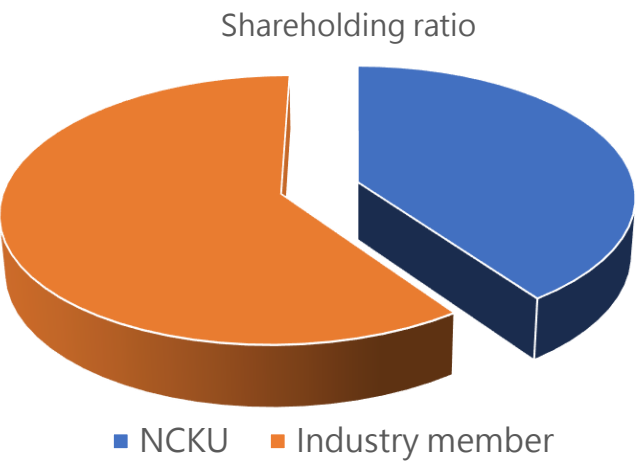


Reason for founding the TBTC Co.Ltd

TBTC Co.Ltd main ventured the capital by Fire Protection and Safety Research Center(NCKU).



Battery manufacture

Proto-type



Taiwan
Battery
Testing and
Certification

- 1. Full cell / Half cell
- 2. Battery test
- 3. OEM manufacturing(Electrode, Dry full cell)

Research / industry cooperation

Academic institutions
Material manufacture

Equipment limited (Accuracy)
Environment Limited (Dew point)
Design limited

1

OEM manufacturing

Electrode process experimental line

- Slurry mixing
- Electrode coating
- Calendering

Punch cell manufacturing process (proto-type sample)

2

Battery test

Punch cell

- C-rate 5V/60A (RT)
- Cycle test
- DCIR/ACIR

3

Electrochemical analysis

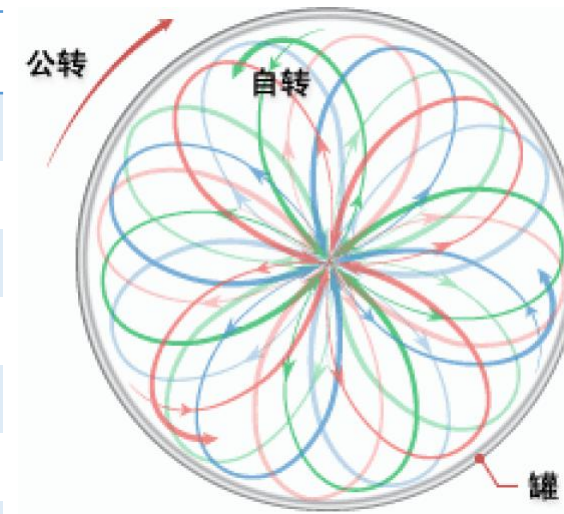
Coin cell (CR2032)

- C-rate
- Cycle test
- EIS/CV/LSV

Electrode process experimental line - Mixing process

Three frame blade planetary mixer (5Liters)

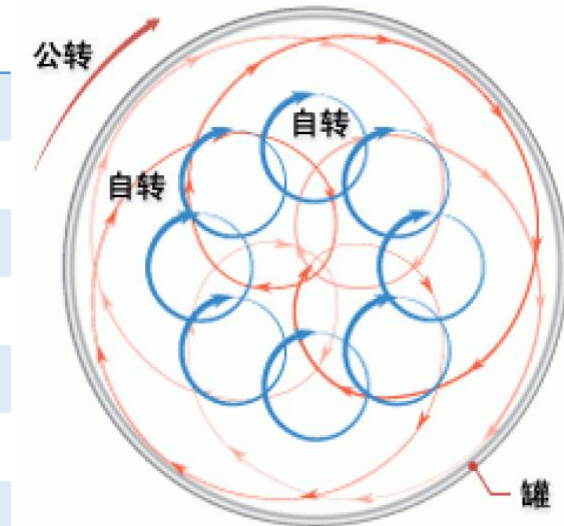
Operating viscosity range :	3,000,000cP<
Blade type :	Twisted frame blade
Orbit Revolution :	0~29.4 r/min
Blade Revolution :	0~96.6 r/min
Total volume:	5L
Operation volume :	4L
Vacuum pressure :	Mixing under vacuum pressure · Min pressure : 0.001 torr
Cooling temperature:	10~15°C,Max pressure 0.19MPa



