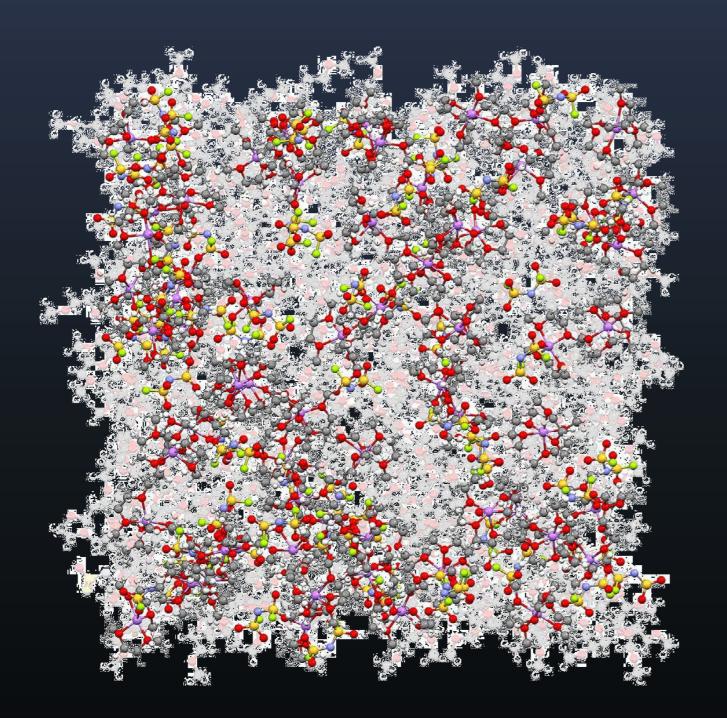
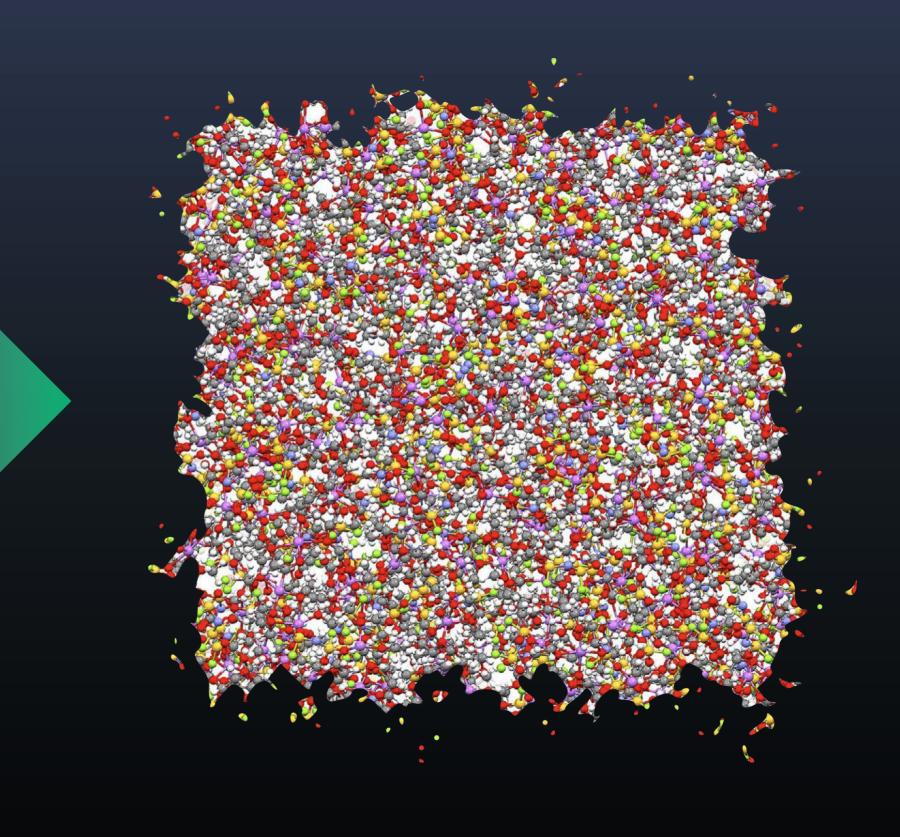




Solid Polymer Ionic Liquid Li-Metal

High concentration solvent-in-salt electrolyte for Li-Metal





Hermes™ High Energy Rechargeable Metal cElls for Space



Avatar - Battery digital twin with full traceability DNA (material/cell design), Pregnancy (manufacturing), Lifestyle (test data)



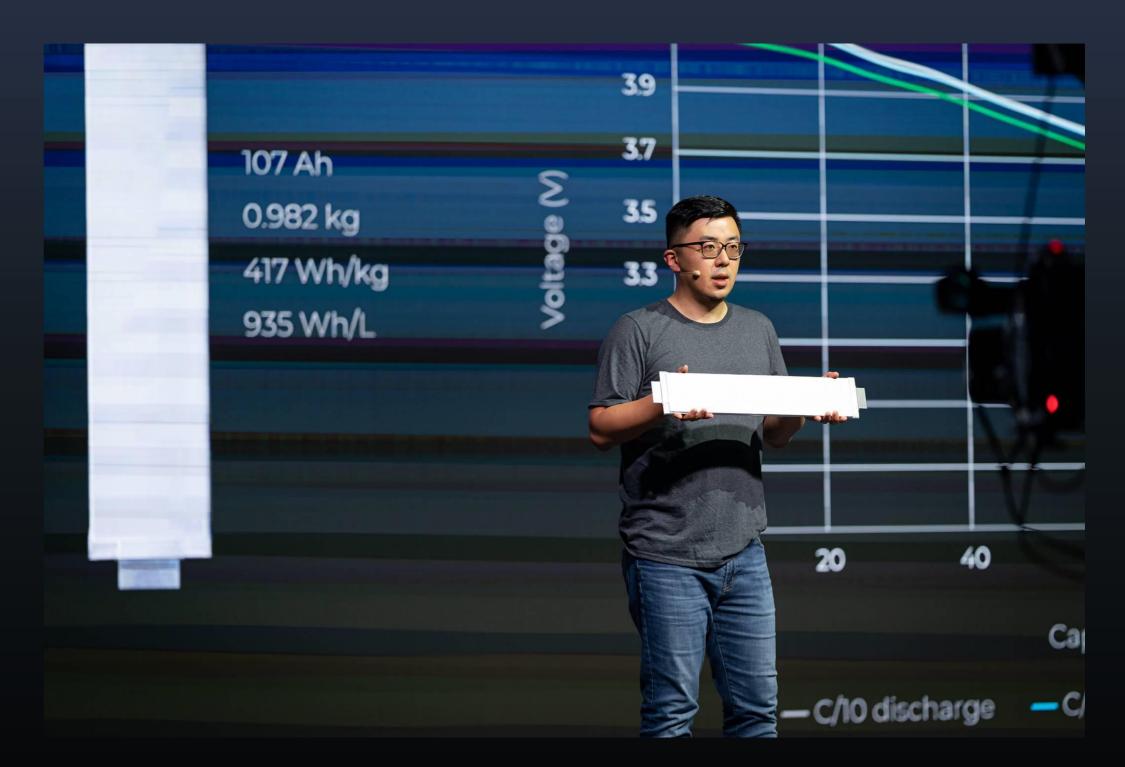
World's first automotive A-sample JDA for Li-Metal

HONDA





World's largest Li-Metal cell





World's first automotive B-sample JDA for Li-Metal

It's one small step for SES's Li-Metal, one giant leap for the future of transportation both on land and in air

JOINT DEVELOPMENT AGREEMENT (B-SAMPLE)

THIS AGREEMENT, made and entered into on the _____ day of ______, 2023 by and between **SES HOLDINGS PTE. LTD.**, a corporation duly organized and existing under the laws of the Republic of Singapore and having its registered office at 1 Robinson Road, #18-00 AIA Tower, Singapore 048542 (hereinafter referred to as "SES") and _______., for and on

[Confidential]

human-based deep learning machine-based deep learning



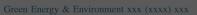
+ MODEL

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ScienceDirect





Research paper

All-fluorinated electrolyte for non-flammable batteries with ultra-high specific capacity at 4.7 V

Zhe Wang ^{a,1}, Zhuo Li ^{a,1}, Jialong Fu ^a, Sheng Zheng ^a, Rui Yu ^a, Xiaoyan Zhou ^a, Guanjie He ^b, Xin Guo ^{a,*}

 ^a State Key Laboratory of Material Processing and Die & Mould Technology, Laboratory of Solid State Ionics, School of Materials Science and Engineering, Huazhong University of Science and Technology, Wuhan, 430074, PR China
 ^b Electrochemical Innovation Lab, Department of Chemical Engineering, University College London, 20 Gordon Street, London WC1E 7JE, UK

Received 3 February 2023; revised 26 May 2023; accepted 11 June 2023

Available online

Abstract

Li metal batteries (LMBs) with LiNi_{0.8}Mn_{0.1}Co_{0.1}O₂ (NMC811) cathodes could release a specific energy of >500 Wh kg⁻¹ by increasing the charge voltage. However, high-nickel cathodes working at high voltages accelerate degradations in bulk and at interfaces, thus significantly degrading the cycling lifespan and decreasing the specific capacity. Here, we rationally design an all-fluorinated electrolyte with addictive tri(2,2,2-trifluoroethyl) borate (TFEB), based on 3, 3, 3-fluoroethylmethylcarbonate (FEMC) and fluoroethylene carbonate (FEC), which enables stable cycling of high nickel cathode (LiNi_{0.8}Co_{0.1}Mn_{0.1}O₂, NMC811) under a cut-off voltage of 4.7 V in Li metal batteries. The electrolyte not only shows the fire-extinguishing properties, but also inhibits the transition metal dissolution, the gas production, side reactions on the cathode side. Therefore, the NMC811||Li cell demonstrates excellent performance by using limited Li and high-loading cathode, delivering a specific capacity >220 mA h g⁻¹, an average Coulombic efficiency >99.6% and capacity retention >99.7% over 100 cycles. © 2023 Institute of Process Engineering, Chinese Academy of Sciences. Publishing services by Elsevier B.V. on behalf of KeAi Communi-

cations Co., Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Fluorinated electrolyte; Li metal batteries; Solid electrolyte interphase; Cathode electrolyte interphase; Coulombic efficiency

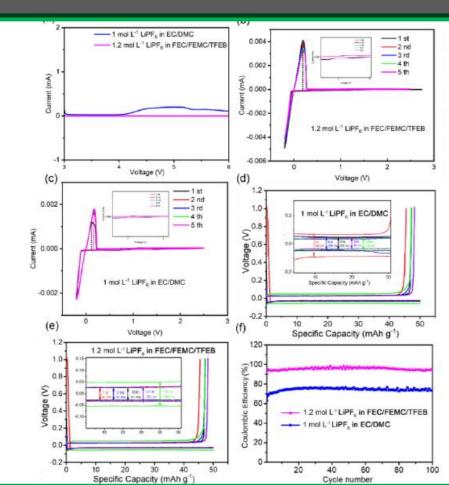
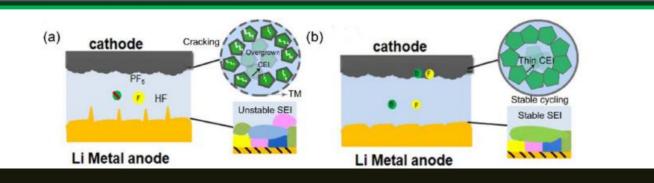


