Single-channel potentiostat/galvanostat with EIS Model CS360 consists of a DDS arbitrary function generator, a potentiostat/galvanostat and an FRA. With the help of built-in dual 24-bit Delta-sigma AD converters, it achieves excellent stability and high potential (1μV) and current(1pA) resolutions.With EIS frequency up to be 8MHz, CS360 has been an ideal tool for the study of solid-state electrolyte.

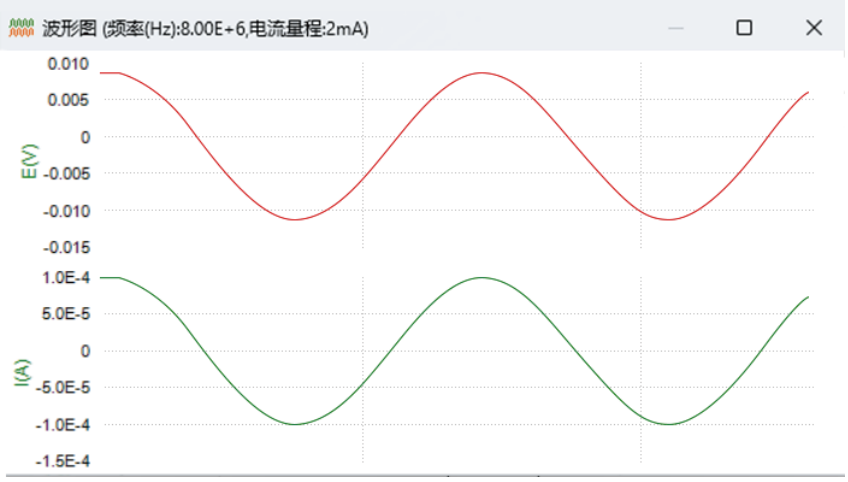
Applications

- Energy materials (Solid-state battery, Li-ion battery, solar cell, fuel cell, supercapacitors, etc);
- Electrocatalysis (HER, OER, ORR, CO_2RR, NRR, water splitting).
- Reactive mechanisms of electrosynthesis, electrodeposition (electroplating), anodic oxidation, electrolysis;
- Metallic corrosion; corrosion inhibitor, coating and cathodic protection efficiency;

With virtues of high energy density, fast charging &discharging, and long lifespan, solid-state batteries are widely used in electric vehicles, wearable devices and so on. Featured by leak-proofness, flame retardancy and inhibition of dendrite growth, solid-state electrolytes enhance the safety of batteries. EIS is an important technique to study the performance of solid-state batteries. It can provide information about charge transfer, electrochemical reactions, etc by measuring EIS in various frequency regions, further providing important theoretical basis and technical support for the development of high-performance fully solid-state batteries.

The EIS frequency can be up to 8MHz for CS360 electrochemical workstation, which can meet the need of high-frequency EIS test on solid electrolytes. Study of solid electrolytes especially focus on impedance behavior in high-frequency region. It helps us to quantify the electronic &ionic conductivity, find microstructural problems of the material (such as grain boundary effects), and thus provide guidance on material optimization, and battery performance improvement.

