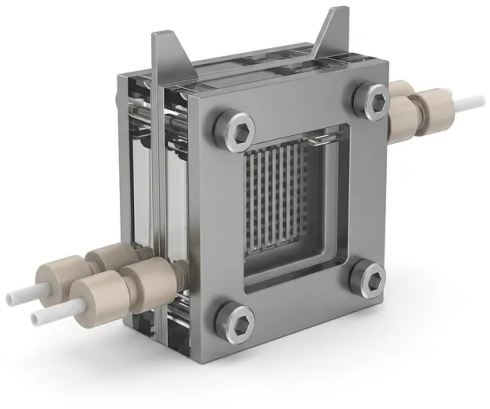
Visual Membrane Electrode Assembly Reaction Cell For In Situ Optical Electrochemistry And Flow Field Analysis

Item Number: PL-DJ33



Introduction

Optimize electrochemical research with this visual membrane electrode assembly reaction cell featuring high purity titanium bipolar plates and dual optical windows for real time in situ observation and high speed photography of dynamic gas liquid flow fields and interfaces

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Application	Description	Key Benefit
PEM Water Electrolysis	Real-time observation of the oxygen evolution reaction (OER) at the anode catalyst layer and gas diffusion layer interface.	Direct visualization of bubble nucleation, growth, and detachment dynamics to optimize bubble evacuation and lower overpotentials.
Fuel Cell Water Management	High-speed imaging of liquid water transport, droplet formation, and channel flooding within the cathode serpentine flow fields.	Empirically identifies critical operating limits for gas flow rates, temperature, and humidity to prevent cathode flooding and cell degradation.
Carbon Dioxide Reduction (CO2RR)	Monitoring multi-phase gas-liquid-solid boundary layers at gas diffusion electrodes during continuous CO2 reduction.	Visualizes gas distribution and localized liquid film thickness to enhance mass transfer rates and suppress the hydrogen evolution reaction.
Electro-Organic Synthesis	In-situ monitoring of colorimetric changes, phase separations, and reactant diffusion profiles in microstructured flow channels.	Provides direct visual feedback on concentration gradients and reaction progress, enabling rapid optimization of flow rates and current densities.
Flow Field Design Validation	Empirical verification of flow distribution profiles and pressure-drop characteristics across customized channel geometries.	Enables researchers to validate computational fluid dynamics (CFD) models with direct, high-resolution physical observations.
Catalyst Layer Degradation Studies	Long-term visual monitoring of catalyst layer erosion, delamination, and gas diffusion layer deformation under accelerated stress testing.	Correlates real-time structural changes at the electrode interface with electrochemical degradation markers like cyclic voltammetry curves.

Parameter	Specification (PL-DJ33 Series)	Customization Options
Model Identifier	PL-DJ33	Configurable variants tailored to active area
Active Area Dimensions	20×20 mm / 30×30 mm / 50×50 mm	Bespoke dimensions from 10×10 mm to 100×100 mm
Bipolar Plate Material	High-Purity Titanium (Grade 2 / Grade 5)	Platinum-plated titanium, gold-coated titanium
Fastening Bracket Material	High-Purity Titanium	Stainless Steel 316L, PEEK (for electrical isolation)
Optical Window Material	Polymethyl Methacrylate (PMMA / Acrylic)	Optical Quartz, Sapphire, Borosilicate Glass
Optical Window Thickness	10 mm (standard)	5 mm to 20 mm depending on pressure rating
Cathode Flow Field	Hollowed-out Serpentine	Multi-serpentine, interdigitated, pin-type, custom
Anode Flow Field	Hollowed-out Multi-Parallel	Serpentine, spiral, customized flow paths
Channel / Rib Width	1.0 mm / 1.0 mm (standard)	Customizable from 0.2 mm to 3.0 mm
Channel Depth	1.0 mm (standard)	Customizable from 0.1 mm to 2.5 mm
Bipolar Plate Thickness	3.0 mm (standard)	Custom thickness options from 1.5 mm to 8.0 mm
Sealing Gasket Material	High-performance PTFE / FKM / Silicone	EPDM, FFKM for highly aggressive organic solvents

Parameter	Specification (PL-DJ33 Series)	Customization Options
Operating Temperature	-20°C to +80°C (Standard PMMA)	Up to +180°C with Quartz/Sapphire and PEEK brackets
Max Operating Pressure	0.3 MPa (standard)	High-pressure designs up to 2.0 MPa available
Fluid Connection Ports	Standard 1/4"-28 UNF thread or Barb fittings	NPT fittings, Swagelok-compatible ports