Fig. 2. (a) Oxidation stability of LiPF₆ FEC/FEMC/TFEB electrolyte and LiPF₆ EC/DMC electrolytes in Li||stainless steel cells measured by LSV at a scanning rate of 1 mV s⁻¹. (b) Oxidation/reduction stability of LiPF₆ EC/DMC electrolyte in Li||stainless steel cells measured by CV at a scanning rate of 2 mV s⁻¹. (c) Oxidation/reduction peak of LiPF₆ FEC/FEMC/TFEB fully-fluorinated electrolyte for forming SEI layer determined in Li||stainless steel cells and Oxidation/reduction stability of fully-fluorinated electrolyte by CV at a scanning rate of 2 mV s⁻¹. (d) Li-metal plating/stripping profiles on Cu foil cycled in LiPF₆ EC/DMC electrolyte at 0.5 mA cm⁻². (e, f) Li-metal plating/stripping profiles on Cu foil cycled in LiPF₆ FEC/FEMC/TFEB electrolyte at 0.5 mA cm⁻². Li plating/stripping Coulombic efficiency in different electrolytes at 0.5 mA cm⁻².



text

data

illustrations

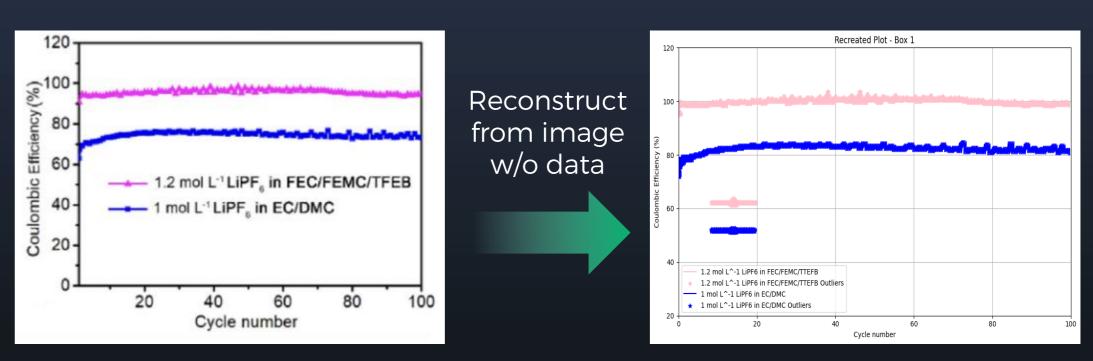
The electrolyte used in the research paper is a fully fluorinated electrolyte. It consists of the following components:

- 1. Electrolyte Solvents:
- 3,3,3-fluoroethylmethyl carbonate (FEMC)
- Fluoroethylene carbonate (FEC)
- Tri(2,2,2-trifluoroethyl) borate (TFEB)
- 2. Electrolyte Salt:
- Lithium hexafluorophosphate (LiPF6)
- 3. Additives:
- None mentioned in the paper

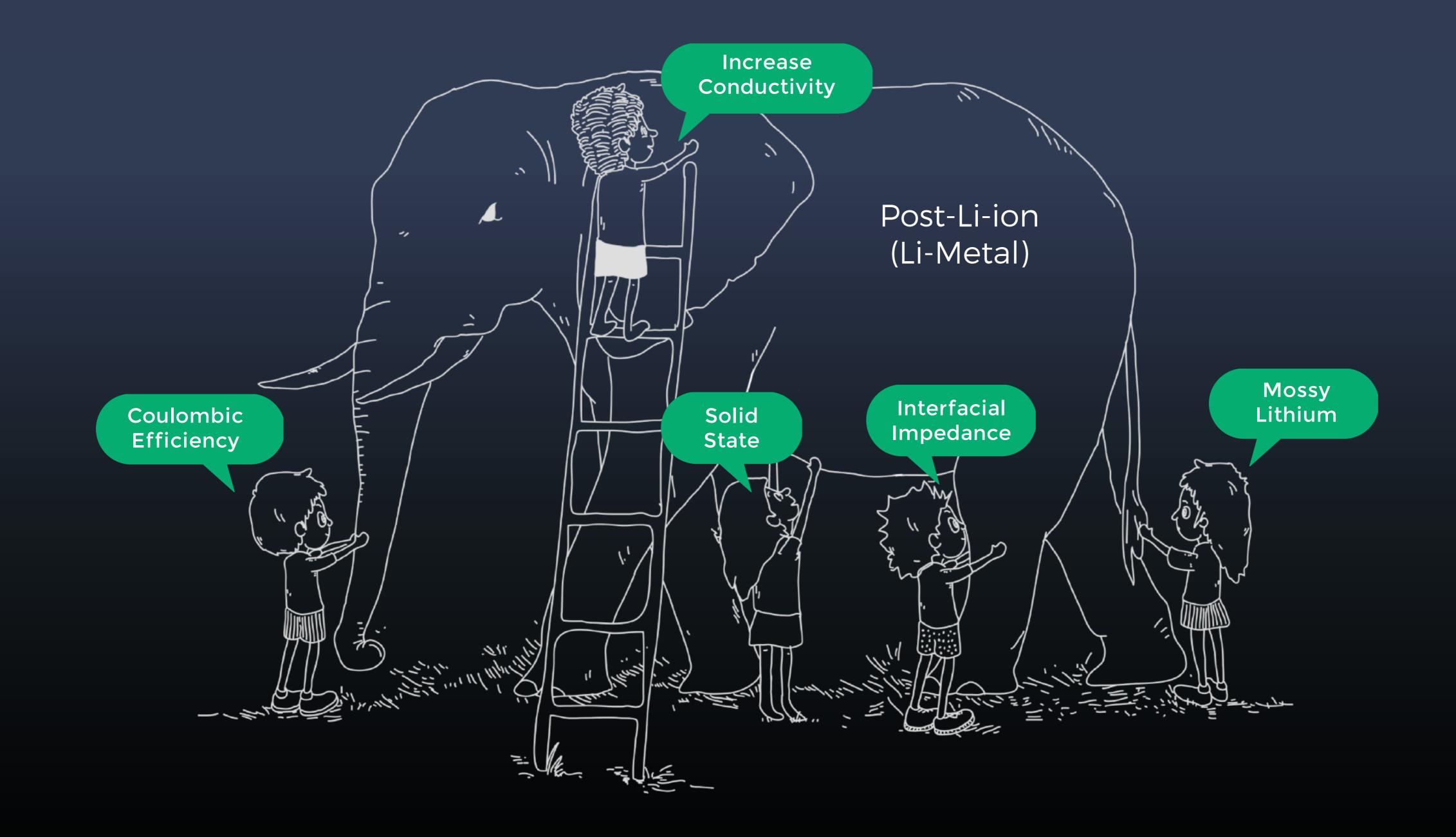
The ratio of the solvents and salt in the electrolyte is not explicitly mentioned in the paper.

The ion conductivity and coulombic efficiency of the electrolyte are mentioned in the paper.

The electrolyte demonstrates stable cycling performance with an average Coulombic efficiency >99.6% and capacity retention >99.7% over 100 cycles. However, specific values for ion conductivity are not provided in the paper.







Electrolyte Foundry



Boston, MA



Boston HQ Electrolyte Foundry

7 T-

South Korea: Line 2, 3, 5 (JV) Shanghai Giga: Line 1, 4

SES Chungju 100 Ah Test Bunker

S.shin

0

SES Shanghai 100 Ah Test Bunker





	Cell Type	4.2Ah (25+ layer) at 25°C	50.7Ah (16+ layer) at 25°C	105.8Ah (32+ layer) at 25°C	
	Low power C/20	> 375 Wh/Kg	_	-	
Room Temperature (25° C) Energy Density	Low power C/10	375 Wh/Kg (= 700 Wh/L at SOC 0%)	357 Wh/Kg (= 773 Wh/L at SOC 30%)	399 Wh/Kg (= 862 Wh/L at SOC 30%	
	Medium power C/3	-	342 Wh/Kg (=743 Wh/L)	390 Wh/Kg (=842 Wh/L)	
	Medium power 1C	339 Wh/Kg	_	370 Wh/Kg	
	High power 3C	_	303 Wh/Kg	351 Wh/Kg	
	High power 5C	321 Wh/Kg -		-	
	Low power C/10	324 Wh/Kg	_	-	
Low Temperature (0° C)	Medium power C/3	-	305 Wh/Kg	346 Wh/Kg	
Energy Density	Medium power 1C	298 Wh/Kg	_	_	
	High power 5C	282 Wh/Kg -		-	
	C/10 – C/3	600 cycles (80% retention)	>200 cycles (Ongoing)	>300 ongoing	
Lifetime (Ch-Dch)	C/3 – C/3	300 cycles (80% retention)	210 cycles (80% retention)	>250 ongoing	
	C/5 - 1C	700 cycles (80% retention)	-	-	
Fast Charging	Charge at 4C	80% in <15min	0% in <15min -		
	Thermal	C/10 - C/3600 cycles (80% retention)>200 cyclesC/3 - C/3300 cycles (80% retention)210 cyclesC/5 - 1C700 cycles (80% retention)210 cyclesCharge at 4C80% in <15min		PASS TEST	
Safety	Nail Penetration	PASS TEST PASS TEST		PASS TEST	
	Overcharge	PASS TEST	PASS TEST	PASS TEST	
	External Short Circuit	PASS TEST PASS TEST		PASS TEST	
Certification		UN38.3 UN38.3, IATF16949		UN38.3	
Manufacturability		(highly similar process to Li-ion)			
Tested Operating Temperature		-30 °C to 60 °C	-10 °C to 45 °C	-10 °C to 45 °C	





