

CS2150 Bipotentiostat / Bigalvanostat equals to two sets of single-channel potentiostat (Model CS150) in one chassis. It brings convenience to the researchers and save their time. It is a popular cost-effective product among users.

CS2150 Bipotentiostat is the real 2-channel potentiostat. The two channels are totally independent. It can not only support RE, CE, WE 1, WE 2 system, but also supports two independent systems:

System 1#: WE 1, RE 1, CE 1

System 2#: WE 2, RE 2, CE 2

When the bipotentiostat has 2 independent channels, you can connect to 2 independent cell systems, and conduct the experiment at the same time in each channel.

This will save your time and make experiment more efficient especially when you have many samples to be tested.



Application

- Electrosynthesis, electrodeposition (electroplating), anodic oxidation, electrolysis
- Oxygen reduction reaction (ORR), oxygen evolution reaction (OER), Hydrogen evolution reaction (HER), carbon dioxide reduction.
- Energy and materials (Li-ion battery, solar cell, fuel cell, supercapacitor), advanced function materials, and sensor.
- Corrosion behavior of metals, and anti-corrosion evaluation
- Fast evaluation of inhibitor, water quality stabilizer, coating, and cathodic protection efficiency.

Typical Application

Rotating Ring-Disk Electrode (RRDE)

Oxidation/reduction reaction (ORR) study: while measuring the polarization curve of disk electrode in the main channel, apply a constant polarization potential on the ring electrode, and thus detect the



intermediate products on the disk electrode. RRDE test becomes the typical method for ORR study. CS2150 can be connected to a RRDE equipment from Pine or ALS. We can supply RRDE-3A setup (100 to 8,000 rpm rotating rate, ALS, Japan) with our bipotentiostat.

Hydrogen Diffusion Test (HDT)

CS2150 bipotentiostat is combined with H-cells. By measuring current of cathode hydrogen charging and hydrogen atoms anode oxidation, it can further calculate the diffusion coefficient of hydrogen atoms in metal and hydrogen flux.



Specifications

| Specifications | |
|---|--|
| Support 2-, 3- or 4-electrode system | Interface: Ethernet |
| Potential control range: Primary Channel: $\pm 10V$ second Channel: $\pm 10V$ | 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: $\pm 2A$ | 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 |
| Potential and current range: Automatic | Weight / Measurements: $8kg, 36.5 \times 30.5 \times 16cm$ |
| Operating System: Windows 2000/NT/XP/ win7/win8/win10 | |

Techniques in each channel - CS2150

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)
- Chronoamperometry (CA)
- Chronocoulometry (CC)

Voltammetry

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

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
- Potentiostatic Intermittent Titration Technique
- Galvanostatic Intermittent Titration Technique

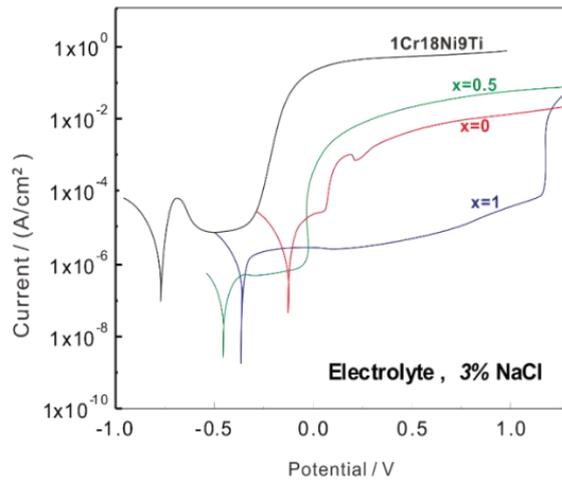
Extensions

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

Technical advantages

1. Polarization curve

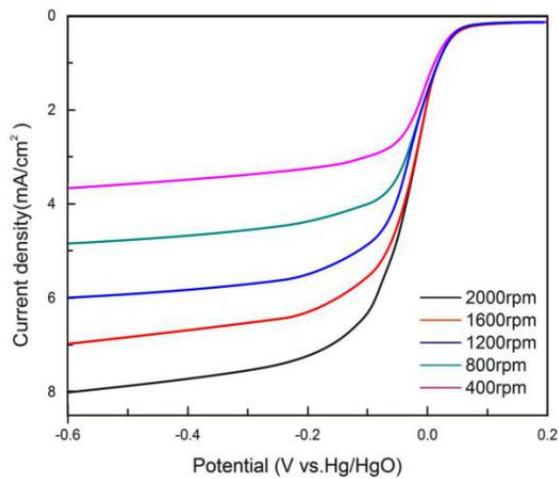
Tafel plot can be obtained. The user can set the anodic reversal current (passivation film breakdown current) of the cyclic polarization curve to obtain material's pitting potential and protection potential and evaluate the its susceptibility to intergranular corrosion. The software uses non-linear fitting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



