CORRTEST Instruments

Multichannel potentiostat model CS310X Option A (4-channel, EIS*1)

Corrtest Multichannel potentiostat/ galvanostat/EIS is a versatile instrument offering 8 slots.

Multichannel potentiostat/ galvanostat model CS310X (Option A) is the 4-channel potentiostat. And you have 4 slots occupied with potentiostat boards and 4 slots idle for adding potentiostat board(s) to expand channels in the future. It equals that you can have 4 sets potentiostat/galvanostat, and they're integrated in one chassis independently. EIS module (10μHz~1MHz) is equipped one channel. Each channel potential control range is ±10V, current control range ±1A, can meet experiment requirement for most people.

Full floating module and electrical isolation design guarantee each channel is totally independent, which ensures accurate data and efficient simultaneous measurements.

Multichannel potentiostat brings convenience to those who have many samples, and is an ideal device for studies of energy materials, battery study, metal corrosion etc.

Multichannel potentiostat (**±1A**, ±10V) Each channel is independent			
Model: CS310X			
Option A **4-channel,** **EIS * 1 channel**	**Option B** **4-channel,** **EIS * 4**	**Option C** **8-channel,** **EIS * 1**	**Option D** **8-channel,** **EIS * 8**

The number of channels is expandable by adding and installing more boards, thanks to the intelligent chassis and plug-in design.

Cal Power
Via Acquanera, 29 22100 COMO
tel. 031.526.566 (r.a.) fax 031.507.984
info@calpower.it www.calpower.it

Application

- Reaction mechanism of Electrosynthesis, electrodeposition (electroplating), anodic oxidation.
- Electrochemical analysis, electro-catalysis, sensor;
- New energy materials, advanced functional materials, photoelectronic materials;
- Corrosion study of metals in water, concrete and soil etc;
- Fast evaluation of corrosion inhibitor, water stabilizer, coating and cathodic protection efficiency.

Specifications

Specifications	
Number of channels with boards: 4	Channel insulation resistance: >100MΩ
Communication: Ethernet	Lower-pass filter: covering 8-decade
Potential control range: ±10V	Constant current control range: ±1A
Potential accuracy: 0.1%×full range±1mV	Current accuracy: 0.1%×full range
Potential resolution:10μV(>100Hz), 3μV(<10Hz)	Current resolution: 1pA
Potential rise time: <1μs(<10mA), <10μs(<2A)	Current range: 2nA ~1A, 10 ranges
Reference electrode input impedance: 10^{12}Ω||20pF	Maximum current output: 1A
Compliance voltage: ±21V	Current increment during scan: 1mA @1A/ms
CV and LSV scan rate: 0.001mV~10000V/s	Potential increment during scan: 0.076mV@1V/ms
CA and CC pulse width: 0.0001~65000s	DPV and NPV pulse width: 0.0001~1000s
SWV frequency:0.001~100KHz	CV minimum potential increment: 0.075mV
AD data acquisition:16bit@1MHz,20bit @1kHz	IMP frequency:10μHz~1MHz
DA resolution:16bit, setup time:1μs	Current and potential range: automatic
Operating System requirements: Windows 7/8/10 /11	Weight: 12.5 Kg Dimensions: 40*40*14cm
Electrochemical Impedance Spectroscopy (EIS)	
Signal generator	
Frequency range: 10μHz~1MHz	AC signal amplitude: 1mV~2500mV
Frequency accuracy: 0.005%	Signal resolution: 0.1mV RMS
DDS output impedance: 50Ω	DC Bias: -10V~+10V
Wave distortion: <1%	Waveform: sine wave, triangular wave, square wave
Scan mode: Logarithmic/linear, increase/decrease	
Signal analyzer	
Maximum integral time:10^6 cycles or 10^5s	Measurement delay:0～10^5S
Minimum integral time:10ms or the longest time of a cycle	
DC offset compensation	
Potential compensation range: -10V~+10V	Current compensation range: -1A~+1A
Bandwidth adjustment: automatic and manual, 8-decade frequency range	

Advantages

High current/voltage: Applied potential range ±10V, current ±1A. It can meet the needs of most studies.
Comprehensive techniques: Built-in EIS (10μHz~1MHz) is equipped in one channel. There are comprehensive techniques in each channel.
Warranty: 5 years warranty. We're the manufacturer, and our engineers will provide technical support anytime you need.
Low cost: The price includes instrument host, software (experiment control & data processing), necessary cables, dummy cell. No other charges.
Reliability &quality: We've been in the market for 20 years, and now is the No. 1 brand of potentiostat product in China

Techniques in each channel-Option A

(EIS is included in one channel)

Model	CS310X Option A
Number of channels	4
EIS *(10μHz~1MHz)*	One channel has EIS