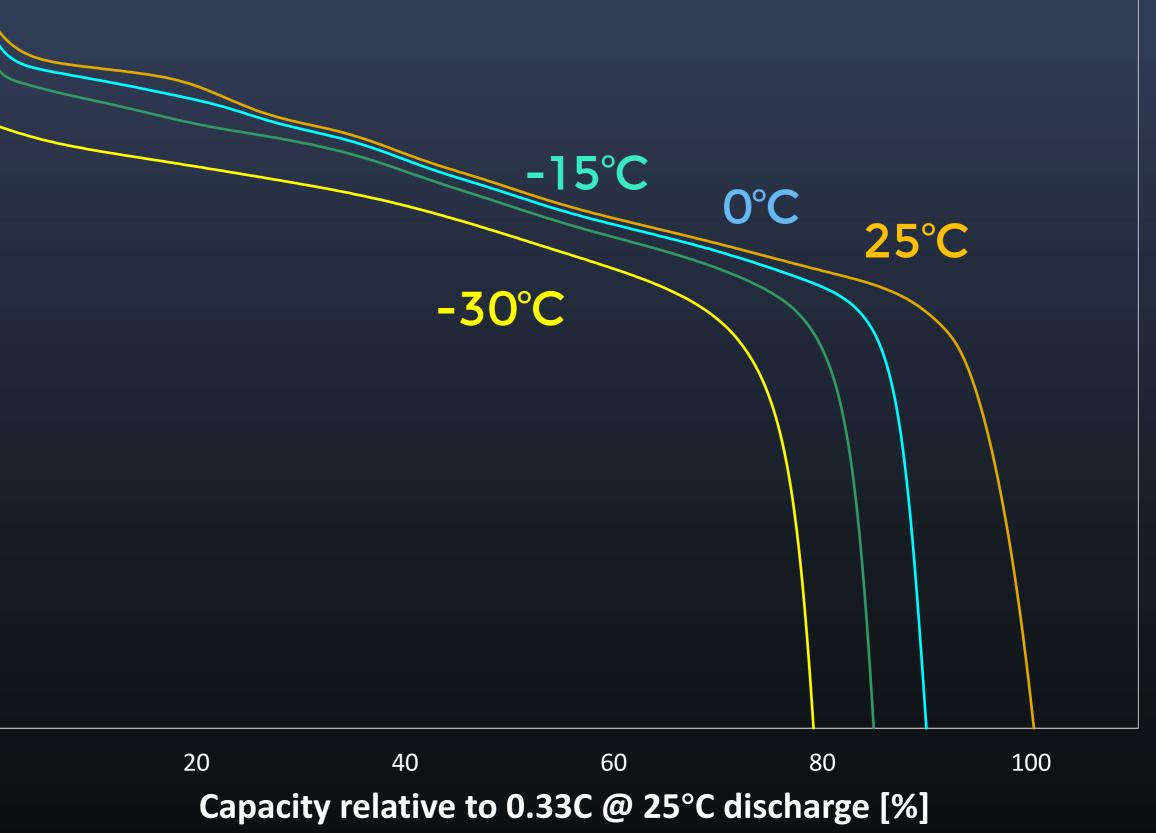




Excellent performance in cold weather

Retains 80% capacity (C/3 at 25°C) even at -30°C

4.3 4.1 3.9 3.7 Voltage (V) 3.5 3.3 3.1 2.9 2.7 2.5

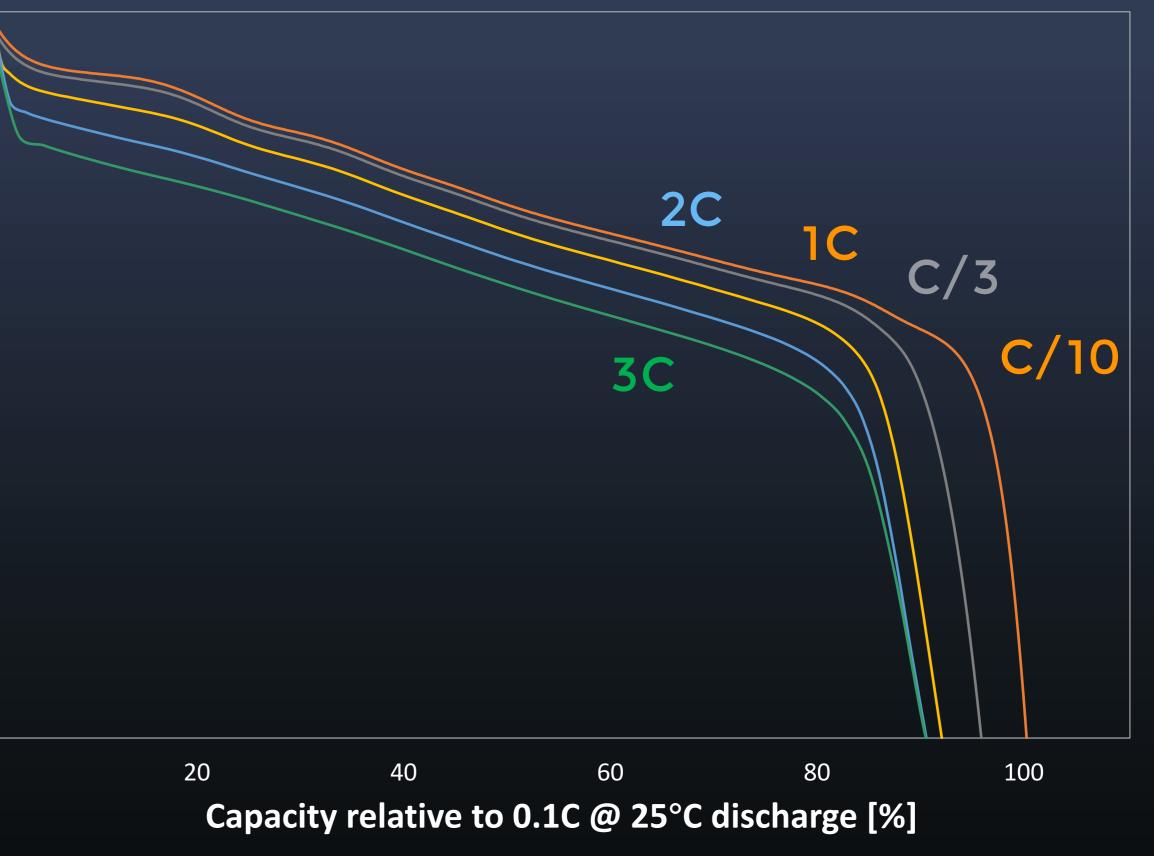




Excellent performance in high power requirements

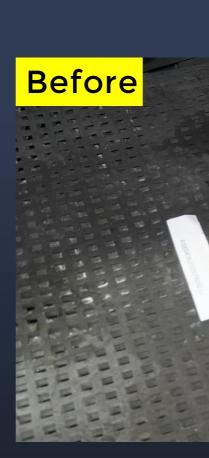
Retains 90% capacity (C/3 at 25°C) even at 3C



