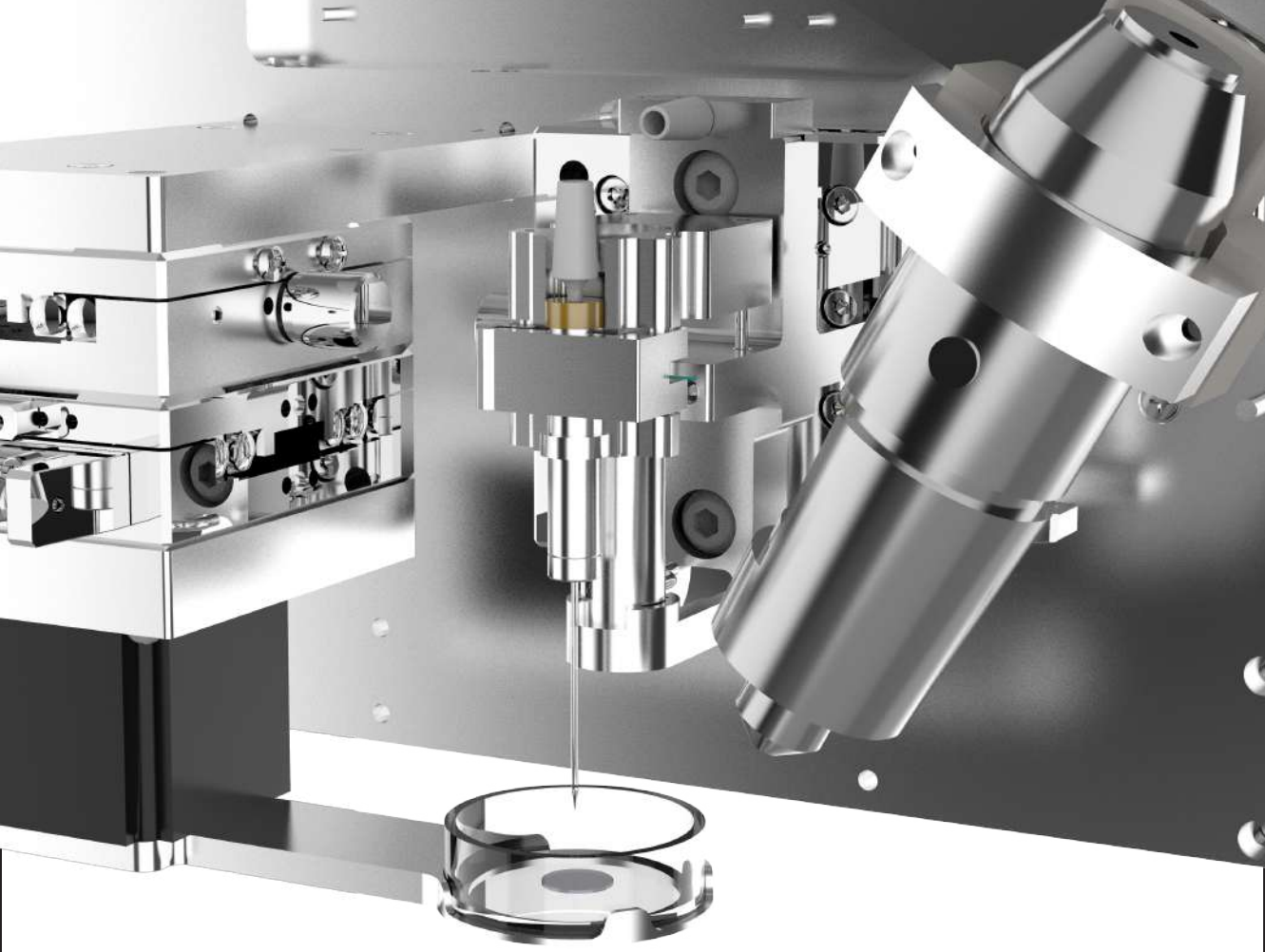
Eaglenos



DUALSCOPE 100

Nanoscale Scanning Electrochemical Analytical System

Your Premier Partner for Customized Electrochemical Surface Studies



TECHNOLOGY FEATURES

Acquisition of multiplex information

High-resolution 3D co-imaging of material surface morphology and electrochemical parameters.