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)

Stripping Voltammetry

- Potentiostatic Stripping
- Linear Stripping
- Staircase Stripping
- Square Wave Stripping
- Differential Pulse Voltammetry Stripping
- Normal Pulse Voltammetry Stripping
- Differential Normal Pulse Voltammetry Stripping

Amperometric

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

Electrochemical Impedance Spectroscopy (EIS)

- EIS vs Frequency (IMP)
- Galvanostatic EIS
- EIS vs Potential (IMPE)(Mott-Schottky)
- EIS vs Time (IMPT)
- Galvanostatic EIS vs Time

Corrosion Measurements

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

Battery test

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

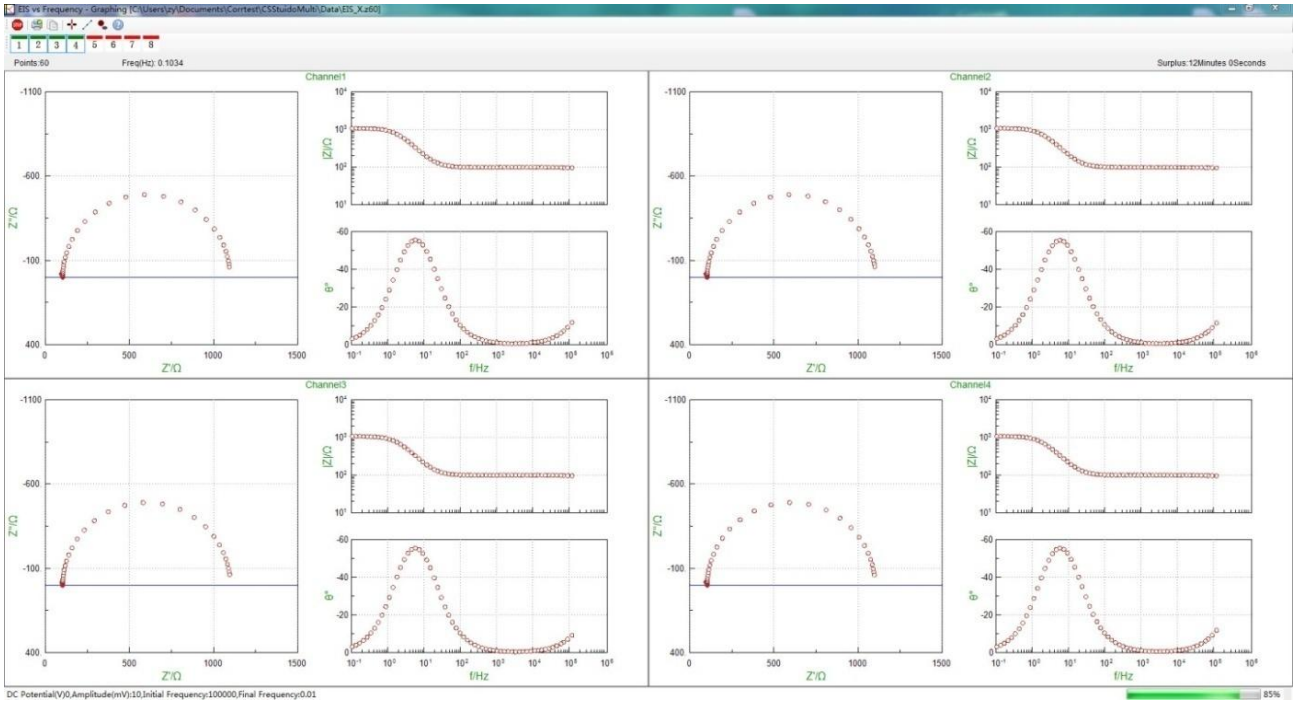
Extensions

- Electrochemical Stripping/ Deposition
- Bulk Eletrolysis with Coulometry (BE)
- Rs Measurement

