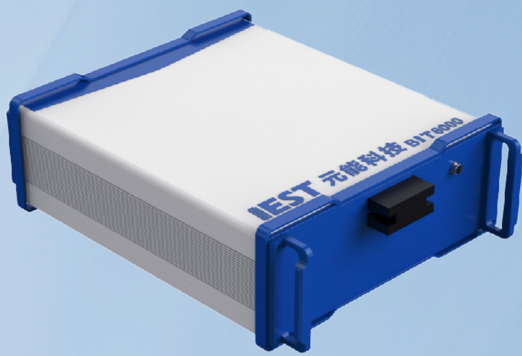
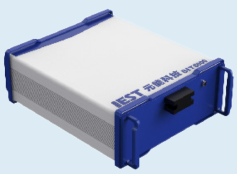
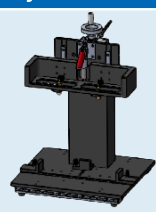
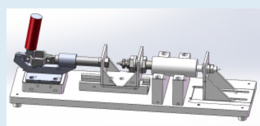
Battery Impedance Tester

Scan QR code
for details



- EIS Test for Large-capacity Batteries (Single & Cycle test)
- Battery Consistency Screening (Abnormal Battery Screening)
- SOH Rapid Estimation (Cascade Utilization)
- Battery Failure Analysis (Production Problem Troubleshooting)

A Model Table

	Battery Impedance Tester	Adjustable Prismatic Battery Test Bracket	Adjustable Cylindrical Battery Test Bracket
Physical picture			
Model	BIT6000	APTB1000	ACTB1000
Voltage control accuracy	±0.006% F.S	Applicable to all kinds of prismatic batteries Maximum length*width*height 284*94*255 mm Maximum tab spacing 40 ~ 240 mm (Other sizes can be customized)	Applicable to cylindrical batteries18650/21700, etc. Maximum length 130 mm Diameter range 18 ~ 50 mm (Other sizes can be customized)
Current control accuracy	±0.05% F.S		
EIS frequency range	1500Hz ~ 0.1 Hz		
EIS test range	0.05mΩ ~ 100mΩ		
Applicable battery capacity	2~1000A lithium-ion battery		

Note: IEST prioritizes continuous product updates, and our specifications are subject to change without prior notice.

B Background

Battery Manufacturers

Q1:The larger the battery capacity, the smaller the internal resistance. Traditional electrochemical workstations cannot perform effective testing and they are expensive if used with current amplifiers;

Q2: Different batteries can' t be distinguished by OCV or 1000Hz ACIR alone. How can the batteries be sorted more finely?

Q3:If there is an abnormality in the battery, how can we quickly locate the production problem? Is it a poor welding? Or a poor formation? Or is it a material failure?

Battery Use & Recycling Companies

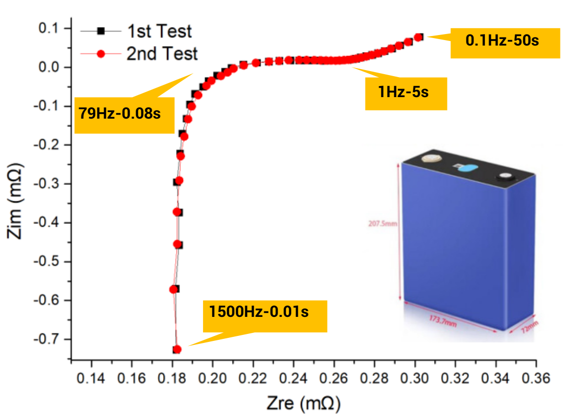
Q4:How to judge the consistency of the battery before assembling the battery module? OCV or 1000Hz ACIR alone can no longer meet the requirements;

Q5:Are there differences between the same type of batteries purchased from different manufacturers? Can they be mixed?

Q6:How much SOH is left for recycled or disassembled batteries? How to perform cascade utilization?