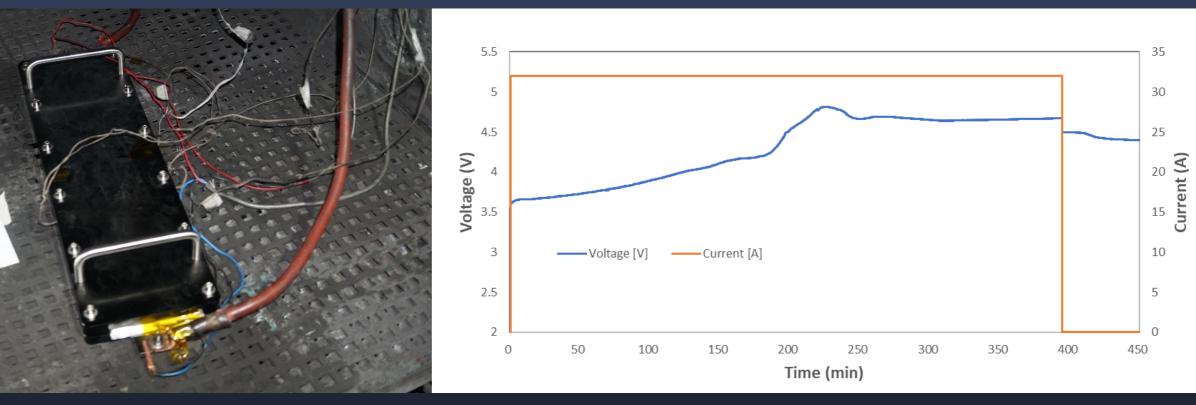


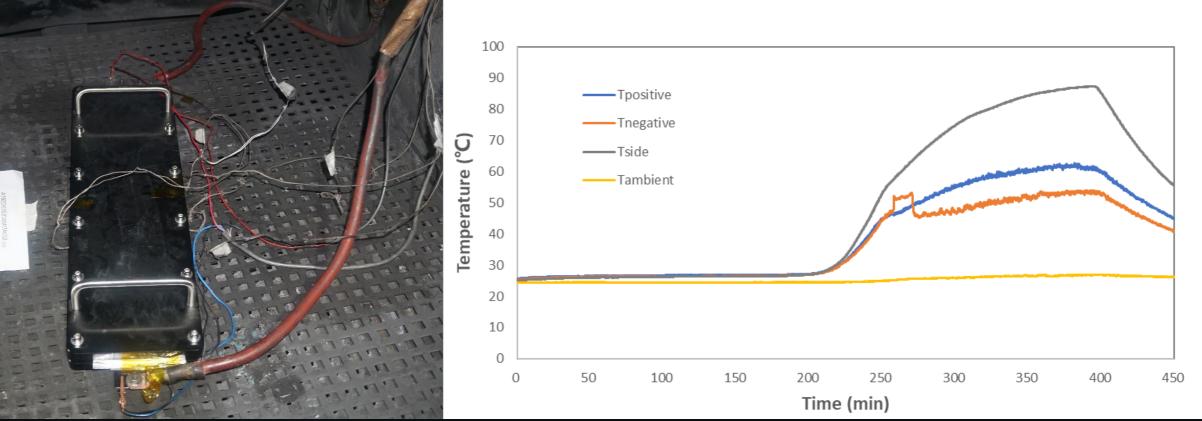


Overcharge Passed





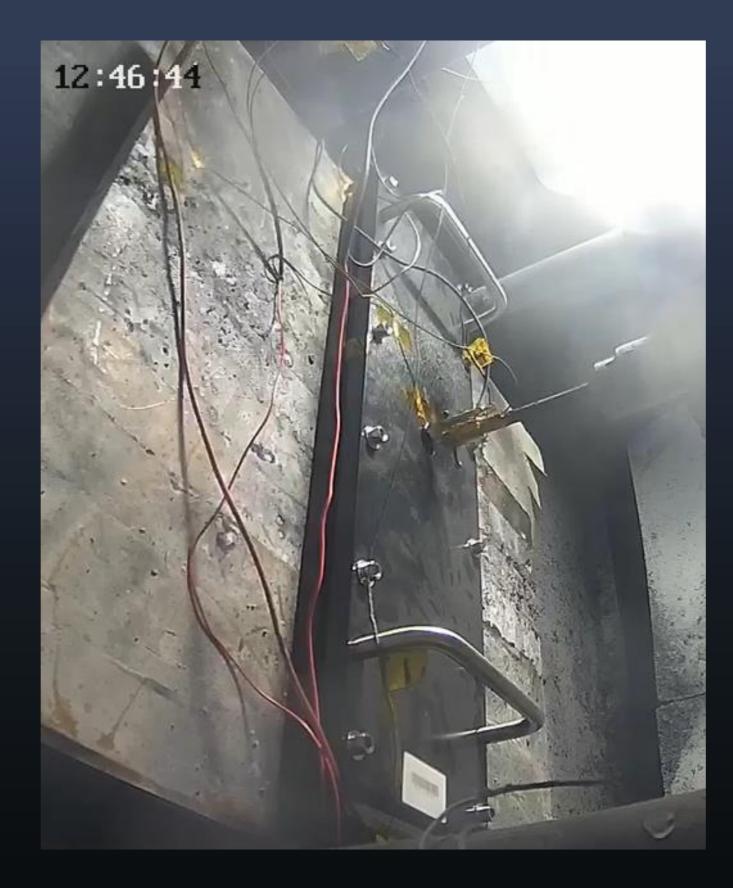


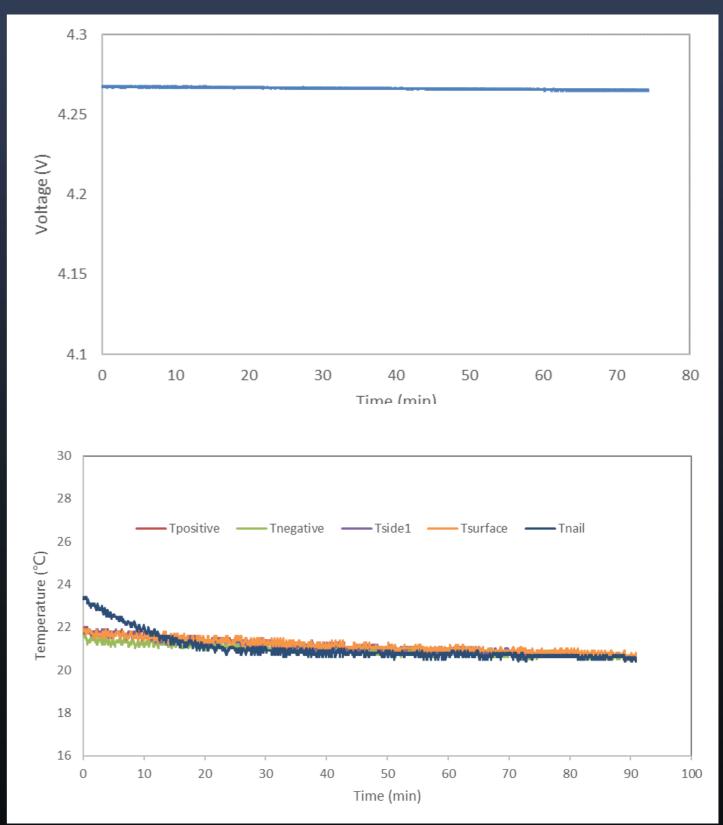






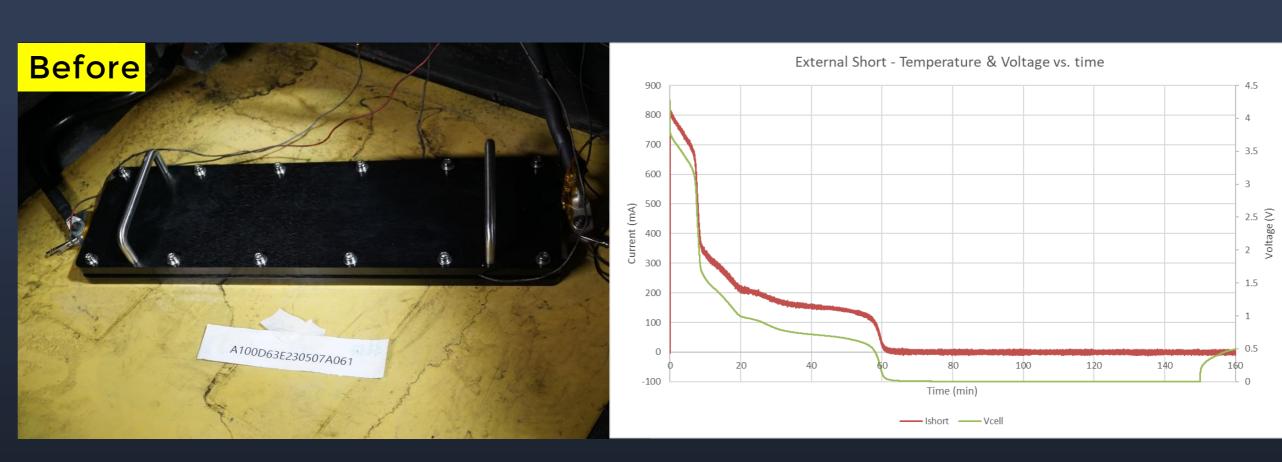
Nail Penetration Passed

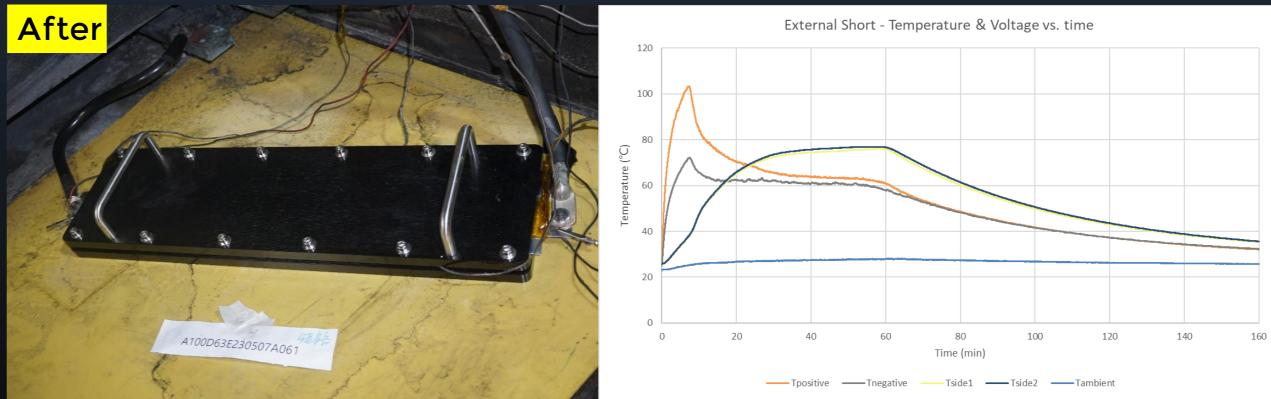






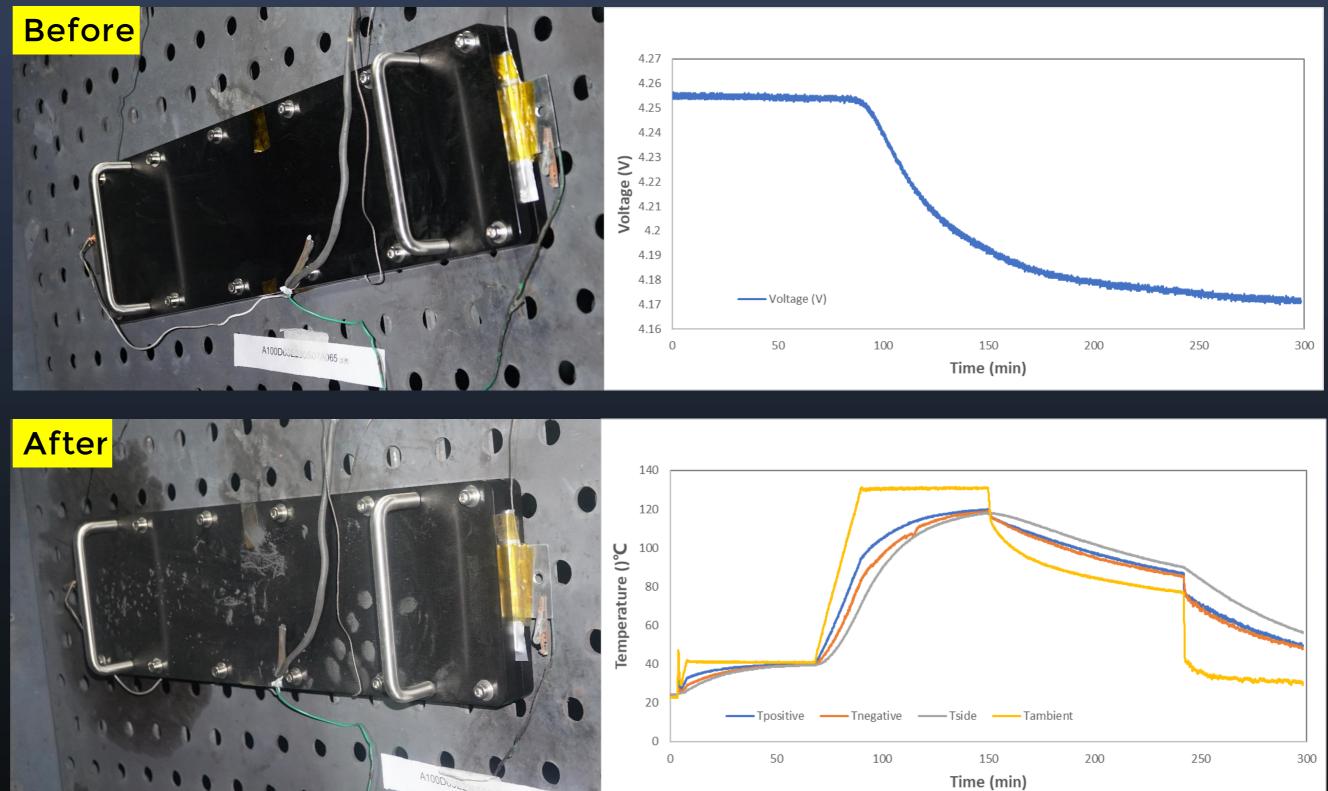
External Short Circuit Passed

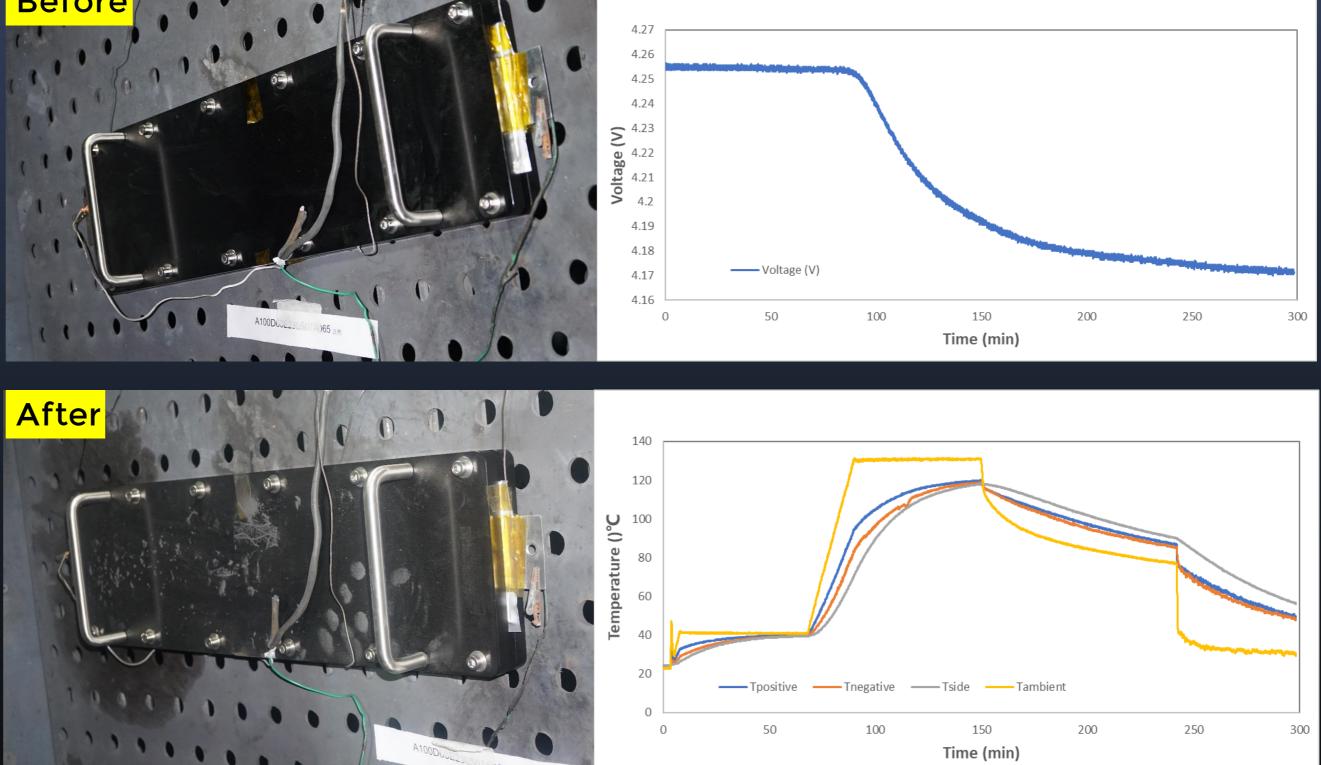






Thermal Stability Passed











样品描述(Sample Description):