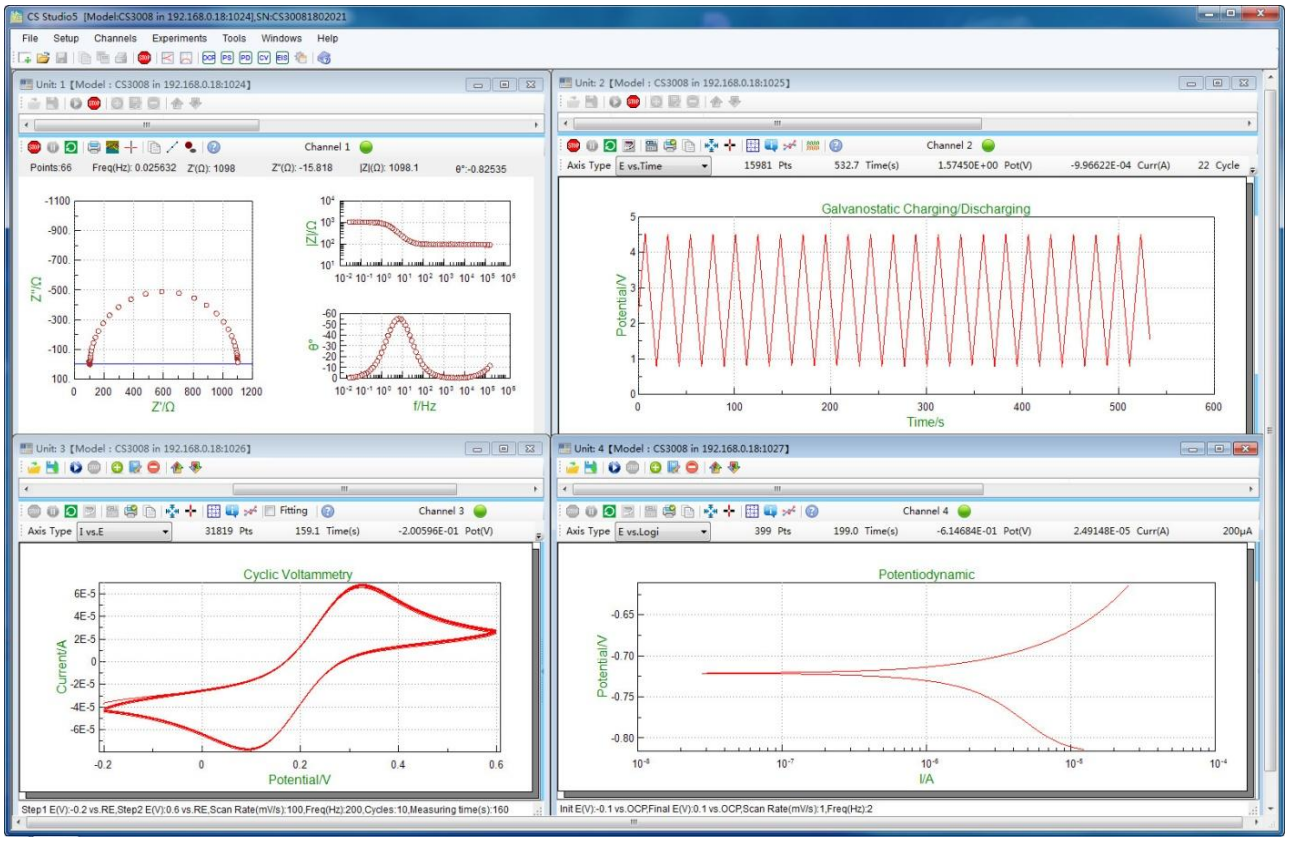
Simultaneous Measurements

You can run a same experiment for each channel at the same time. Set the same parameters for

each experiment once and run all independently. It's especially useful when you have many samples for one single test.



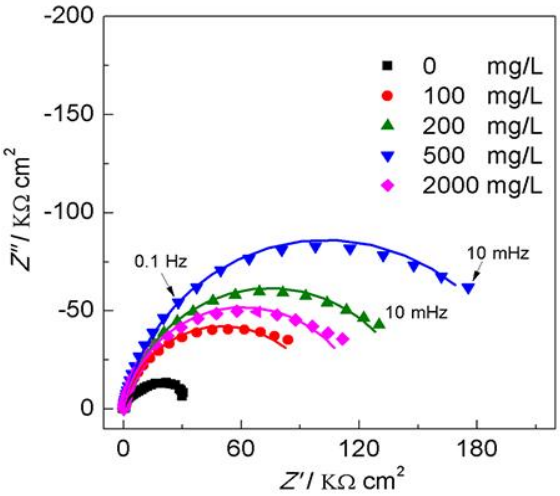
You can also choose different experiment in each channel. Set the parameters for each experiment, and run each experiment independently.



Technical advantages

1. Impedance (EIS)

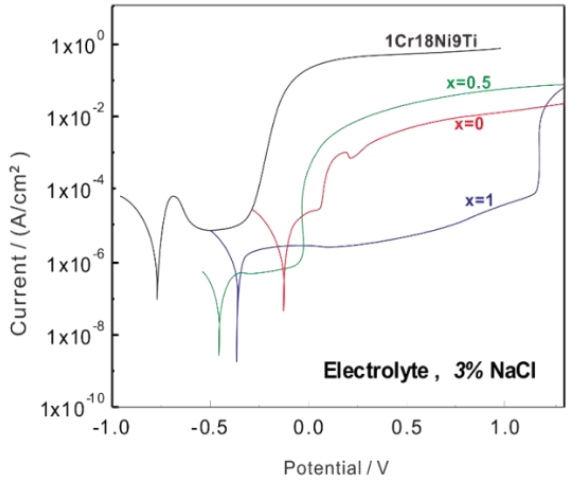
Corrtest potentiostat applies correlation integral algorithm and dual-channel over-sampling technique, and has strong anti-interference ability. It is suitable for EIS measurements of high-impedance system (>$10^9\Omega$, such as coating, concrete etc.).