Integration of multiple scanning imaging modes

Switch seamlessly between SICM, SECCM, and SECM modes to cater to varied sample testing needs—whether solid materials or solutions, scanning is possible in liquid or air mediums.

High spatial resolution

A fully solid-state scanning mode with XY spatial resolution of 20nm and Z spatial resolution of 5nm provides accurate imaging results.

Fast and precise positioning system

A linear positioning system based on advanced piezoelectric motors provides long working distances within a compact footprint.

High flexibility and customizability

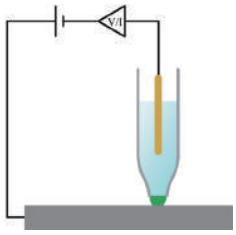
An open system with modular design allows tailored customization for researchers, integrating third-party instruments such as fluorescence and electrochemical luminescence to adapt to evolving research interests and experimental needs.

BASICS

Characterization of electrochemical materials has advanced to the micro- and nanoscale, but studying the 3D co-localized imaging of electrochemical properties and morphology under in-situ conditions with nanometer-level resolution remains challenging. Our nanoscale scanning electrochemical analytical system, inspired by SECCM, SICM, and SECM principles, features high-sensitivity current detection, super-resolution piezoelectric motion, and precise feedback control. This enables high spatial-resolution imaging of electrochemical and optical properties, as well as 3D morphology of electrode materials. A powerful tool for understanding electrochemical processes and material screening.

SECCM

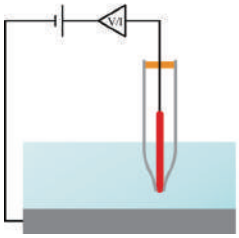
Scanning Electrochemical Cell Microscopy (SECCM) uses nanoscale liquid droplets or solid-state nanospheres on the probe tip to form tiny electrochemical cells with the sample. This allows for nanoscale measurements of electrochemical activity even without a liquid environment.



- 3D imaging of morphology and electrochemical properties
- Microscale surface fabrication and modification
- Super-resolution imaging of electrocatalytic reactions
- Material transfer at interfaces, Ultra-miniature sensor capabilities

SECM

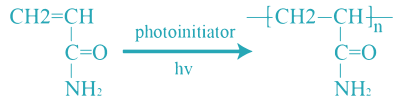
Scanning Electrochemical Microscope (SECM) immerses an ultramicrodisk electrode capable of 3D movement as the working probe in an electrolyte solution. Positioned a few micrometers away from the substrate, it characterizes substrate morphology and properties by monitoring current changes at the probe.



- Corrosion process evaluation
- In situ analysis of battery materials

Solid-state electrolyte probes enhance spatial resolution in intricate surroundings

Introducing solid-state electrolytes into the probe creates a fully solid-state scanning electrochemical probe, eliminating the need for liquid electrochemical cells. This versatile probe allows for a range of measurements on chemical and biological samples (cells and tissues) in dry and wet conditions. Our capabilities include analyzing surface morphology, electrochemical properties, and in-situ 3D assessment of biomarkers.



Limitation of liquid-SECCM

- Instability of droplets at the tip of the electrode
- Droplets are susceptible to environmental humidity
- Interference of sample surface hydrophobicity/hydrophilicity
- Traces left by droplets affect repeat scanning

Advantages of solid-state SECCM

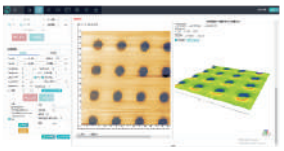
- Enhanced stability with solid microspheres at the tip.
- Comparable electrochemical performance to liquid
- Overcoming surface hydrophobicity/hydrophilicity constraints
- Achieving 20nm spatial and 5nm vertical resolution.