Dry powder blending and Solid / liquid mixing (High shear force)

Two frame blade planetary mixer (10 Liters)

Operating viscosity range :	1,000,000cP以下
Blade type :	Two Twisted frame blade/Dispersion blade
Orbit Revolution :	5~86 rpm
Blade Revolution :	200~7700 rpm
Total volume:	10L
Operation volume :	8L
Vacuum pressure :	Mixing under vacuum pressure · Min pressure : 0.1 torr
Cooling temperature:	20~25°C,Max pressure 0.05MPa



Solid / liquid mixing (High shear rate)

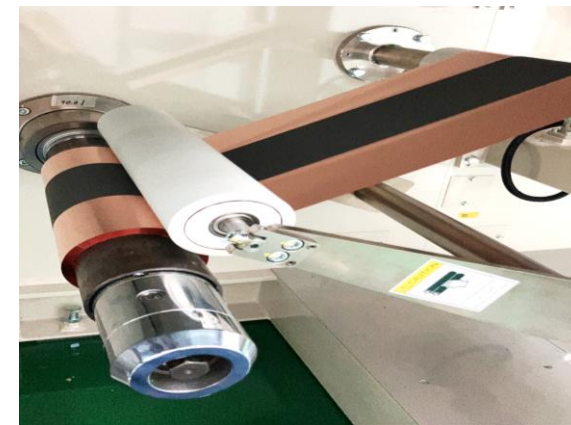
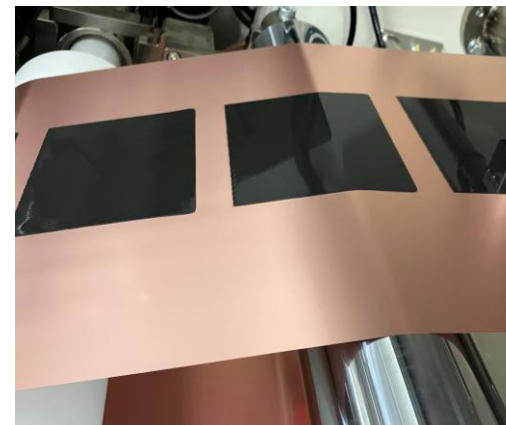
Confidential

Electrode process experimental line - Coating process

Multi - type coater

Coating type :	Comma direct (continuous) Comma reverse (continuous, Intermittent) Slot die(continuous, Intermittent, strip)
Machine speed :	0.3~3m/min
Foil type :	Al 、 Cu 、 PET...etc
Foil width :	380mm<
Coating width:	360mm<
Dry coating thickness:	1~200 um(Accuracy : +/-1um)
Dry coating weight:	0.01~1mg/mm ² (Accuracy : +/-2%)
Feed liquid viscosity :	300~10000mPa.s
Feed liquid solid content:	0.1~90wt%
Solvent :	NMP 、 Water...etc
Heating method :	Electric heating
Heating max temperature :	150°C
Winding / Rewinding core diameter :	3 inch
Intermittent coating:	Coating length : 100~999mm(Accuracy : +/-1mm) Uncoating length : 10~99mm(Accuracy : +/-1mm)

We can make the different type of coating(continuous, Intermittent, strip , strip/intermittent.)