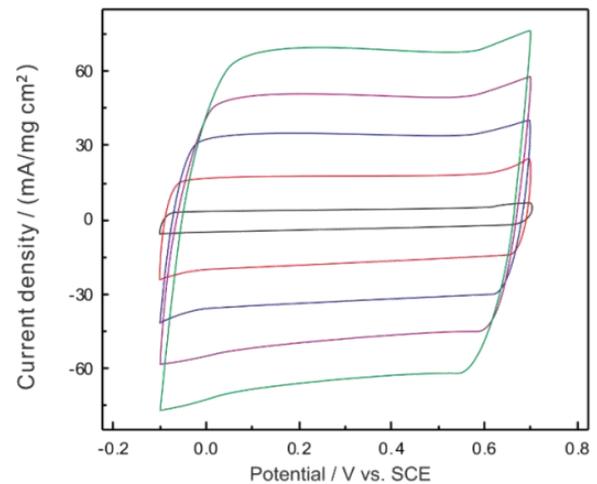
Polarization curve of Ti-based amorphous alloy & stainless steel in 3%NaCl solution

2. 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.



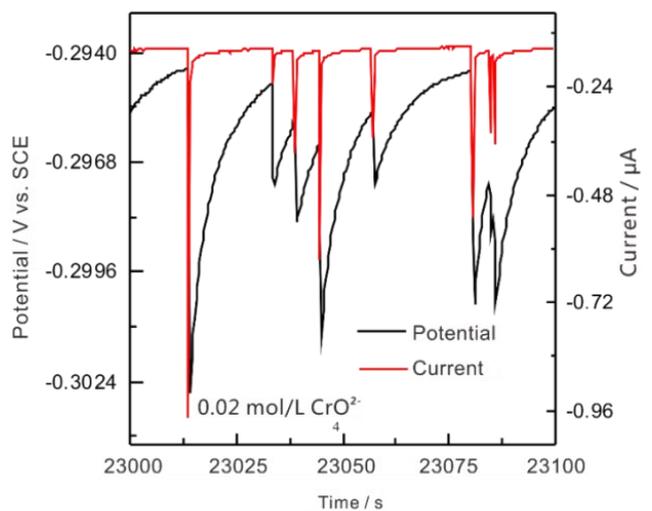
LSV: mesoporous carbon material in 0.1M KOH



CV of PPy supercapacitor in 0.5 mol/L H₂SO₄

3. 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.