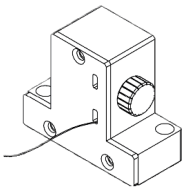
SPECIFICATIONS

Scanner					
Scan range	100umx100um(x,y axises), 40um (Z axis)			Motor station	25mmX25mmX25mm
Imaging resolution					
SICM Resolution	50nm (XY direction), 20nm(Z direction)				
SECCM Resolution	20nm (XY direction), 5nm (Z direction)				
Electrochemical resolution scanning rate	32X32 pixel (＜8min)				
Potentiostats					
Max output voltage	±10V	Current range	±100fA-±10mA	Max current output	±30mA
Current resolution	100fA	Current precision	±0.2%	Max scanning rate	16V/s
Input impedance	$10^{12}\Omega$	Sampling frequency	500kHz	Input bias current	＜10pA
ADC resolution	16bit	Measured noise	10pA (500kHz, 100mM KCl)	Instrument noise	100fA
Imaging module (upgraded version)					
Objective lens	10X, 20X, 40X	CCD resolution	4.2million	Optical range	200nm-1100nm
CCD	Single-photon CCD for imaging and analyzing weak light signals like chemiluminescence and electrochemiluminescence				
Optional module (customized version)					
Dual-channel electrochemical module	Separate dual-channel detection for maximizing imaging spatial resolution.				
Fluorescence	Achieve optical imaging of various modalities including bright field and fluorescence in microregions.				
Microscope module	Customized and need-based microscope solutions				

SOFTWARE

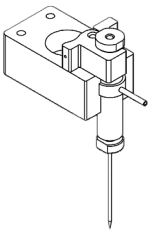
1. Dynamic 2D and 3D image display for intuitive visualization of object changes.
2. Data analysis software: Provided with operational software for data processing and analyzing, visualization, and so on.





Easy replacement of reference electrode

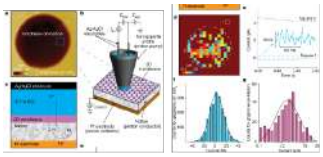
Instead of traditional soldering, a new hand-tightening method secures components, enhancing replaceability of the reference electrode.



Probe holder

The probe holder is easy to disassemble and convenient for replacement.

APPLICATION



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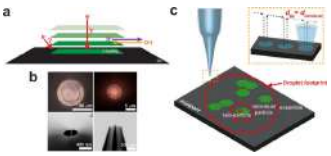
Wahab O J, et al. Nature. 2023, 620, 782–786



Characterization of morphology and in-situ current density of β-Co(OH) 2 particles by SECCM

Chueh WC et al. Nature 2021, 593, 67



Characterization of oxygen evolution reactivity of β-Co(OH) 2 flaky particles

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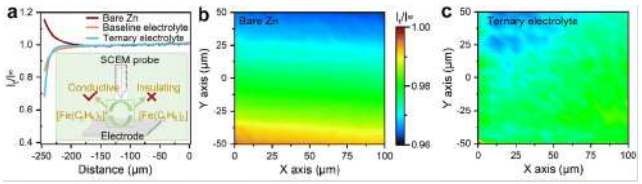

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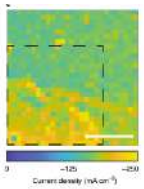

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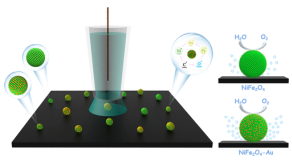

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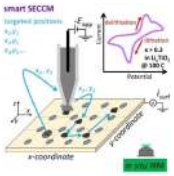

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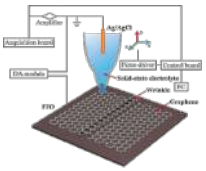

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Eaglenos Sciences, Inc, driven by real-world needs and leveraging existing technological advantages, has developed a range of research products including instruments, consumables, and reagents. Widely applied in materials, semiconductor, biological, and medical research fields, our solutions empower researchers and institutions to innovate and make breakthroughs. Through long-term strategic partnerships with renowned research institutions worldwide, we aim to integrate cutting-edge scientific technologies into research practices. We offer comprehensive technical support and personalized customization to meet diverse customer requirements.

CONTACT US

Phone: +86-400-019-0069

Website: www.eaglenos.com

Contact: Ms. Tian, +86-15261852097

Email: tian_chunxiu@eaglenos.com

Address: Building B2-2, Building 16, Tree House, 73 Tanmi Road, Jiangbei New District, Nanjing City, Jiangsu Province