电池名称(Cell/battery Name): 可充电二次锂电池芯 Rechargeable lithium battery cell

质量(Mass): 0.51kg

规格参数(Specification Parameter): ■锂离子电池/电芯 3.82 V 47.4 Ah 1 □锂金属电池/电芯 ____ V ___ Ah

物理形状(Physical Description): 袋装电池 Pouch Cell

型号(Model Numbers): 37B0582

委托单位(Applicant):

麻省固能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区招贤路 1581 号 Zhaoxian road 1581, Jiading district, 021-59901136 victorsun@ses.ai www.ses.ai

样品生产厂商(Sample Manufacturer):

麻省固能(上海)新能源科技有限公 SES AI(Shanghai) Co., Ltd 上海市嘉定区招贤路 1581 号 Zhaoxian road 1581, Jiading district, 021-59901136 victorsun@ses.ai www.ses.ai

UN38.3 测试实验室(UN38.3 Test Lab)

中认英泰检测技术有限公司 CQC Intime Testing Technology Co., 江苏省苏州市吴中区吴中大道 1368 技金融城 East Taihu Technology and Fina No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303623 cqc_jszlb@126.com http://www.cqc-it.com

UN38.3 试验概要

LITHIUM CELLS OR BATTERIES TEST SUMMARY IN ACCORDANCE WITH SUB-SECTION 38.3 OF UN MANUAL OF TESTS AND CRITERIA

NO. CQCIT2206J0297

		10.000	11220000207		
	样品	测试信息(Sample Test Information):		
	试验报告编号(Test Report Number):				
	2022	20220706J18449			
	试验	报告签发日期(Date of Test Report):			
	2022	-09-06			
	所用	《试验和标准手册》版本(Edition of	UN Manual of Tests		
<u>181</u> Wh	and C	Criteria Used):			
<u> </u>	《关	于危险货物运输的建议书 试验和树	示准手册》第七版修		
	订1	第 38.3 节			
	Reco	mmendations on the Transpo	rt of Dangerous		
	Good	ds, Manual of Tests and Criteria,	ST/SG/AC.10/11/		
	Rev.7	7/Amend.1/Section 38.3			
司	所进	行的试验及其结果(即:通过/未通	i过)一览表(List of		
н)	Tests	Conducted and Results(Pass/Fail)):		
	T1	高度模拟(Altitude simulation)	Pass		
Shanghai	T2	温度试验(Thermal test)	Pass		
	T3	振动(Vibration)	Pass		
	T4	冲击(Shock)	Pass		
	T5	外部短路(External short circuit)	Pass		
	T6	撞击/挤压(Impact/Crush)	Pass		
) : 一司	T7	过度充电(Overcharge)	Not applicable		
, L]	T8	强制放电(Forced discharge)	Pass		
Shanghai	是否	符合集成锂电池的测试要求(As	sembled Lithium		
	Batte	ery Test Requirement):			
	□38	.3.3(f) □38.3.3(g) ■不适	用 N/A		
b):					
, Ltd . 号东太湖科	美海				
了小八两杆	3 38 44				
nance City,	A CARLAN				
l, Wuzhong	技术负益处(Technical Lader)				

