

CS310 Potentiostat / Galvanostat contains a fast digital function generator, high-speed data acquisition circuitry, a potentiostat and a galvanostat. With high performance in stability and accuracy with advanced hardware and well-functioned software, it is a comprehensive research platform for corrosion, batteries, electrochemical analysis, sensor, life science and environmental chemistry etc. CS310 is a cost-effective model for researchers who will need EIS, CV, LSV, galvanostatic charge & discharge, OCP, polarization curve (Tafel plot) etc. It can be used for areas of battery, corrosion, and many others. It supports earth and floating modes.



Applications

- (1) Reaction mechanism of Electrosynthesis, electrodeposition (electroplating), anodic oxidation, etc.
- (2) Electrochemical analysis and sensor;
- (3) Corrosion study of metals in water, concrete and soil etc;
- (4) Fast evaluation of corrosion inhibitor, water stabilizer, coating and cathodic protection efficiency.
- (5) New energy materials (Li-ion battery, solar cell, fuel cell, supercapacitors), advanced functional materials, photoelectronic materials;

Standard supply list for each set

- Instrument host CS310 x1
- CS studio software x1
- Power cable x1
- USB cable x1
- Cell cable x2
- Dummy cell(1k Ω ||100 μ F) x1
- Manual x1

Service: (**all the service is free)

1. Warranty period: 5 years
2. Provide installation guidance and manual, software installation video.
3. Lifetime free software upgrading and technical service
4. Provide repair service for free

Techniques / Software - Model CS310

Stable polarization

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

Transient Polarization

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

Chrono Method

- Chronopotentiometry (CP)
- Chronoamperometry (CA)
- Chronocoulometry (CC)

Voltammetry

- Linear Sweep Voltammetry (LSV)
- Cyclic Voltammetry (CV)

Electrochemical Impedance Spectroscopy (EIS)

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

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

- Data Logger
- Electrochemical Stripping/ Deposition
- Bulk Electrolysis with Coulometry (BE)
- Rs Measurement