Confidential

Electrode process experimental line - Calendering process

Electrode calendering machine

Equipment speed :	1~10m/min
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Roller Press width :	300mm<
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Max motor pressure :	60ton
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Max line pressure:	2ton/cm
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Heating method:	Electric heating the oil sealing in the roller
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Roller heating max temperature:	150°C
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Pre-heating roll max temperature:	150°C
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Winding / Rewinding core diameter :	3 inch
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Roll temperature distribution :	$R \leq 3^{\circ}\text{C}$
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Heating rate :	0.33 °C/min
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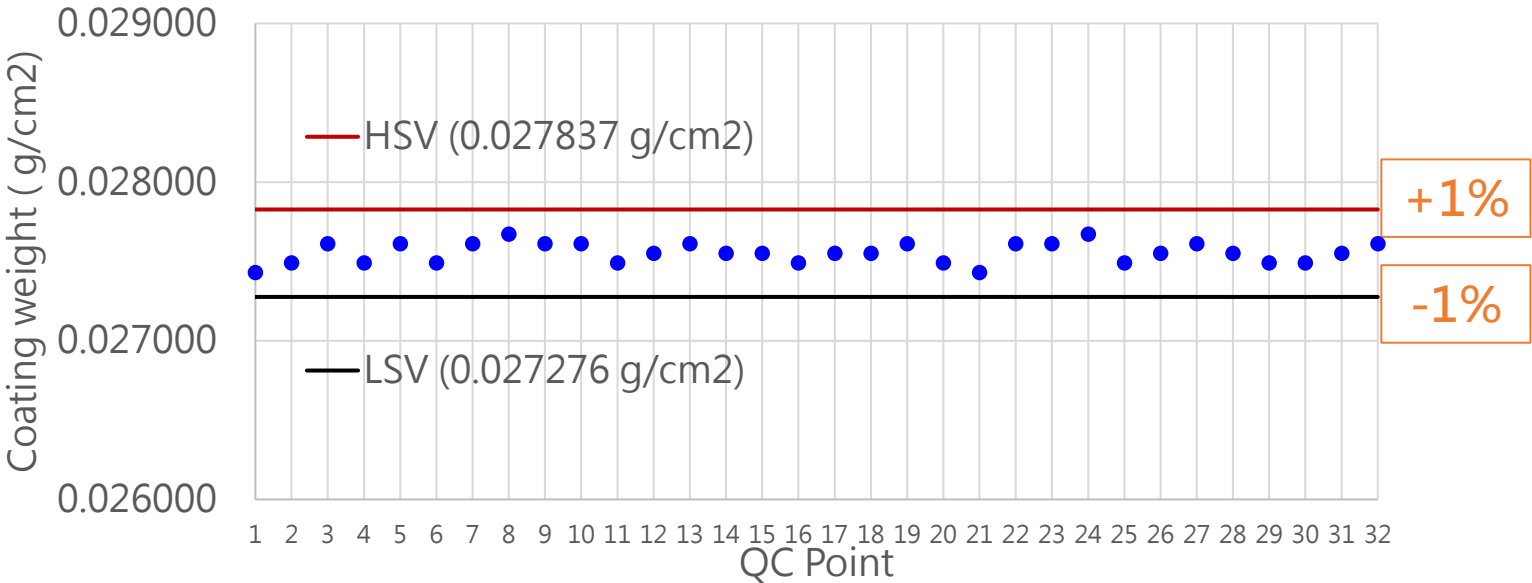
Base on your density target, we can provide the good quality of the electrode.



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Electrode process experimental line