EIS of AA6063 Al alloy in Ce^{3+} containing 3% NaCl solution

2. Polarization curve

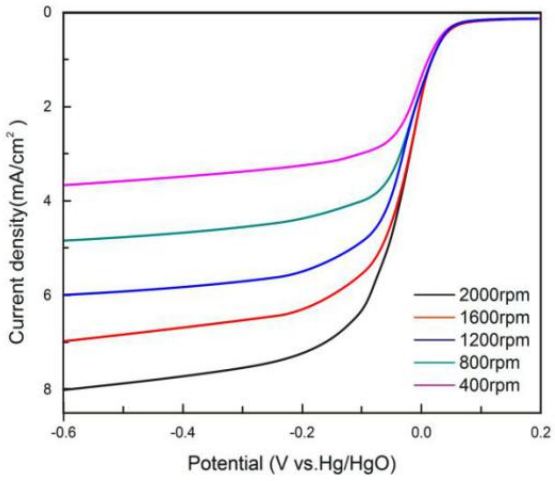
Tafel plot can be obtained. The user can set the anodic reversal current (passivation film breakdown current) of the cyclic polarization curve to obtain material's pitting potential and protection potential and evaluate the its susceptibility to intergranular corrosion. The software uses non-linear fitting to analyze polarization curve, and can make fast evaluation of material's anti-corrosion ability and inhibitors.



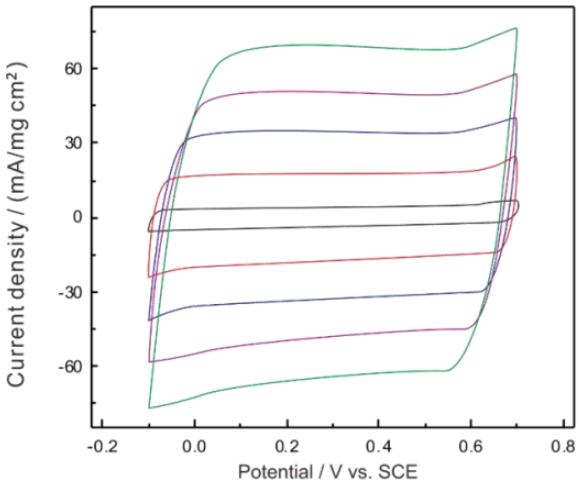
Polarization curve of Ti-based amorphous alloy & stainless steel in 3%NaCl solution

3. Voltammetry

Linear Sweep Voltammetry (LSV), Cyclic Voltammetry (CV), SCV, SWV, DPV, NPV, ACV, Stripping voltammetry etc. It integrates calculation of peak area, peak current and standard curve analysis.



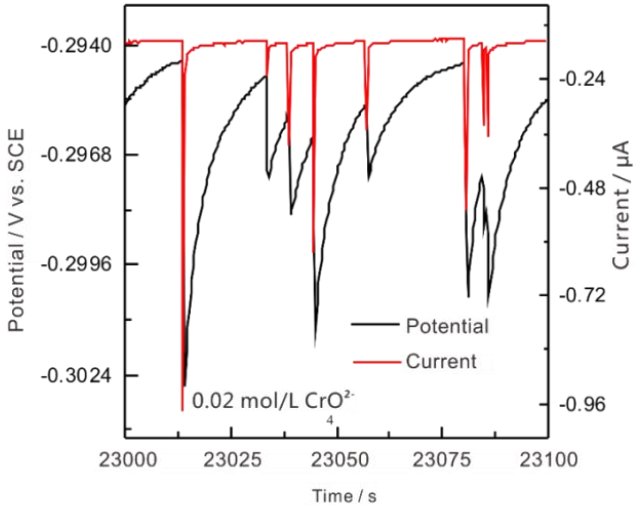
LSV: mesoporous carbon material in 0.1M KOH



CV of PPy supercapacitor in 0.5 mol/L H_2SO_4

4. Electrochemical Noise

With high-resistance follower and zero-resistance ammeter, it measures the natural potential/current fluctuations in corrosion system. It can be used to study pitting corrosion, galvanic corrosion, crevice corrosion, and stress corrosion cracking etc. Based on calculation of noise resistance and pitting index, it can complete localized corrosion monitoring.