C EIS test of battery with large capacity & low internal resistance

EIS Test for 280Ah LFP Battery (1500 Hz~0.1 Hz)

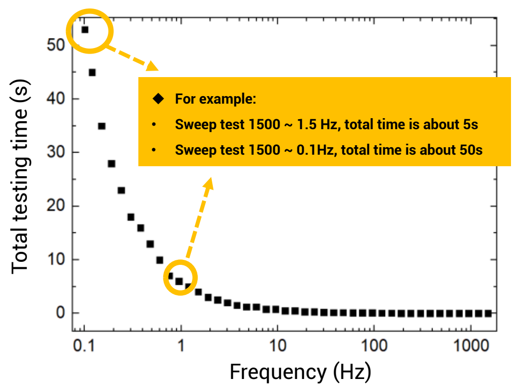


Easily test EIS of batteries with large capacity and low internal resistance

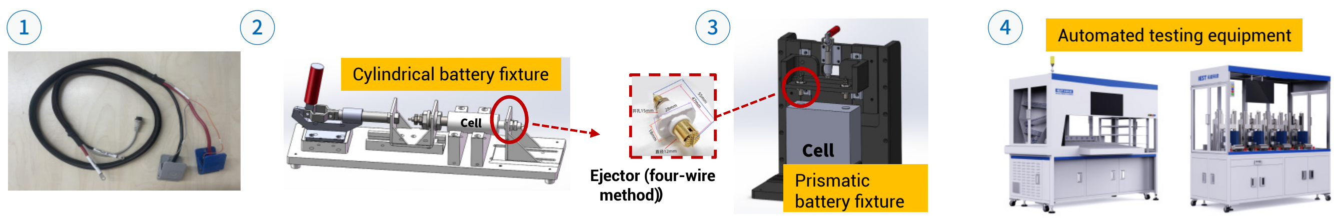
Fast EIS test, 1Hz impedance only takes 5 seconds

Can be used with various fixtures and automation equipment

Frequency vs. Total Test Time

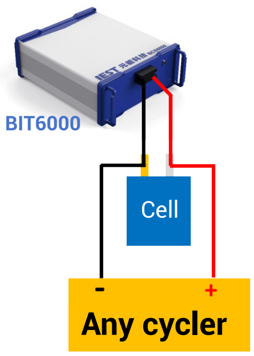


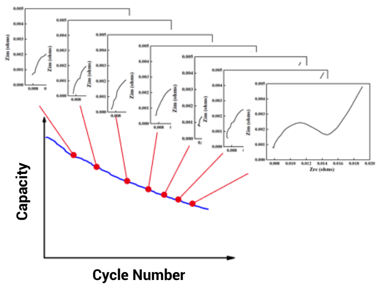
Support customization of various test lines or fixtures



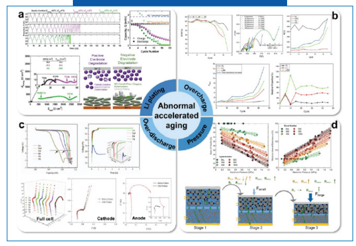
The EIS test frequency range can be adjusted according to the production line progress and process section

D EIS test during battery cycling

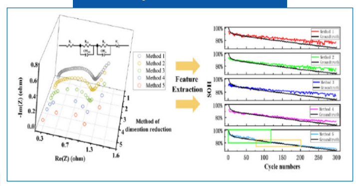




Aging Mechanism Research[1]



Battery Life Prediction[2]



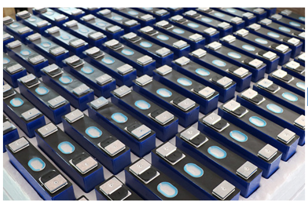
Save the switching time between "temperature adjustment ⇔ charge and discharge instrument ⇔ electrochemical workstation"

[1] J. Phys. Chem. C, 127 4465-4495 (2023);

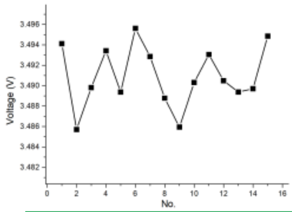
[2] J. Power Sources, 576 233139 (2023);