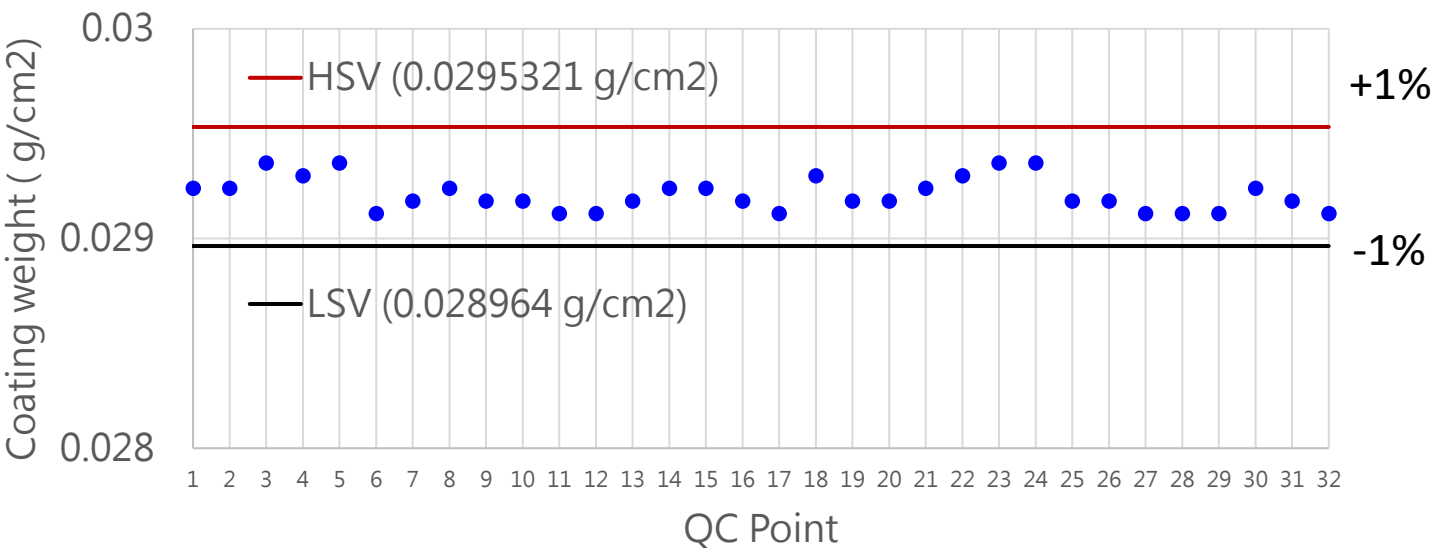
Anode Coating weight Distribution



QC area : ø13mm

	1	9	17	25	
	2	10	18	26	
	3	11	19	27	
	4	12	20	28	
	5	13	21	29	
	6	14	22	30	
	7	15	23	31	
	8	16	24	32	

Cathode Coating weight Distribution



QC area : ø13mm

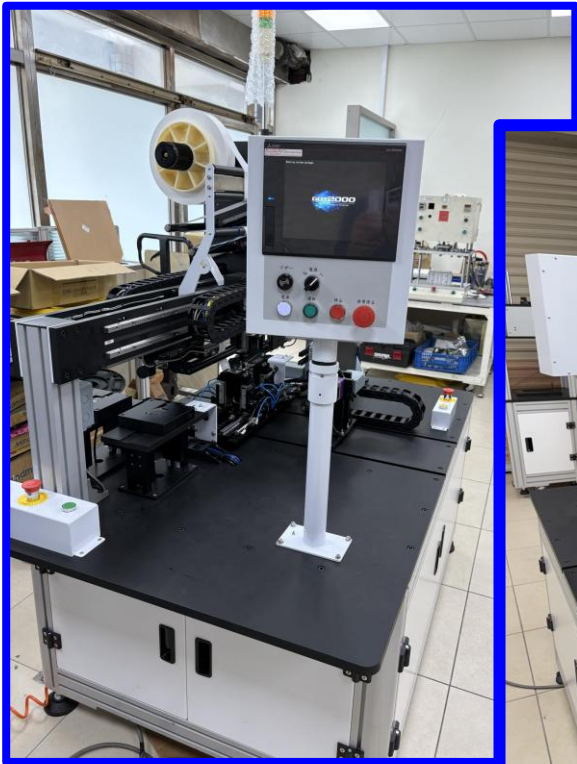
	1	9	17	25	
	2	10	18	26	
	3	11	19	27	
	4	12	20	28	
	5	13	21	29	
	6	14	22	30	
	7	15	23	31	
	8	16	24	32	

Electrode process experimental line - Stacking process

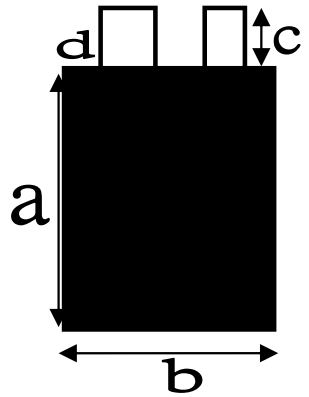
Semi-auto stacking machine

EPC with separator : $<\pm 0.05\text{mm}$

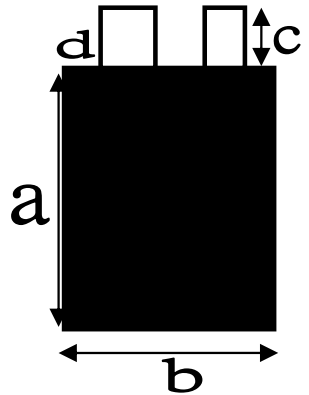
Stacking accuracy: $<\pm 0.2\text{mm}$



1Ah電池尺寸mm			
a ± 0.05	b ± 0.05	c ± 0.05	d ± 0.05
52.5	36	8.5	2



10Ah電池尺寸mm			
a ± 0.05	b ± 0.05	c ± 0.05	d ± 0.05
112	95	13	13.5



Punch cell manufacturing process (Proto-type sample)



Cathode Anode



Punch cell manufacturing process (Capacity : 1~20Ah)