5. Full floating measurement

Full-floating mode be used for autoclave electrochemical measurements, on-line corrosion monitoring of metallic components under the ground (rebar in concrete, etc.)

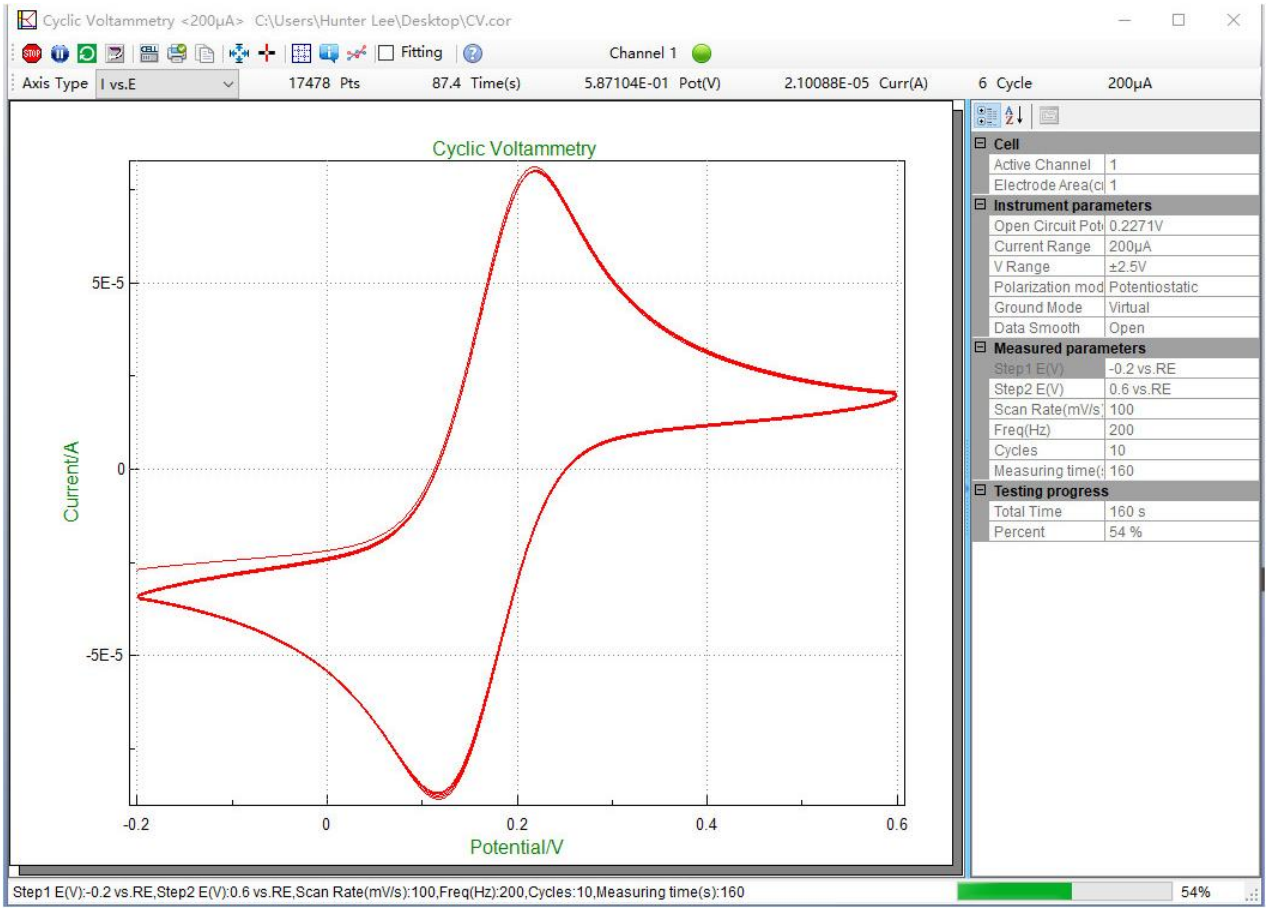
6. Software development kit (SDK)

We are able to provide API functions and development examples, which facilitates some users' requirements for secondary development and self-defined measurements. We can provide .dll file.