签发日期 Heate of issue): 2022-09-06



UN38.3 试验概要

LITHIUM CELLS OR BATTERIES TEST SUMMARY IN ACCORDANCE WITH SUB-SECTION 38.3 OF UN MANUAL OF TESTS AND CRITERIA

NO. CQCIT2306J0442

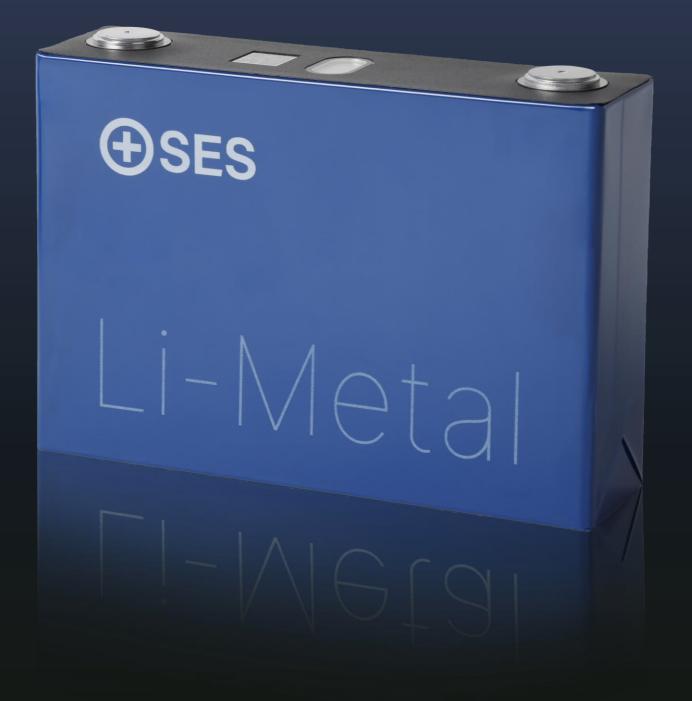
神品強法(Sample Description): 神品強(信.Sample Test Information): 地路名歌(Cell/Dattery Name): 可先电二次環电泡芯 可先电二次環电泡芯 Counter State Report Number): 20230805/23561 Counter State Report Number): Bechargaebie linkum battery cell Jack Add State Report Number): US88g Jack Add State Report Number): With State St	CCC wane testing technology Co.(.).	NO. CQCI	T2306J0442			
可充电二次锂电池芯 Rechargeable lithium battery cell 黄重(Mass): 0.98kg 淋培養取(Specification Parameter): · 锂离子电池中起芯 V Ah g 物温形状(Physical Description): 探表电池 Pouch Cell 载号Model Numbers): 711B0582 委托单位(Applicant): 家在前脸 (上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市畫定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 victorsun@ses.ai www.ses.ai 并是生产/T前(Sample Manufacturer): 麻客育面能 (上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市畫定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 victorsun@ses.ai www.ses.ai WU38.3 對法天检查(UN38.3 Test Lab): 中认英泰检测技术有限公司 COC Intime Testing Technology Co., Ltd. 苏州市是中经济开发区具中大道 1368 号 No.1368 Wuzhong Economic Development Zone, Suzhou, Jiangsu. D12-66303621 jszb@coci.com http://www.cqc-it.com	样品描述(Sample Description):	样品测试信息(Sample Test Information)				
Rechargeable lithium battery cell 「夏、Mass; 0.98kg Mh参和Specification Parameter): ■理素于电池电恋 <u>3.82 V 105.3 Ah 402 Wh</u> □世金属电影电恋 <u>3.82 V 105.3 Ah 402 Wh</u> □世金属电影电恋 <u>1 V Ah g</u> %表电能 Pouch Cell 数转地 Pouch Cell 数特地 Pouch Cell 数特地 Chap is metawatta fall and and the set of test Report): 2023-10-20 MR (Xb和标准手册)友本(Edition of UN Manual of Tests and Criteria, ST/SG/AC.10/11 Rev.7/Amend.1/Section 38.3 SH2f Otsize Jack and Results(Pass/Faill): 1 高度 使用(Altitude simulation) Pass 1 a 面 Criteria Used): 2 art azic Calipsa 1699 G Fuhai road 1699, Jiading district, Shanghai 201-59901136 victorsun@ses.ai www.ses.ai UN38.3 SHX set Laby: Phy zet Calipsa 1699 G Fuhai road 1699, Jiading district, Shanghai 201-59901136 victorsun@ses.ai www.ses.ai UN38.3 SHX set Laby: Phy zet Record discharge) Pass Asta distry Test Requirement:: 138.3.3(f) □38.3.3(g) ■ Fizh Right And Right	电池名称(Cell/battery Name):	试验报告编号(Test Report Number):				
Jean And Section 2015 and 202 Wh 日本 2023-10-20 Section 2015 and 202 Wh 日本 2015 and 2015 and 402 Wh 1015 and 2015 and 4015 Wh 1015 and 2015 and 4015 Wh 1015 and 2015 and 4015 Wh 1015 and 4015 Wh 1015 and 4015 Wh 1015 and 4015 Wh 1015 and 40	可充电二次锂电池芯					
 0.98kg 0.98kg 加格参数(Specification Parameter): 型電子电池电芯 3.82 V 105.3 Ah 402 Wh 型電子电池电芯 3.82 V 105.3 Ah 402 Wh 型電子电池电芯 3.82 V 105.3 Ah 402 Wh 型金属ub池电芯 V Ah g 物電形状(Physical Description): 袋麦电池 Pouch Cell 型每(Model Numbers): 7180552 委托单位(Applicant): 麻省面能(上海) 新能源科技有限公司 SES Al(Shanghai) Co., Lid 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai) Q21-59901136 Victorsun@ses.ai www.ses.ai 并始先並戶厂育(Sample Manufacturer): 麻省面能(上海) 新能源科技有限公司 SES Al(Shanghai) Co., Lid 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai) Q21-59901136 Victorsun@ses.ai www.ses.ai WU38.3 新达实验室(UN38.3 Test Lab): 中认英泰检测技木有限公司 CQC Intime Testing Technology Co., Lid. 苏州市泉中经济开发区风中大型 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszb@coc-it.com http://www.cqc-it.com 	Rechargeable lithium battery cell					
 端格参数(Specification Parameter): ●理属子电池电恋 <u>3.82 V 105.3 Ah 402 Wh</u> 印霍金属电池电恋 <u>10.5 3 Ah 402 Wh</u> 印雷金属电池电恋 <u>10.5 3 Ah 402 Wh</u> 印雷金属电池电恋 <u>10.5 3 Ah 402 Wh</u> (关于危险货物运输的建议书 试验和标准手册》第七版做 (大声心意 <u>3.82 V105.3 Ah 402 Wh</u> (大声心意 <u>3.83 V105.5 4h 10.5 10.5 10.5 10.5 10.5 10.5 10.5 10.5</u>		2023-10-20				
 加合学和(Specification Parameter): 電源子電池电志。3.82 V 105.3 Ah 402 Wh □ 俚金属电池/电芯 V Ah g 如子(Model Numbers): 7180582 委托单位(Applicant): 麻容面能(上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai victorsun@ses.ai www.ses.ai *#品生产厂育(Sample Manufacturer): 麻容面能(上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai victorsun@ses.ai www.ses.ai *#品生产厂育(Sample Manufacturer): 麻容面能(上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai victorsun@ses.ai www.ses.ai Ti 高度模拟(Atitude simulation) Pass Ti 基面/新压(Impact/Crush) Pass Ti 基面/新L(Impact/Crush) Pass Ti 基面/The Libnum Battery Test Requirement): IBatery Test Requirement): IBatery Test Requirement): IBatery Test Requirement): Impact Test Test Test Test Test Test Test Tes		所用(试验和标准手册)版本(Edition of U	N Manual of Test			
 「中国・愛属电池・dos」、V Ah g (关于危险货物运输的建议书 试验和标准手册》第七版纸 订 1 第 38.3 节 (关于危险货物运输的建议书 试验和标准手册》第七版纸 订 1 第 38.3 节 (关于危险货物运输的建议书 试验和标准手册》第七版纸 订 1 第 38.3 节 (Kether and the second of the second the second of the second the second the second of the second the						
 第二次代Physical Description): 教養地名(Notel Numbers): 71 第 38.3 节 Recommendations on the Transport of Dangerou Goods, Manual of Tests and Criteria, ST/SG/AC.10/11 RevT/Amend.1/Section 38.3 新定行的公及文角条(甲), 通过/未通过)一览袭(List of Tests Conducted and Results(Pass/Fail)): T1 高度模拟(Altitude simulation) Pass T2 温度试验(Thermal test) Pass T3 振动(Vibration) Pass T4 冲击(Shock) Pass T5 外部短路(External short circuit) Pass T5 外部短路(External short circuit) Pass T6 撞击/挤压(Impact/Crush) Pass T1 过度充电(Overcharge) Not applicable T8 磁動敵电(Forced discharge) Pass Pass T1 过度充合(Dage and 1699 G) Pass T1 过度充合(Dage and 1699 G) Pass T1 过度充合(Dage and 1699 G) Pass T2 温度(Dage and 1699 G) T2 温度(Dage and 1699 G) T3 高3.3(g) ● 不适用 N/A 			准手册》第七版修			
装装电池 Pouch Cell 3年(Model Numbers): 7180582 3年4位(Applicant): 麻省面能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai victorsun@ses.ai www.ses.ai 717273747575767777777878797171717171717171727374757576777778787971717172737475757677777778797979						
望号(Model Numbers): 7180582 Goods, Manual of Tests and Criteria, ST/SG/AC.10/11 Rev.7/Amend.1/Section 38.3 蘇省國能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区温海路 1699 号 Fuhai road 1699, Jiading district, Shanghai victorsun@ses.ai www.ses.ai Fasts Conducted and Results(Pass/Fail)): 11 高度模拟(Altitude simulation) Pass 72 温度试验(Thermal test) Pass 73 振动(Vibration) Pass 74 冲击(Shock) Pass 75 外部短路(External short circuit) Pass 76 撞击/挤压(Impact/Crush) Pass 77 过度充电(Overcharge) Not applicable 78 漫劇放电(Forced discharge) Pass 77 过度充电(Overcharge) Not applicable 78 漫樹放电(Forced discharge) Pass 79 ジョロ市高定区間海湾 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 Not applicable 71 世友充名有合未成個电為的對式要求(Assembled Lithiur Battery Test Requirement): □38.3.3(g) ■不适用 N/A </td <td></td> <td></td> <td>t of Dangerou</td>			t of Dangerou			
7180582 Rev.7/Amend.1/Section 38.3 第省固能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 Yictorsun@ses.ai Www.ses.ai T1 高度模拟(Altitude simulation) Pass T2 温度试验(Thermal test) Pass T3 振动(Vibration) Pass T4 冲击(Shock) Pass T5 外部短路(External short circuit) Pass T6 撞击/挤压(Impact/Crush) Pass T6 撞击/挤压(Impact/Crush) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T3 振动(xbeage(unasa Test Lab): Pass Putags&检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 Sa.3(f) □38.3.3(g) No1388 Wuzhong Dadao Road, Wuzhong Explate or issue): Zuff Stable@coc.it.com type/incoment Explate or issue): Sup-ino-20	型号(Model Numbers):					
委托单位(Applicant):麻省 回能 (上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-5990113621-59901136victorsun@ses.aiwww.ses.ai#A4生产厂商(Sample Manufacturer):麻省 回能 (上海) 新能源科技有限公司 SES Al(Shanghai) Co., Ltd上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-5990113621-59901136www.ses.aiWassa Mickanghai) Co., Ltd上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136021-59901136victorsun@ses.aiwww.ses.aiUN38.3 Mickaba (unsa.3 Test Lab):中认英泰检测技术有限公司 CCC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu 0512-66303621jszb@cqc-it.com http://www.cqc-it.com	71B0582		011001101101			
麻省固能(上海)新能源料技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 victorsun@ses.ai www.ses.ai #品生产厂商(Sample Manufacturer): 麻省固能(上海)新能源料技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 victorsun@ses.ai www.ses.ai UN38.3 消达实验室(UN38.3 Test Lab): 中认英泰检测技术有限公司 COC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszb@cqc-it.com http://www.cqc-it.com	委托单位(Applicant):		付)→推奏(List o			
3/E3 和(Shahghal) Co., Ltd 上海市嘉定区福海路 1699 号 T1 高度模拟(Altitude simulation) Pass T2 温度试验(Thermal test) Pass T3 振动(Vibration) Pass T4 冲击(Shock) Pass T5 外部短路(External short circuit) Pass T6 撞击/挤压(Impat/Crush) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T8 强制放电(Forced discharge) Pass T0 21-59901136 Pass victorsun@ses.ai Www.ses.ai Pass Www.ses.ai T3 基都放金板(Luss.3 Test Lab): Pass 中认英泰检测技术有限公司 Coc Intime Testing Technology Co., Ltd. Forefage and an stage of the stage): ###### (Technics and stage) No.1368 Wuzhong Datao Road, Wuzhong Ext for the chics and stage): Ext for the chics and stage): Stab@cqc-ti.com http://	麻省固能(上海)新能源科技有限公司					
Fuhai road 1699, Jiading district, Shanghai T2 温度试验(Thermal test) Pass 021-59901136 Yictorsun@ses.ai Yass T3 振动(Vibration) Pass WWW.ses.ai T4 冲击(Shock) Pass T4 Pass #R4E#C/T@(Sample Manufacturer): F4 Pass T5 外部短路(External short circuit) Pass #R4E#C/T@(Sample Manufacturer): F6 撞击/挤压(Impact/Crush) Pass T7 过度充电(Overcharge) Not applicable T8 要前放电(Forced discharge) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass Pass T3 强制放电(Forced discharge) Pass Victorsun@ses.ai www.ses.ai WuX8.3 3ftxx6@(UN38.3 Test Lab): T3 T3 T3 T3 T3 T3 T4 Pass T6	SES Al(Shanghai) Co., Ltd 上海市真定区福海路 1600 号					
021-59901136 1 ass victorsun@ses.ai 13 振动(Vibration) Pass Www.ses.ai 73 振动(Vibration) Pass #A£±产厂商(Sample Manufacturer): 74 冲击(Shock) Pass #A£±产厂商(Sample Manufacturer): 75 外部短路(External short circuit) Pass #A£±产厂商(Sample Manufacturer): 75 外部短路(External short circuit) Pass #A£±产厂商(Sample Manufacturer): 71 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass T9 法度充电(UN38.3 Test Lab): Pass Pu\Lass a 微试交验室(UN38.3 Test Lab): Pass PuLL perform T2 cone, Suzhou, Jiangsu. 0512-66303621 Sizb@coqc-it.com Suzhou, Jiangsu. 0512-66303621 Suzhou, Jiangsu.						
Witchrsungses.ai T4 沖击(Shock) Pass #AL生产厂商(Sample Manufacturer): T5 外部短路(External short circuit) Pass 藤省関能(上海)新能源科技有限公司 T6 撞击/挤压(Impact/Crush) Pass SES Al(Shanghai) Co., Ltd T7 过度充电(Overcharge) Not applicable 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai T8 漫前放电(Forced discharge) Pass 21-59901136 victorsun@ses.ai www.ses.ai COC Intime Testing Technology Co., Ltd. Battery Test Requirement): 38.3.3(f) □38.3.3(g) ■不适用 N/A UN38.3 對試交验室(UN38.3 Test Lab): 中认英泰检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 支油生 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Exp(Technical cover) St2b@coqc-it.com http://www.cqc-it.com Suphon tent or issue): 220-10-20	021-59901136					
#品生产厂商(Sample Manufacturer): T5 外部短路(External short circuit) Pass 第省固能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd T3 过度充电(Overcharge) Not applicable SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai Pass T7 过度充电(Overcharge) Not applicable T8 漫制放电(Forced discharge) Pass Pass Set Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai Overcharge) Pass O21-59901136 victorsun@ses.ai Www.ses.ai Battery Test Requirement): Dass.3.3(g) ■不适用 N/A UN38.3 消伏实验室(UN38.3 Test Lab): Dass.3.3(g) ■不适用 N/A UN38.3 消伏实验室(UN38.3 Test Lab): Dass.3.3(g) ■不适用 N/A UN38.3 消伏实验室(Lunage) Jass.3.3(g) ■不适用 N/A UN38.3 消伏实验室(Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 Jass.3.3(g) ■不适用 N/A 0512-66303621 Jszlb@coqc-it.com Jass.3.3(g) ■不适用 N/A Jszlb@coqc-it.com Mutp://www.cqc-it.com State originage): Supp. Jass Supp. Jass						
#晶生产厂商(Sample Manufacturer): T6 撞击/挤压(Impact/Crush) Pass 麻省固能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 T7 过度充电(Overcharge) Not applicable T8 强制放电(Forced discharge) Pass 21-59901136 Victorsun@ses.ai Pass www.ses.ai	www.ses.ai					
神品生产厂育(Sample Manufacturer): T 过度充电(Overcharge) Not applicable 麻省固能(上海)新能源科技有限公司 T7 过度充电(Overcharge) Not applicable SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Pass Pass Fuhai road 1699, Jiading district, Shanghai 21-59901136 Pass EA符合集成僵电泡的测试要求(Assembled Lithiur victorsun@ses.ai 38.3.3(f) □38.3.3(g) ■不适用 N/A UN38.3 测试实验室(UN38.3 Test Lab): □38.3.3(f) □38.3.3(g) ■不适用 N/A UN38.3 测试实验室(UN38.3 Test Lab): □36.3.3(g) ■不适用 N/A US12-66303621 jszlb@cqc-it.com 近点工 近点工 jszlb@cqc-it.com ※公司 ※公司 ※公司 http://www.cqc-it.com ※公員用 ※公員日 ※公司						
麻省固能(上海)新能源科技有限公司 SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 victorsun@ses.ai www.ses.ai UN38.3 激技突检查(UN38.3 Test Lab): 中认英泰检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com	样品生产厂商(Sample Manufacturer):					
SES Al(Shanghai) Co., Ltd 上海市嘉定区福海路 1699 号 Fuhai road 1699, Jiading district, Shanghai 021-59901136 victorsun@ses.ai www.ses.ai UN38.3 湖试实验室(UN38.3 Test Lab): 中认英泰检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com		, ,				
Fuhai road 1699, Jiading district, Shanghai 是否符合集成僵电池的测试要求(Assembled Lithiur 021-59901136 victorsun@ses.ai www.ses.ai Battery Test Requirement): □ 38.3.3(f) □ 38.3.3(g) UN38.3 测试实验室(UN38.3 Test Lab): 中认英泰检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com		T8 强制放电(Forced discharge)	Pass			
021-59901136 victorsun@ses.ai www.ses.ai UN38.3 湖试实验室(UN38.3 Test Lab): 中认英泰检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com						
victorsun@ses.ai www.ses.ai Battery Test Requirement): □ 38.3.3(g) ■不适用 N/A UN38.3 激技实验室(UN38.3 Test Lab): □ 38.3.3(f) □ 38.3.3(g) ■不适用 N/A UN38.3 激技实验室(UN38.3 Test Lab): 中认英泰检测技术有限公司 CQC Intime Testing Technology Co., Ltd. 苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com			embled Lithiur			
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苏州市吴中经济开发区吴中大道 1368 号 No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com						
No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com 签发日期 feate of issue): 2020-10-20						
Economic Development Zone, Suzhou, Jiangsu. 0512-66303621 jszlb@cqc-it.com http://www.cqc-it.com						
jszlb@cqc-it.com http://www.cqc-it.com 签发日期 (bate of issue): 2023-10-20	· · · ·	1/2 BURK				
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▲ 検測专用章 /	nup://www.cqc-ii.com		26-10-20			
		▲ 検測专用章 ノ				