Model size :
1. 35.7*50 mm
2. 94.0*108.0 mm



Welding

Frist Sealing

Electrolyte injection



Second sealing

Degassing

Formation

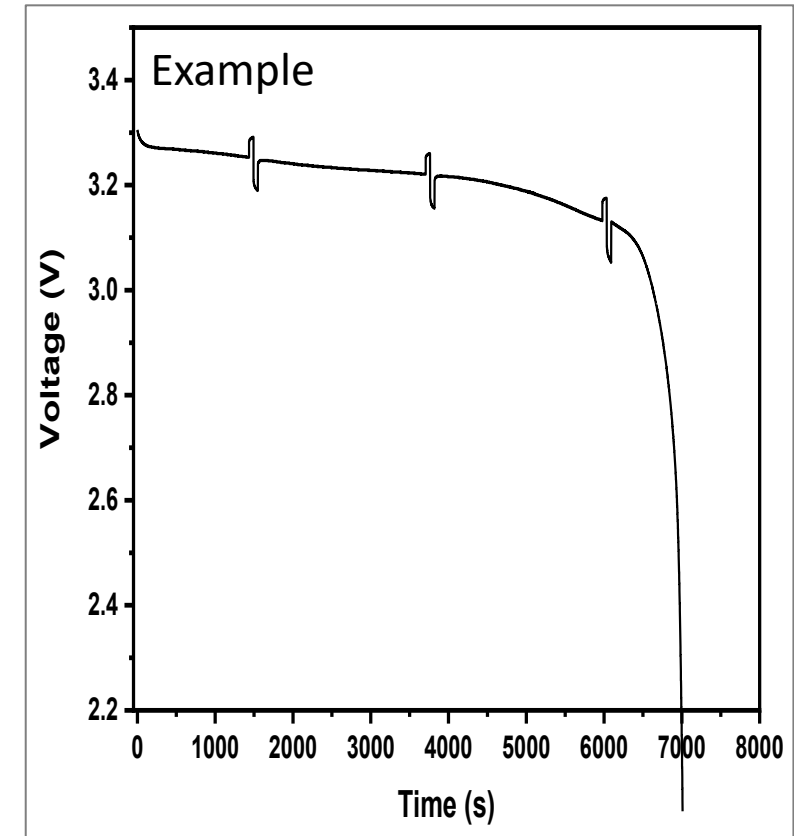
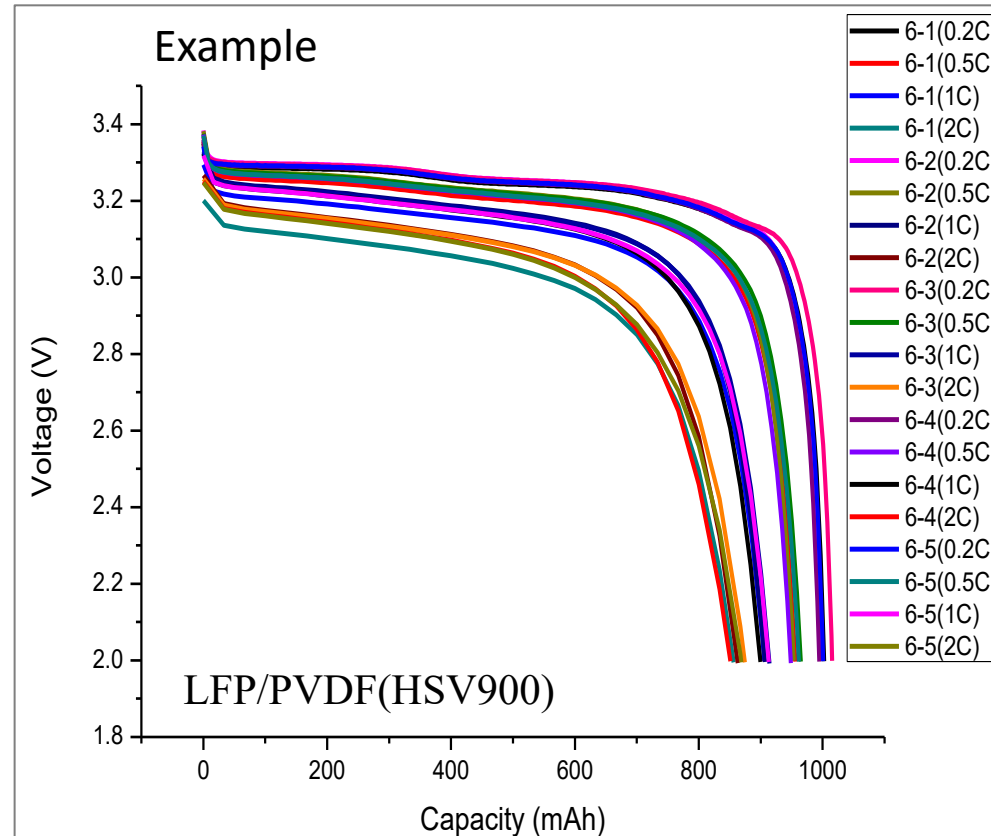