E Battery consistency screening (abnormal battery screening)

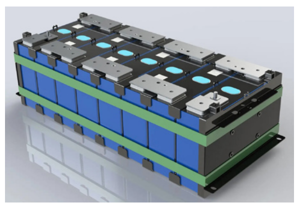
Traditional battery sorting method



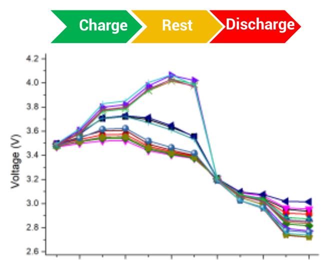
A batch of batteries "to be used"



Choose batteries with consistent "OCV"



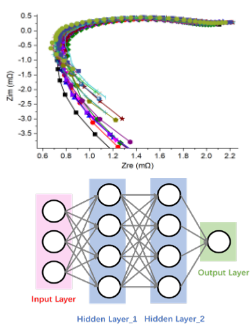
Assemble into battery module



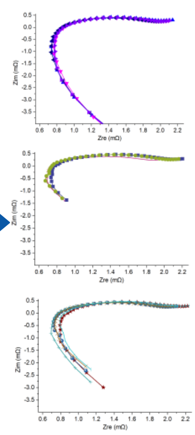
Unable to solve the problem of inconsistent charging and discharging

IEST's battery sorting method

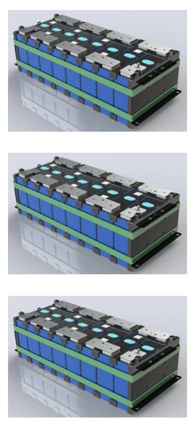
A batch of batteries "to be used"



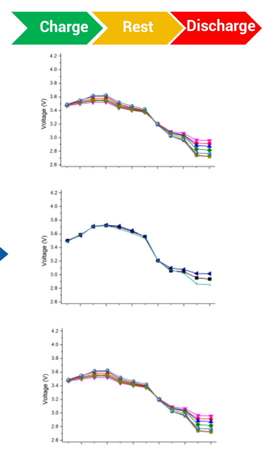
Test the EIS curves and classify it using a neural network algorithm



Choose batteries with consistent "EIS"



Assemble into battery module



Ensure the consistency of batteries in the module

F SOH rapid estimation（cascade utilization）

Traditional battery grading and cascade utilization:

1. A batch of recycled batteries
2. Charge and discharge the batteries
3. Grouping and tiered utilization based on capacity

Three major disadvantages:

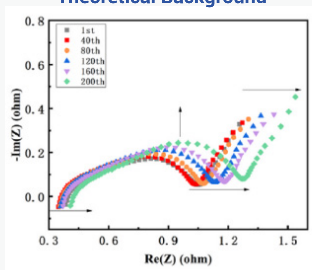
- Long grading time
- High power consumption
- Many channels occupied

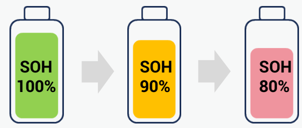
VS

IEST's rapid grading solution：

1. A batch of recycled batteries
2. Perform EIS test on the batteries
3. According to the correlation model between EIS and capacity, conduct rapid capacity division

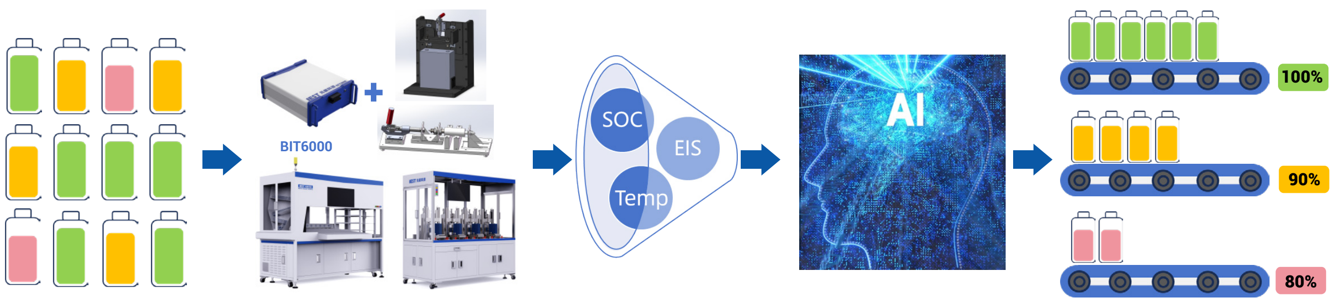
Theoretical Background[1]