50 Ah UN 38.3: Passed

100 Ah UN 38.3: Passed

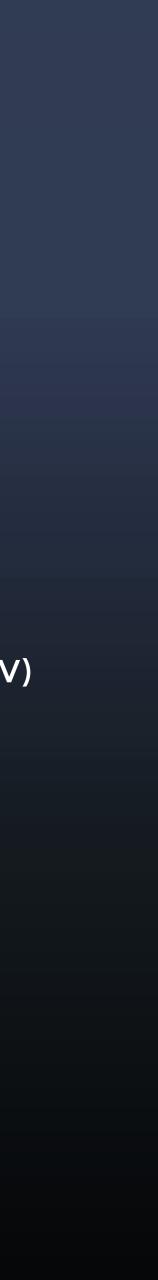






Boston HQ Electrolyte Foundry

South Korea: Line 2.5, 3, 5(JV) Shanghai Giga: Line 1.5, 4

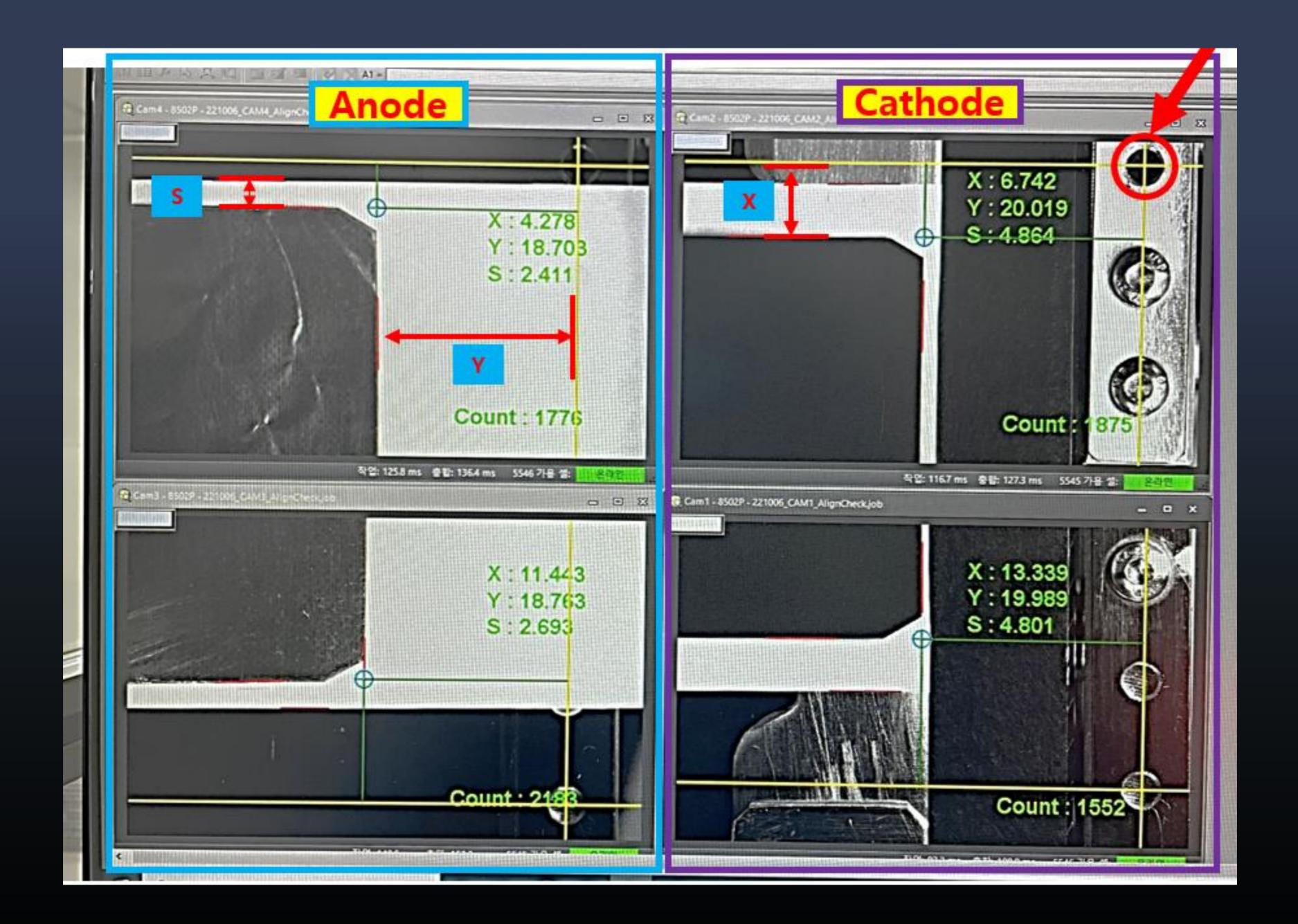


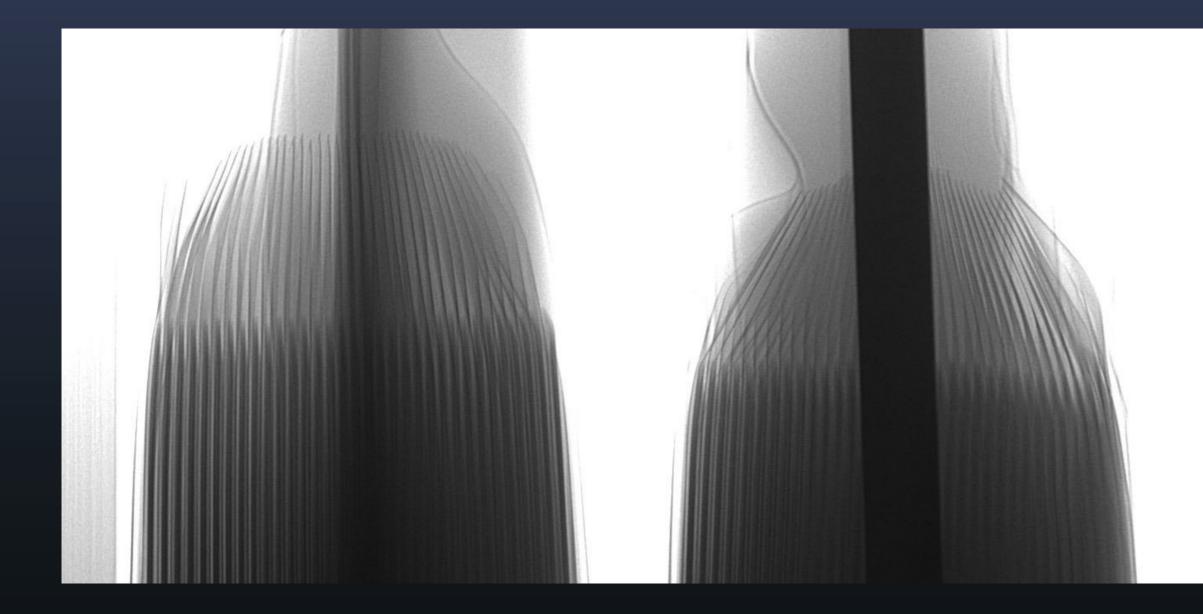
A-sample

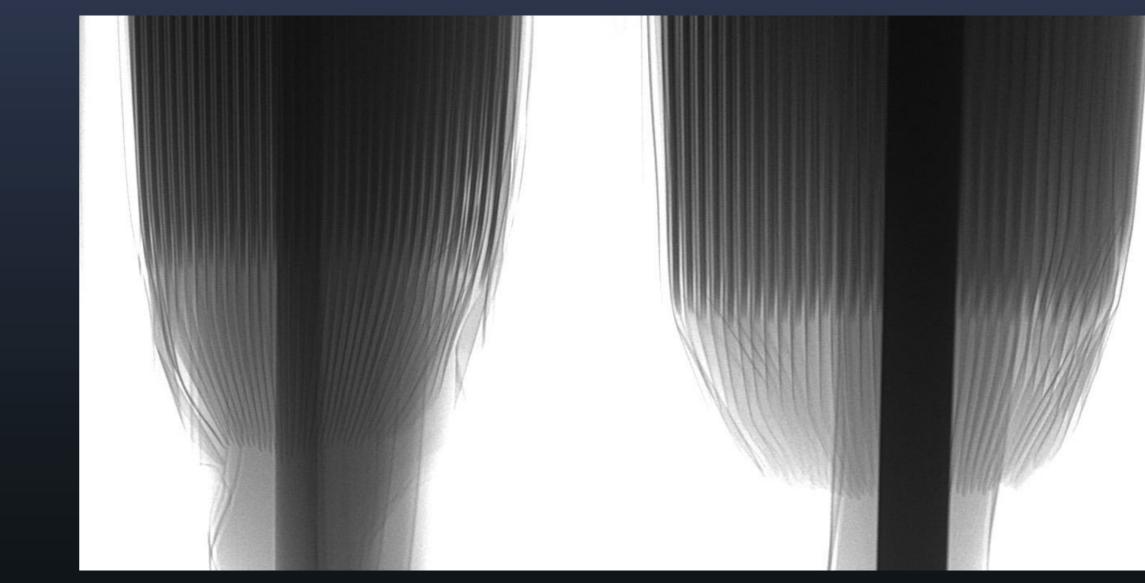
Items	controlpoints			
IQC	126			
Process	260			
Total	386			