Software Features

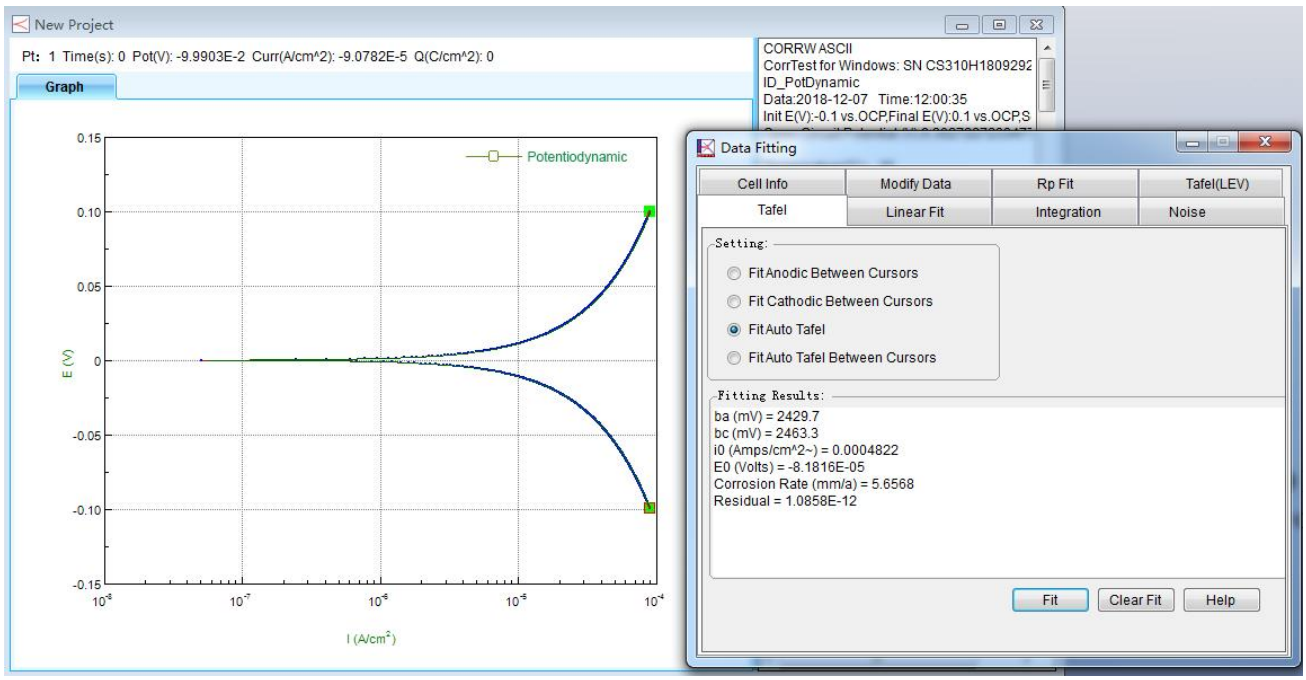
Cyclic voltammetry:

CS studio software provides users a versatile smoothing/differential/ integration kit, which can complete the calculation of peak height, peak area and peak potential of CV curves. In CV technique, during the data analysis, there is function of selecting exact cycle(s) to show. You can choose to see a cycle or some cycles as you want. You can also export data or vector graph of an exact cycle or several cycles.



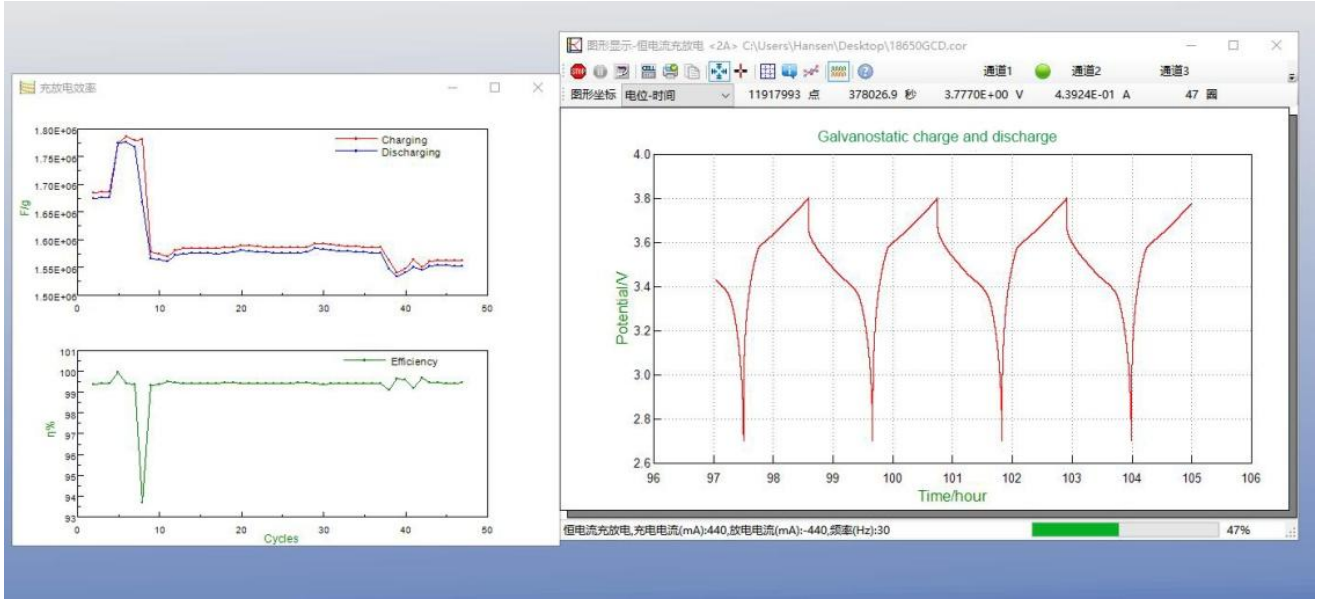
Tafel plot and corrosion rate:

CS studio also provides powerful non-linear fitting on Butler-Volmer equation of polarization curve. It can calculate Tafel slope, corrosion current density, limitation current, polarization resistance, corrosion rate. It can also calculate the power spectrum density, noise resistance and noise spectrum resistance based on the electrochemical noise measurements.



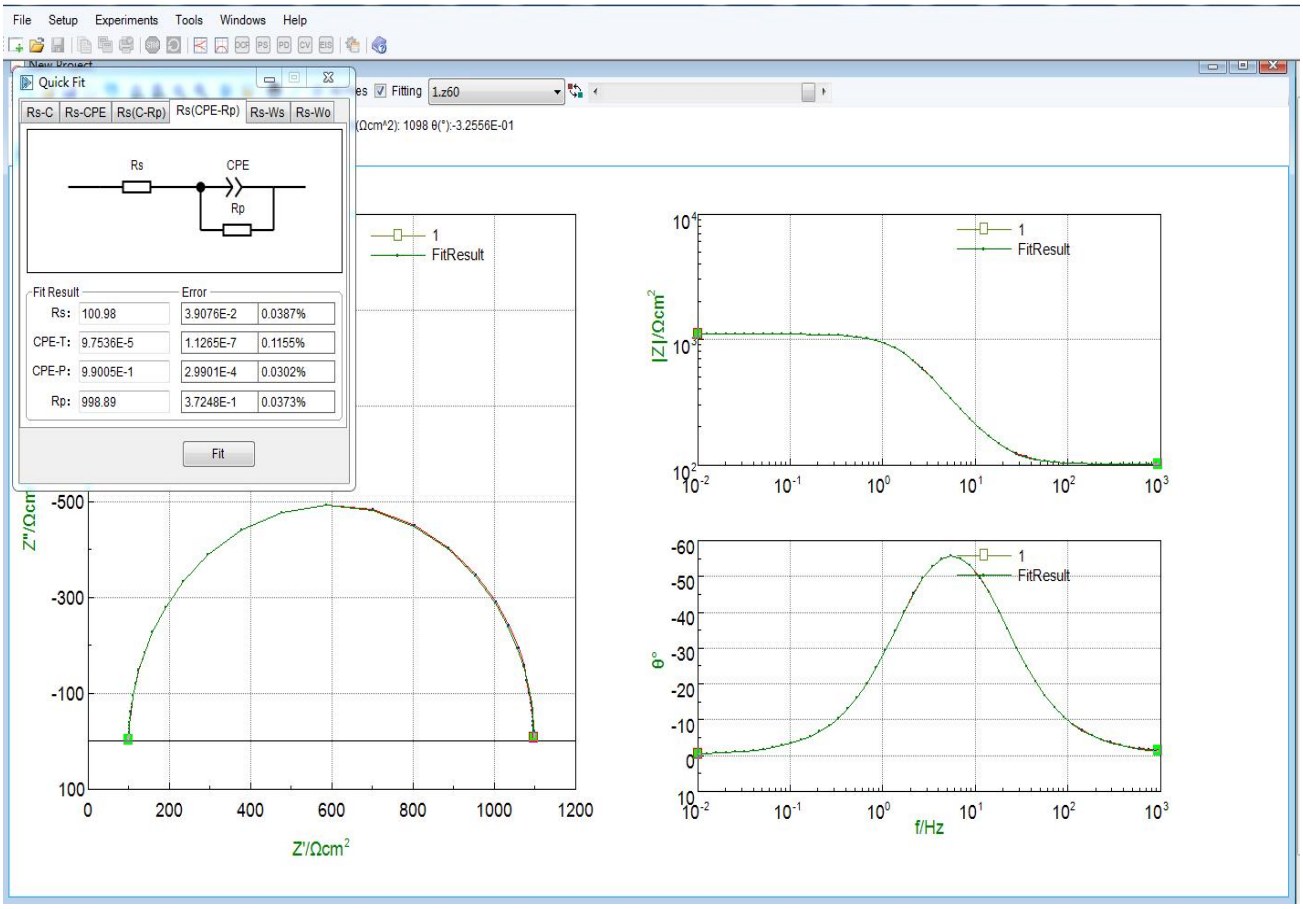
Battery Test and analysis:

charge & discharge efficiency, capacity, specific capacitance, charge & discharge energy.