[1] J. Power Sources, 576 233139 (2023);

As the battery health (SOH) decreases, its EIS test results will also change accordingly



A batch of recycled batteries (different SOH)

SOH rapid prediction model based on EIS test

SOH estimation accuracy <5% (big data modeling required)

Applications:

Battery Recycling & Cascade Utilization

Battery Pack After-Sales Outlets

Used Car Recycling

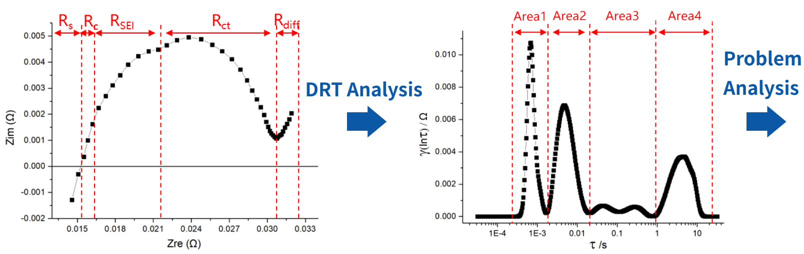
G Battery cell failure analysis (production problem troubleshooting)

Distribution of Relaxation Times (DRT) analysis is a mathematical method for analyzing EIS spectra. Different from conventional equivalent circuit fitting, DRT analysis can avoid various problems such as

① the fitting model depends on the initial value;

②the fitting result is distorted;

③ different models can be fitted, but the mechanism explanation is not unified.



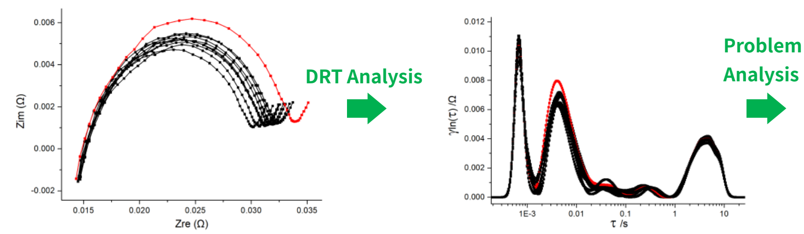
Contact impedance R_s: The sum of all electronic resistances inside the battery, which is related to various problems

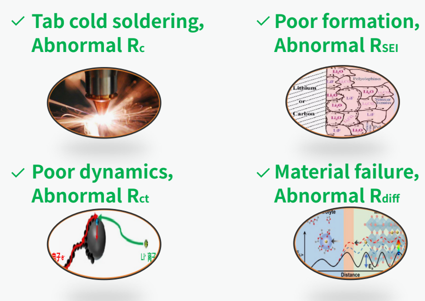
Contact impedance R_c ⇔ Area1: problems such as poor soldering of the tab and poor contact

SEI film impedance R_{SEI} ⇔ Area2: problems such as poor formation folding and wrinkling of the electrode

Charge transfer impedance R_{ct} ⇔ Area3: problems such as poor interface dynamics and lithium precipitation

Ion diffusion impedance R_{diff} ⇔ Area4: problems such as poor electrode compaction and poor electrolyte infiltration





Initial Energy Science&Technology(Xiamen) Co., Ltd

Tel: (86)592-5367060 Fax: (86)592-5367062

Mail: info@iesttech.com Web: www.iestbattery.com

Add: 4F No.2 BLDG, Xinfeng 2nd Road, Huli District, Xiamen, China

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