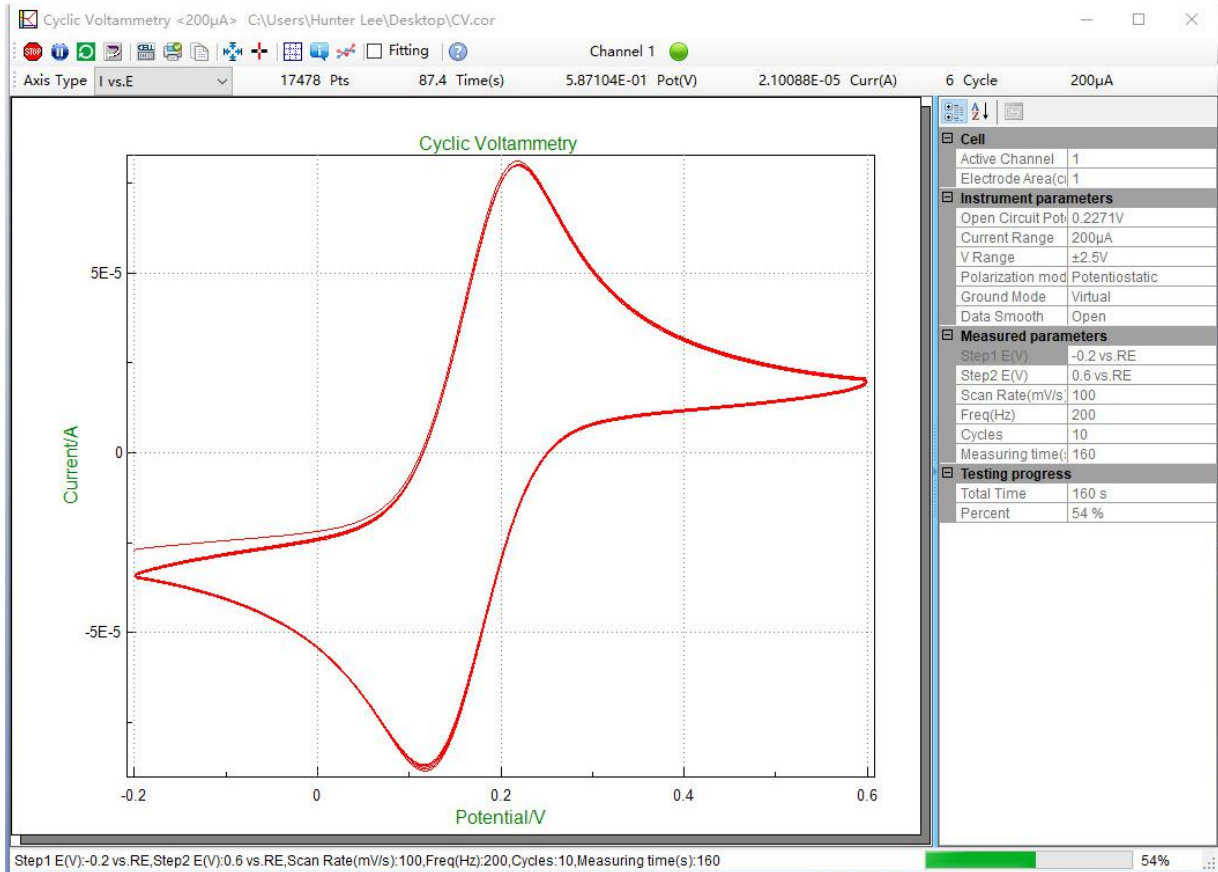
Specifications

Specifications	
Support 2-, 3- or 4-electrode system	Potential and current range: Automatic
Potential control range: $\pm 10V$	Current control range: $\pm 2A$
Potential control accuracy: $0.1\% \times \text{full range} \pm 1mV$	Current control accuracy: $0.1\% \times \text{full range}$
Potential resolution: $10\mu V$ ($>100Hz$), $3\mu V$ ($<10Hz$)	Current sensitivity: $1pA$
Rise time: $<1\mu S$ ($<10mA$), $<10\mu S$ ($<2A$)	Reference electrode input impedance: $10^{12}\Omega 20pF$
Current range: $2nA \sim 2A$, 10 ranges	Compliance voltage: $\pm 21V$
Maximum current output: $2A$	CV and LSV scan rate: $0.001mV \sim 10,000V/s$
CA and CC pulse width: $0.0001 \sim 65,000s$	Current increment during scan: $1mA @ 1A/ms$
Potential increment during scan: $0.076mV @ 1V/ms$	SWV frequency: $0.001 \sim 100 kHz$
DPV and NPV pulse width: $0.0001 \sim 1000s$	AD data acquisition: $16bit @ 1 MHz, 20bit @ 1 kHz$
DA Resolution: $16bit$, setup time: $1\mu s$	Minimum potential increment in CV: $0.075mV$
IMP frequency: $10\mu Hz \sim 1MHz$	Low-pass filters: covering 8-decade
Operating System: Windows 2000/NT/XP/ 7/8/10	Interface: USB 2.0
Weight / Measurements: $6.5kg, 36.5 \times 30.5 \times 16 cm$	
EIS (Electrochemical Impedance Spectroscopy)	
Signal generator	
Frequency range: $10\mu Hz \sim 1MHz$	AC amplitude: $1mV \sim 2500mV$
DC Bias: $-10 \sim +10V$	Output impedance: 50Ω
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 10^5s
Measurement delay: $0 \sim 10^5s$	
DC offset compensation	
Potential automatic compensation range: $-10V \sim +10V$	Current compensation range: $-1A \sim +1A$
Bandwidth: 8-decade frequency range, automatic and manual setting	