Solid-state battery holder



Waveform of the EIS test

Specifications - CS360

Specifications	
Support 2-, 3- or 4-electrode configuration	
Maximum applied Potential: ±10V	Maximum output current: ±2A
Potential control accuracy: 0.1%×full range±1mV	Current control accuracy: 0.1%×full range
Potential resolution: 1μV	Current sensitivity:1pA
Potential rise time: ≤1μs	Reference electrode input impedance:$10^{13}\Omega$||5pF
Input basis current:≤10pA	Potential range: ±200mV, ±2.5V, ±5V, ±10V, 4 ranges
Current range: ±200pA~±2 A, 11 ranges	Compliance voltage: ±30V
CV and LSV scan rate: 0.001mV/s~10kV/s	CA and CC pulse width: 0.0001~65,000s
Current increment during scan: 1mA@1A/ms	Potential increment during scan: 0.02mV @1V/ms
SWV frequency: 0.001~100kHz	DPV and NPV pulse width: 0.001~100s
AD data acquisition: 16bit@1MHz, 20bit @1KHz	DA Resolution: 20 bit
Minimum Potential increment in CV: 0.02mV	Low-pass filters: covering 7-decade
Potential and current range: Manual/Auto switch	Ground mode: Floating, Earthing, supports ZRA
Communication: USB2.0, RJ45 Ethernet	Operating System: Windows 10/11
Power supply: 90~240V AC 50/60Hz	Weight / Measurements: 6.5kg, 36 x 30 x16 cm
EIS (Electrochemical Impedance Spectroscopy)	
Signal generator	
Frequency range:10μHz~8 MHz	AC amplitude: 1mV~2500mV
DC Bias: -10~+10V	DDS output impedance: 50Ω
Frequency accuracy: 0.1%	Signal resolution: 0.1mV RMS
Waveform: sine wave, triangular wave and square wave	Wave distortion: <1%
Scanning mode: logarithmic/linear, increase/decrease	
Signal analyzer	
Integral time: minimum:10ms or the longest time of a cycle	Maximum:10^6 cycles or 10^5 s
Measurement delay: 0~10^5s	
DC offset compensation	
Potential automatic compensation range: -10V~+10V	Current compensation range: -2A~+2A
Bandwidth: 8-decade frequency range, automatic and manual setting	

Techniques - CS360

Stable polarization:

Open Circuit Potential (OCP)
Potentiostatic (I-T curve)
Galvanostatic
Potentiodynamic (Tafel plot)
Galvanodynamic (DGP)

Transient Polarization:

Multi Potential Steps
Multi Current Steps
Potential Stair-Step (VSTEP)
Galvanic Stair-Step (ISTEP)

Chrono Method:

Chronopotentiometry (CP)
Chronoamperametry (CA)
Chronocaulometry (CC)

Voltammetry:

Linear Sweep Voltammetry (LSV)
Cylic Voltammetry (CV)
Staircase Voltammetry (SCV)
Square Wave Voltammetry (SWV)
Differential Pulse Voltammetry (DPV)
Normal Pulse Voltammetry (NPV)
Differential Normal Pulse Voltammetry (DNPV)
AC Voltammetry (ACV)
2nd harmonic AC Voltammetry (SHACV)
Fourier Transform AC Voltammetry (FTACV)

Electrochemical Impedance Spectroscopy:

Potentiostatic EIS (Nyquist, Bode)
Galvanostatic EIS
Potentiostatic EIS (Optional freq.)
Galvanostatic EIS(Optional freq.)
Mott-Schottky
Potentiostatic EIS vs. Time (Single freq.)
Galvanostatic EIS vs. Time (Single freq.)

Corrosion Measurements:

Cyclic polarization curve (CPP)
Linear polarization curve (LPR)
Electrochemical Potentiokinetic Reactivation (EPR)
Electrochemical Noise (ECN)
Zero resistance Ammeter (ZRA)

Battery testing:

Battery Charge and Discharge
Galvanostatic Charge and Discharge (GCD)
Potentiostatic Charging and Discharging (PCD)
Potentiostatic Intermittent Titration Technique (PITT)
Galvanostatic Intermittent Titration Technique (GITT)

Amperometric:

Differential Pulse Amperometry (DPA)
Double Differential Pulse Amperometry (DDPA)
Triple Pulse Amperometry (TPA)
Integrated Pulse Amperometric Detection (IPAD)

Stripping Voltammetry:

Potentiostatic Stripping,
Linear Stripping,Staircase Stripping

Square Wave Stripping

Differential Pulse Voltammetry Stripping

Normal Pulse Voltammetry Stripping

Differential Normal Pulse Voltammetry Stripping

Extensions:

Electrochemical Stripping/ Deposition

Bulk Eletrolysis with Coulometry (BE)

Rs Measurement