EIS analysis: Bode, Nyquist, Mott-Schottky plot

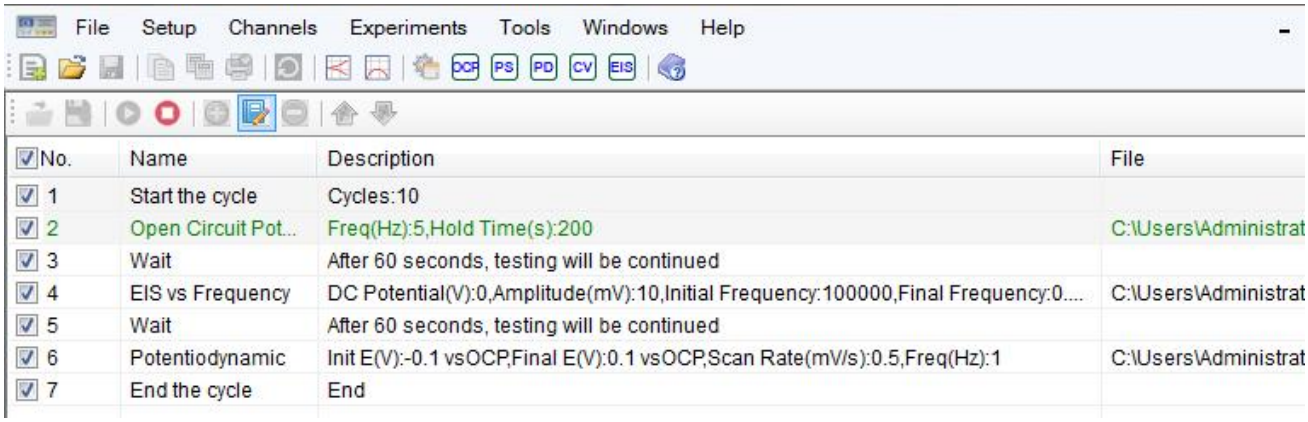
During EIS data analysis, there is built-in fitting function to draw the custom equivalent circuit.



Real time saving of data: The data can be automatically saved even in case of sudden power off.

Combination test: it can facilitate the automation of experiments and save time. With the unique function of combination test, you can choose several techniques, and set the wait time, the start time, and the cycles. Choose the experiments you want to run. Then you can make auto measurement of the set

experiments as you want without having to wait in the lab. This function is especially useful if you have multi experiments to run and save your time greatly.



No.	Name	Description	File
1	Start the cycle	Cycles:10	
2	Open Circuit Pot...	Freq(Hz):5,Hold Time(s):200	C:\Users\Administrat
3	Wait	After 60 seconds, testing will be continued	
4	EIS vs Frequency	DC Potential(V):0,Amplitude(mV):10,Initial Frequency:100000,Final Frequency:0....	C:\Users\Administrat
5	Wait	After 60 seconds, testing will be continued	
6	Potentiodynamic	Init E(V):-0.1 vsOCP,Final E(V):0.1 vsOCP,Scan Rate(mV/s):0.5,Freq(Hz):1	C:\Users\Administrat
7	End the cycle	End	

Data open: You can open the data files by txt format in notepad. Data can also be opened in Origin

Standard supply multichannel potentiostat (Option A):

Instrument host *1
CS studio software package *1
Power cable * 1, Ethernet cable *1
Cell/Electrode cable *8 pcs
Dummy cell *4
Manual *1

After-sales Service

1. Warranty period: 5 years.
2. Provide manual, software installation video & training videos.
3. Free repair service
4. Lifetime software upgrading and technical service.

Contact us

Wuhan Corrtest Instruments Corp., Ltd.
Add: #505, Jinfeng Bld. A, International Enterprise Center,
Optics valley Ave.,East lake High-tech Dev. Zone, Wuhan city, 430074, China
Email: sales2@corrtest.com.cn
Mob./whatsapp: +86 13469965984
Website:
https://www.corrtestinstruments.com/en
http://www.corrtest.com.cn/en

Cal Power
Via Acquanera, 29 22100 COMO
tel. 031.526.566 (r.a.) fax 031.507.984
info@calpower.it www.calpower.it