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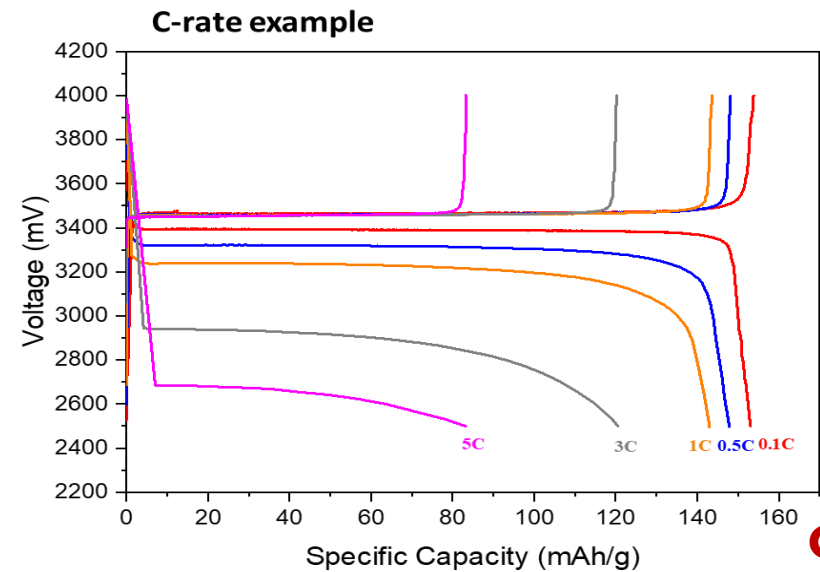
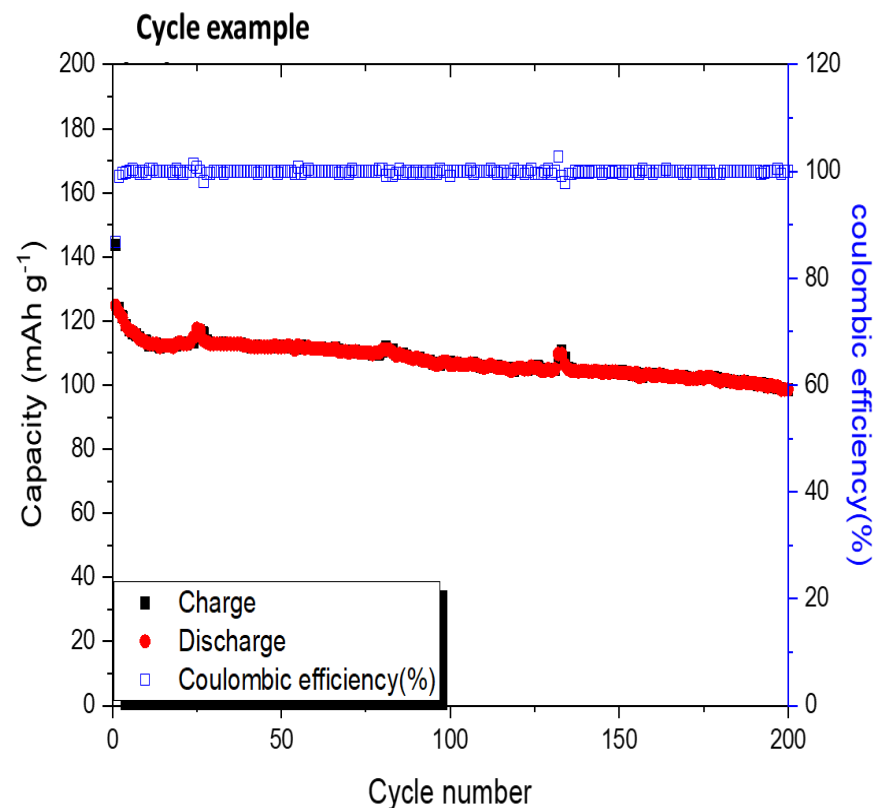
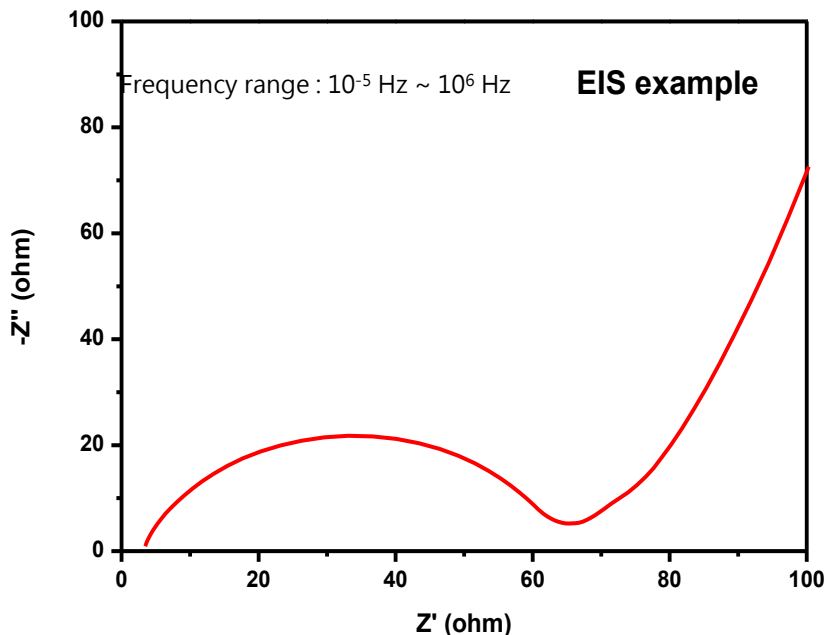
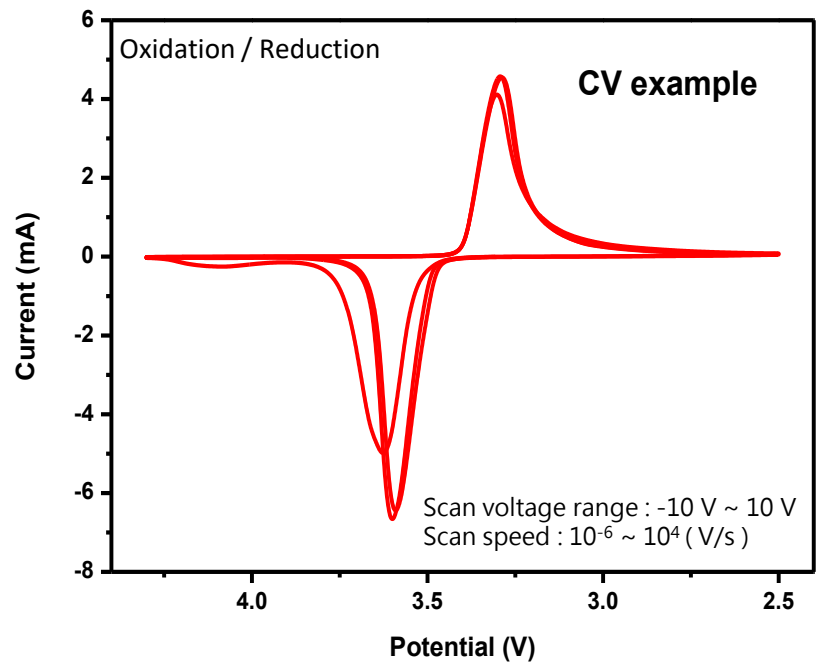
Size:
1. 34.2*48.5 mm
2. 92.0*106.0 mm

Battery test - Punch cell

- C-rate 5V/60A RT
- Cycle test
- DCIR/ ACIR test
- Different C-rate test



Electrochemical analysis(Coin cell : CR2032)



TBTC Co.Ltd Implementation cases

Item		Case
Electrode	Cathode material (with additive)	Graphene Verification
	Anode material (with additive)	SiC anode Verification
	Binder	Cathode binder Verification Anode binder Verification
	Cu Foil	Cu Foil surface Verification
	Al Foil	Carbon conductive coating Verification
Separator		Separator modified Verification
Aluminum plastic film		Physical properties test
Electrolyte	Electrolyte	Electrolyte test
	Additive	Gel electrolyte additive test
Electrochemical analysis	Punch cell, Coin cell	Cycle test, C-rate test
OEM/ODM	Full cell	Customers made
	Electrode	Customers made

Thanks