SOFTWARE FEATURES

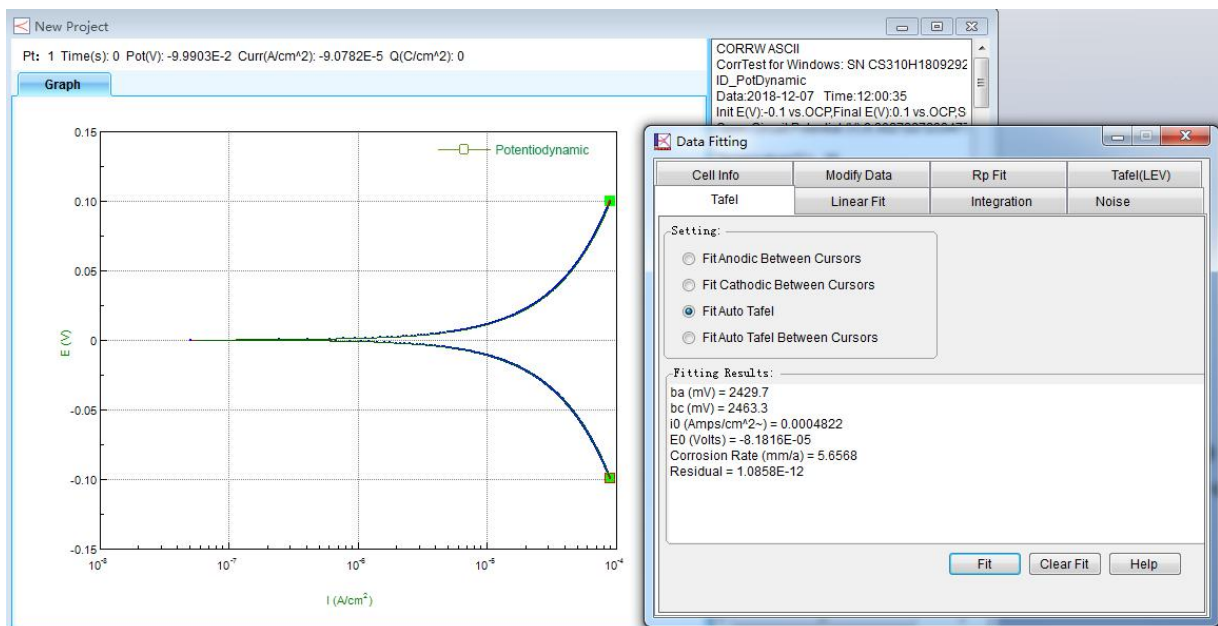
Cyclic voltammetry:

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.



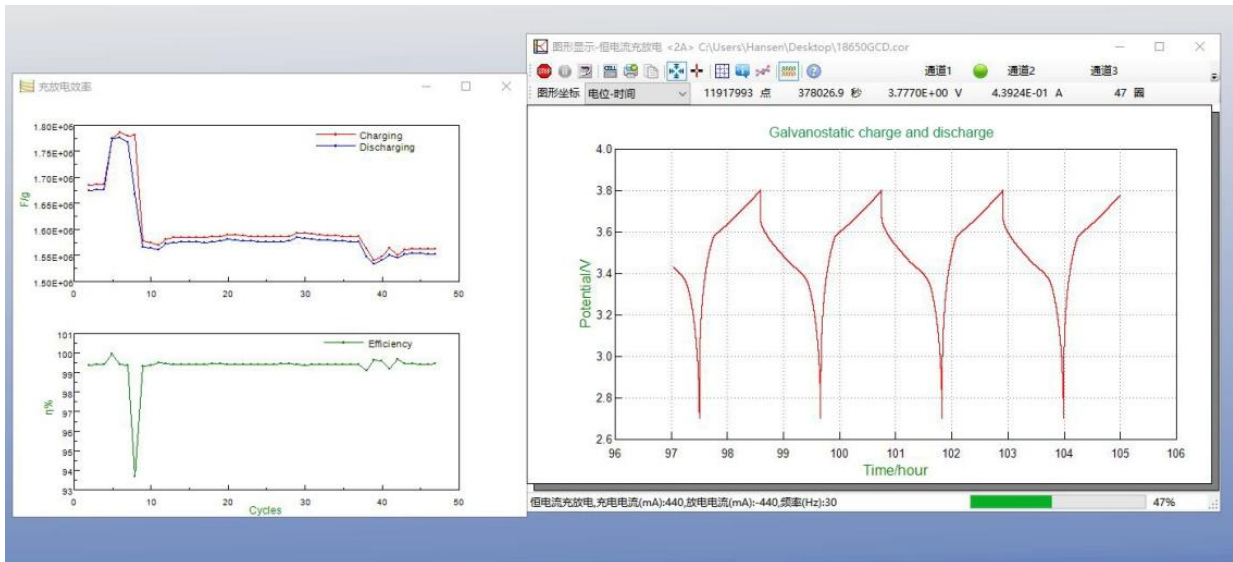
Tafel plot and corrosion rate:

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.



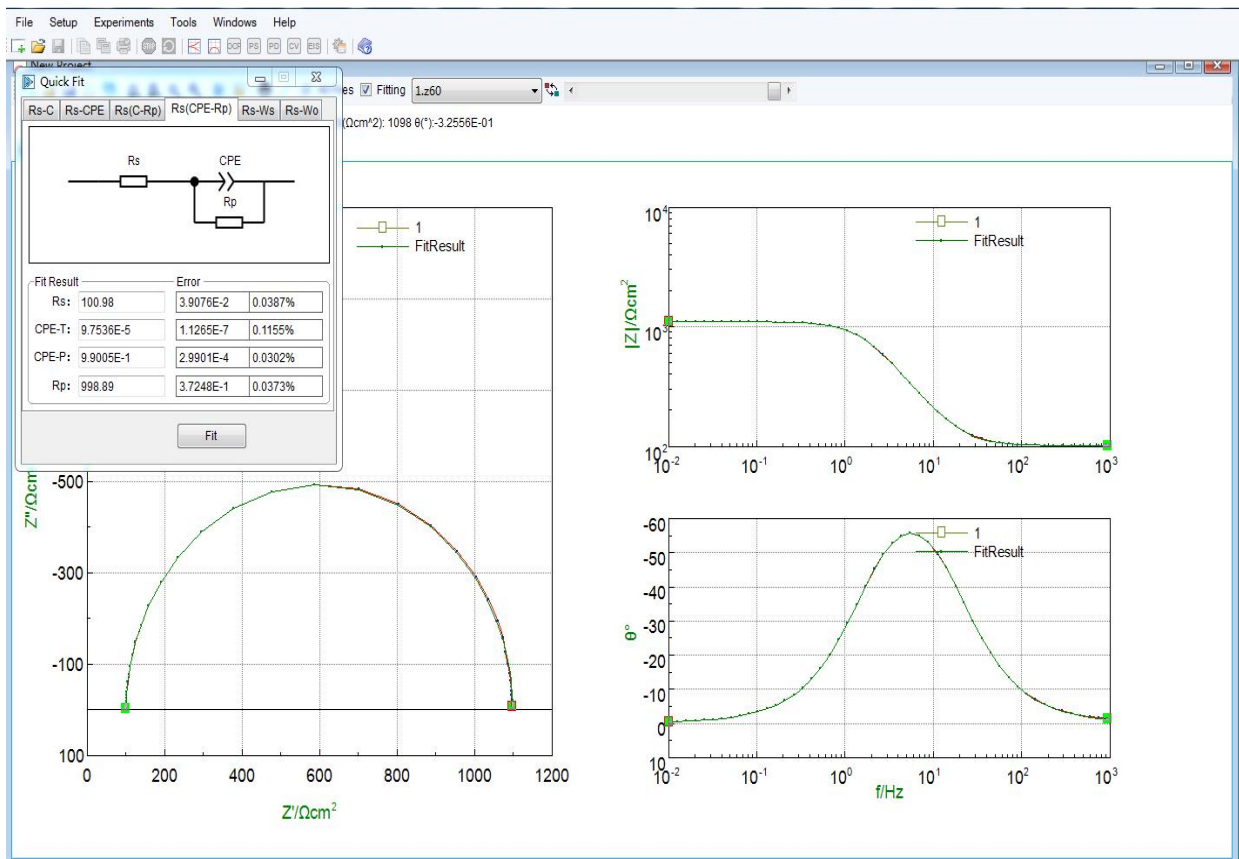
Battery Test and analysis:

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.