4. Full floating measurement

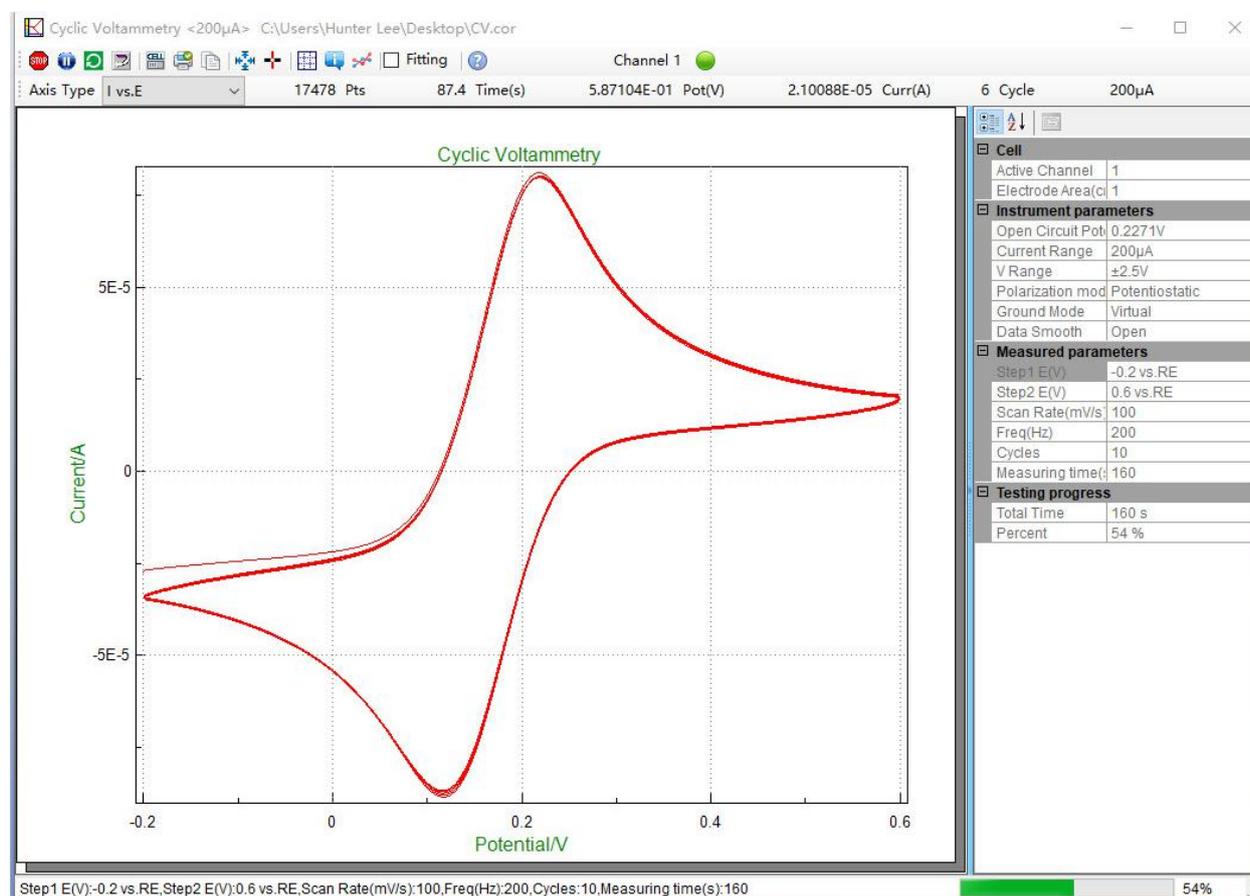
Full-floating mode be used for autoclave electrochemical measurements, on-line corrosion monitoring of metallic components under the ground (rebar in concrete, etc.)

5. 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.