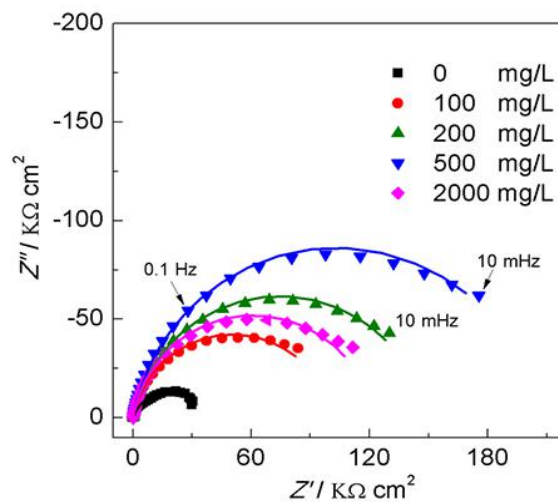
No.	Name	Description	File
1	Start the cycle	Cycles:10	
2	Open Circuit Pot...	Freq(Hz):5, Hold Time(s):200	C:\Users\Administrat
3	Wait	After 60 seconds, testing will be continued	
4	EIS vs Frequency	DC Potential(V):0, Amplitude(mV):10, Initial Frequency:100000, Final Frequency:0...	C:\Users\Administrat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

TECHNICAL ADVANTAGES

1. Impedance (EIS)

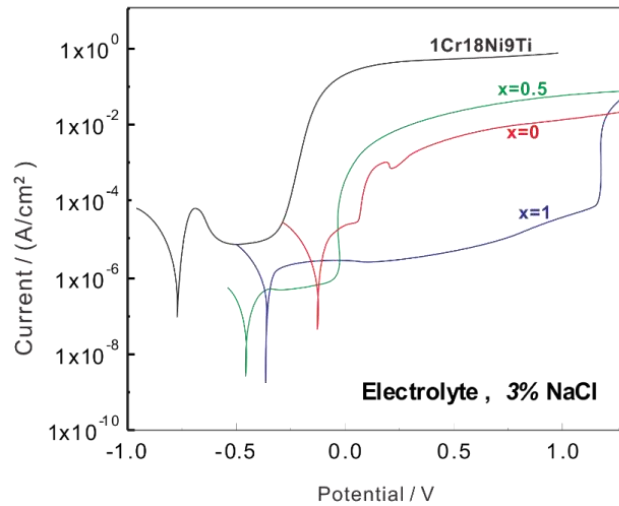
CS310 potentiostat applies correlation integral algorithm and dual-channel over-sampling technique, and has strong anti-interference ability. It is suitable for EIS measurements of high-impedance system ($>10^9 \Omega$, such as coating, concrete etc.). It can also be used to obtain Mott-Schottky curve and differential capacitance curve. During test, the software can display real-time open circuit potential (OCP) without entering.



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

2. Polarization curve

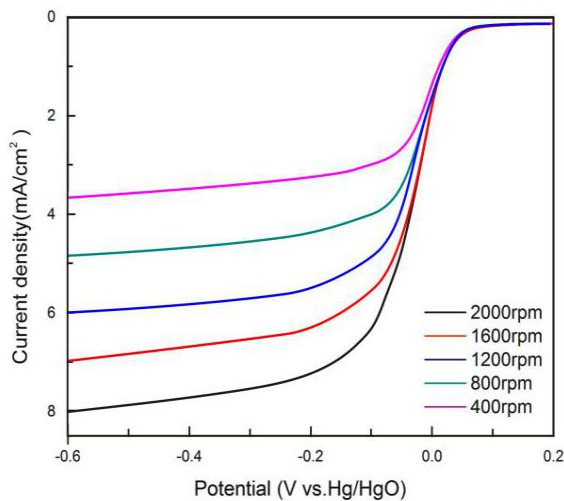
It can complete linear polarization curve and Tafel plot measurements. The user can set the anodic reversal current (passivation film breakdown current) of the cyclic polarization curve to determine material's pitting potential and protection potential and evaluate the its susceptibility to intergranular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



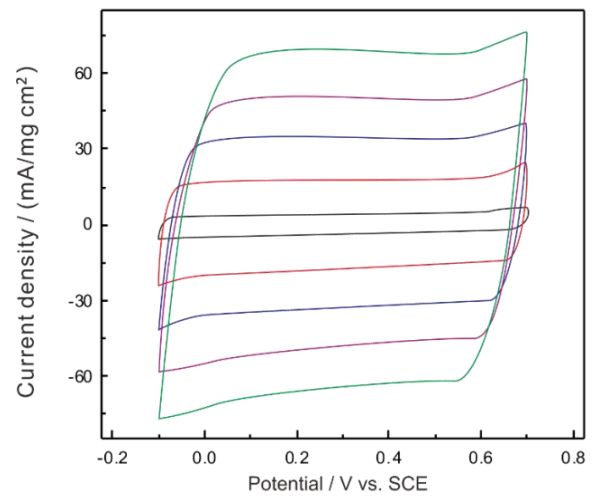
Polarization curve of Ti-based amorphous alloy & stainless steel in 3%NaCl solution

3. Voltammetry

It can do the following electroanalysis methods: Linear Sweep Voltammetry (LSV), Cyclic Voltammetry(CV).It integrates calculation of peak area, peak current and standard curve analysis.



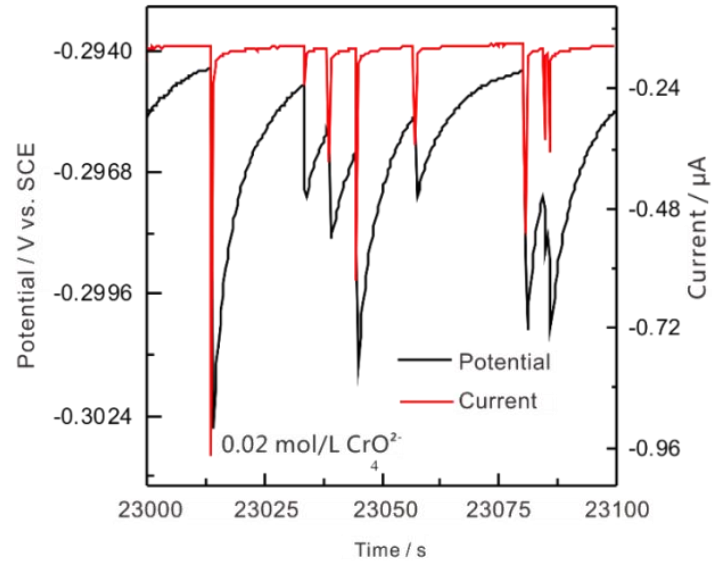
LSV curve: mesoporous carbon material in 0.1M KOH



CV curves of PPy supercapacitor in 0.5 mol/L H₂SO₄

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. Through noise spectrum, we can evaluate the inducement, growth and death of metastable pitting and crack. Based on calculation of noise resistance and pitting index, it can complete localized corrosion monitoring.



Electrochemical noise of low-carbon steel in 0.05mol/L Cl^- +0.1mol/L NaHCO_3

5. Full floating measurement

CS310 potentiostat /galvanostat uses full-floating working electrode. It can 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.