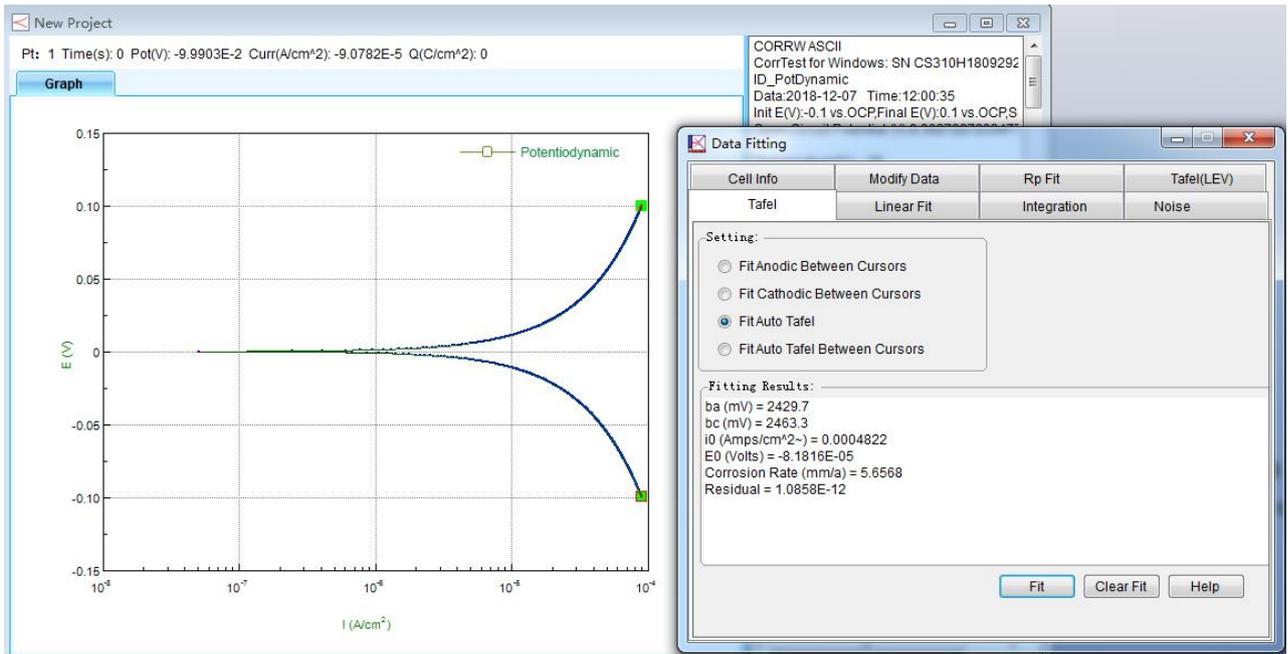
Software Features

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.



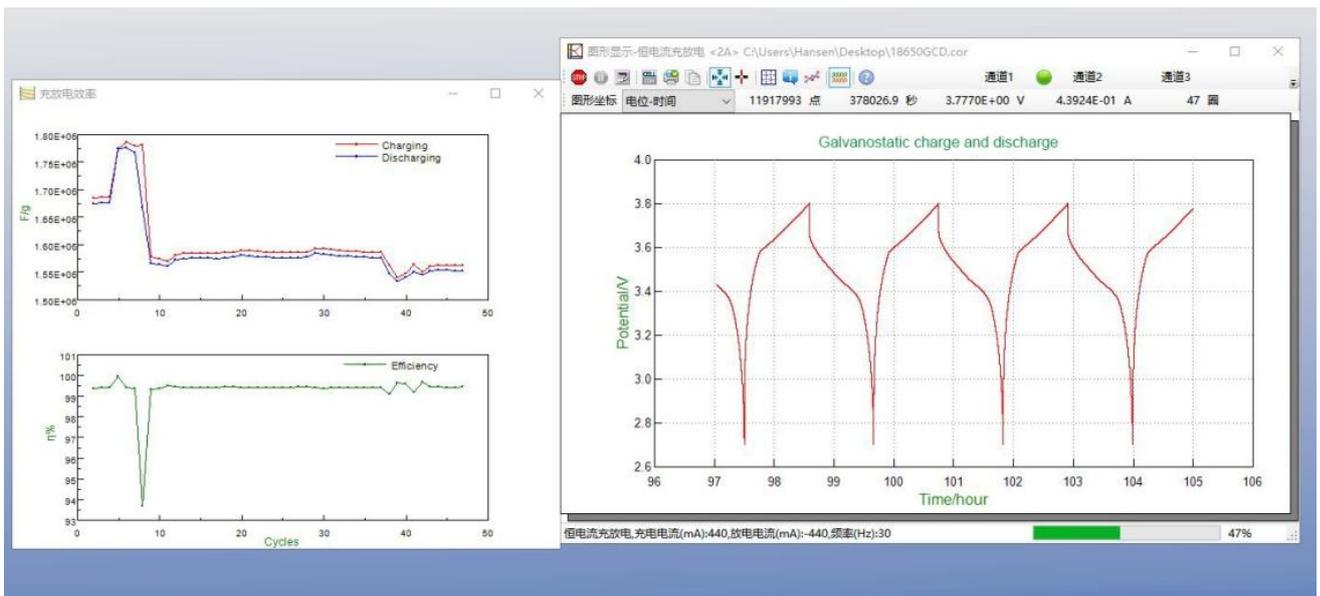
Tafel plot and corrosion rate:

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.



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

Combination test: it can achieve automation of experiments and save time. With the unique function of combination test, you can choose several experiments you want to run. Then you can make auto run of the pre-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

BiPotentiostat / BiGalvanostat model CS2150

Standard Supply:

Instrument CS2150 x1

CS studio software x1

Power cable x1, Ethernet cable x1, Cell cable x 4

Dummy cell (1kΩ | 100μF) x2

Delivery: 2 weeks after payment is received

Service for bipotentiostat instrument (**All the after service is FREE)

1. Warranty period: 5 years.
2. Provide installation guide, manual, software installation video, and training videos.
3. Lifetime free software upgrading of the same model and technical service.
4. Free repair service