B-sample

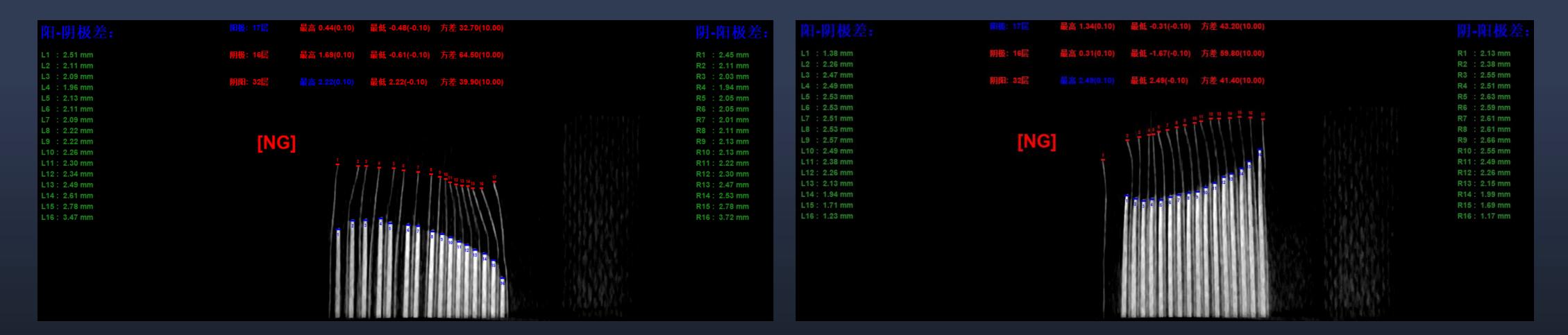
Items	controlpoints			
IQC	286			
Environment	29			
Cathode Line	401			
Anode Line	131			
Assembly 1	327			
Assembly 2	269			
Total	1443			

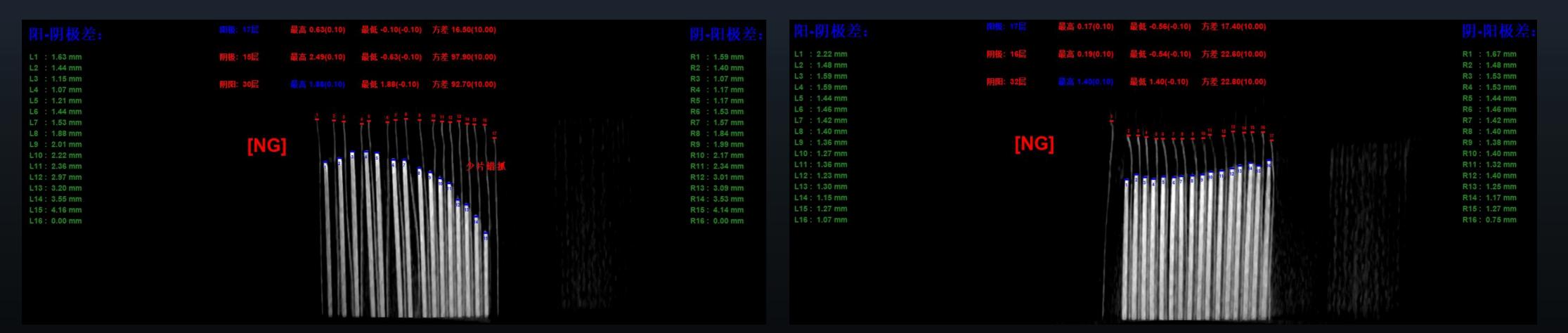


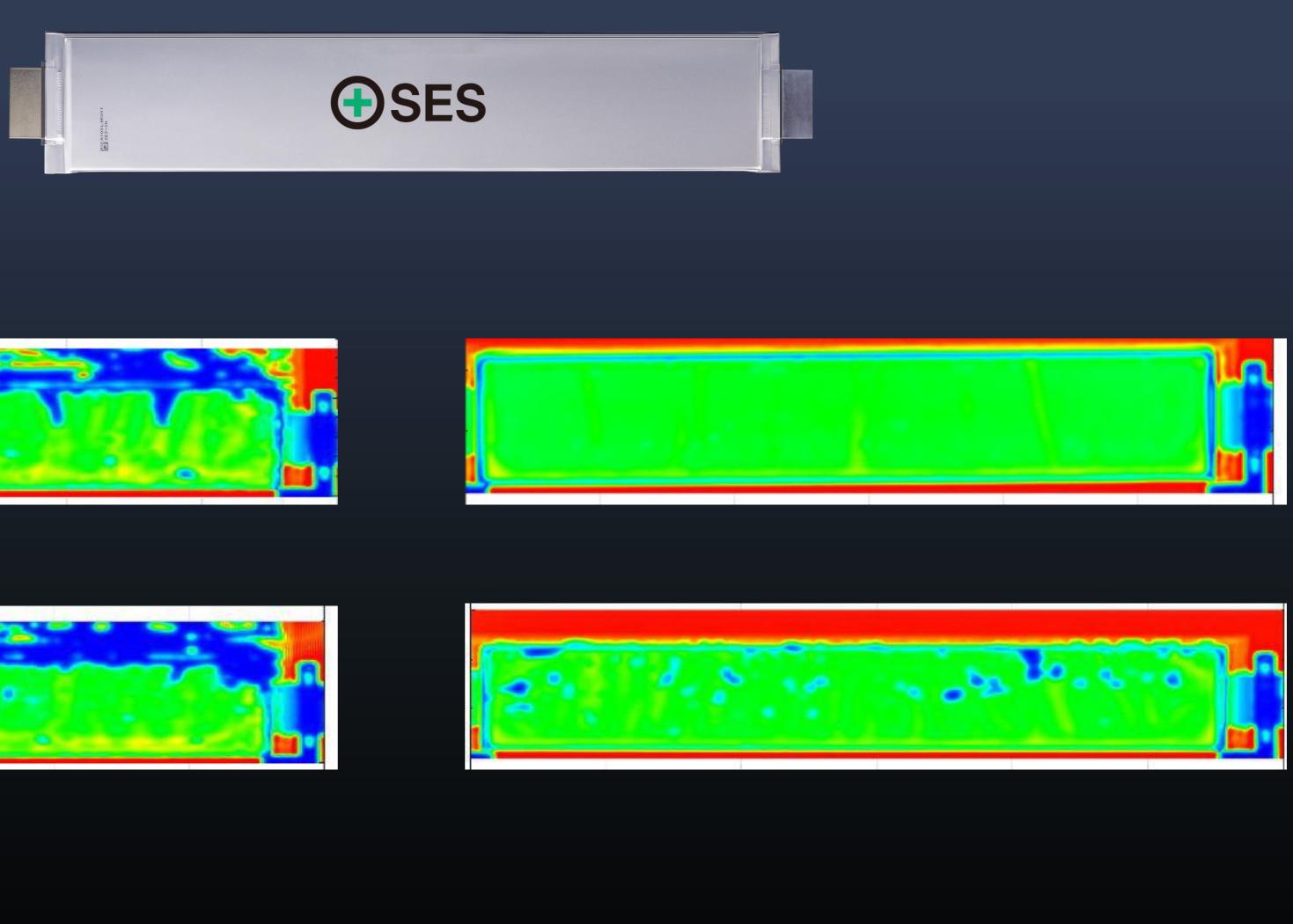


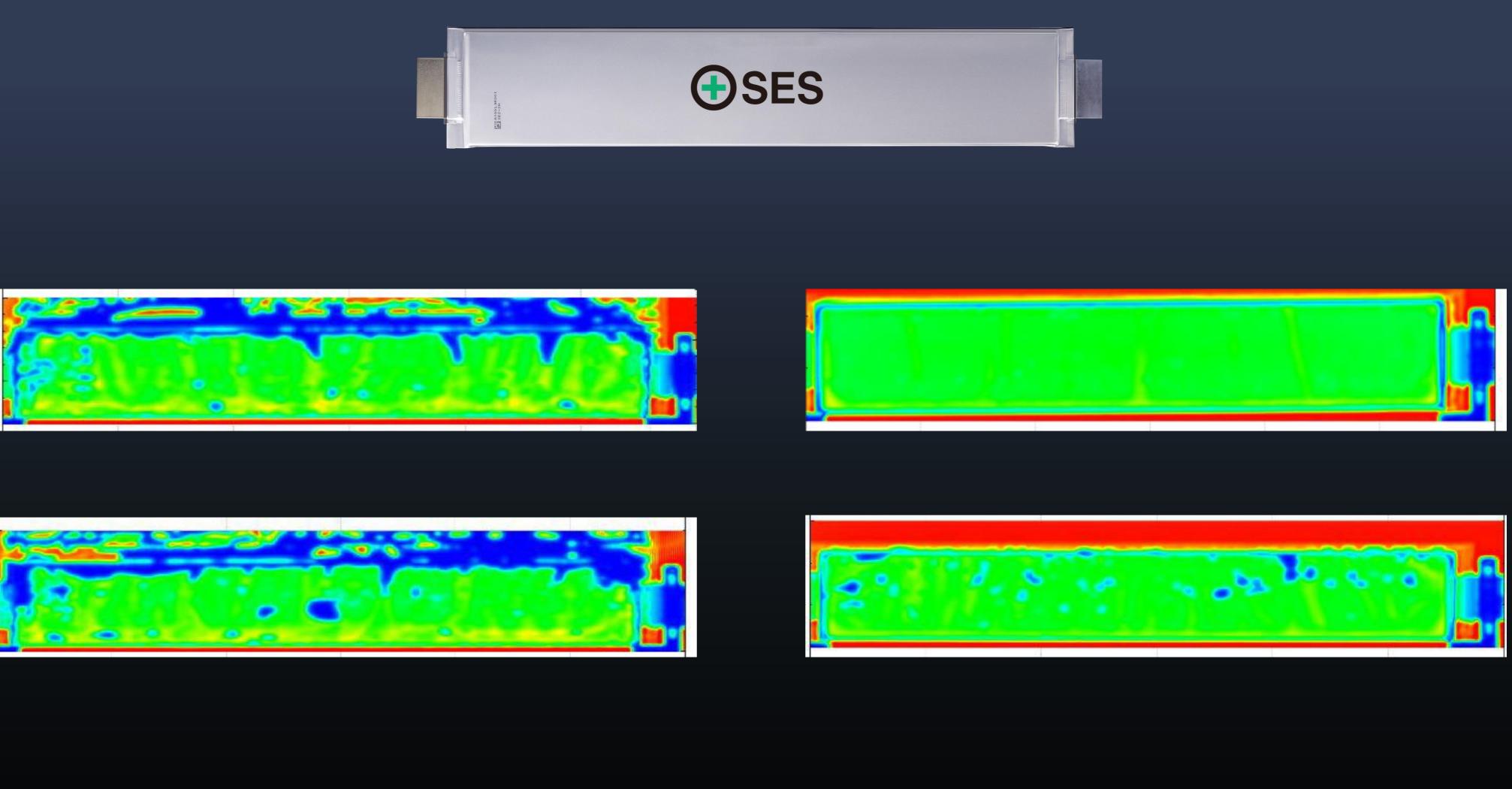


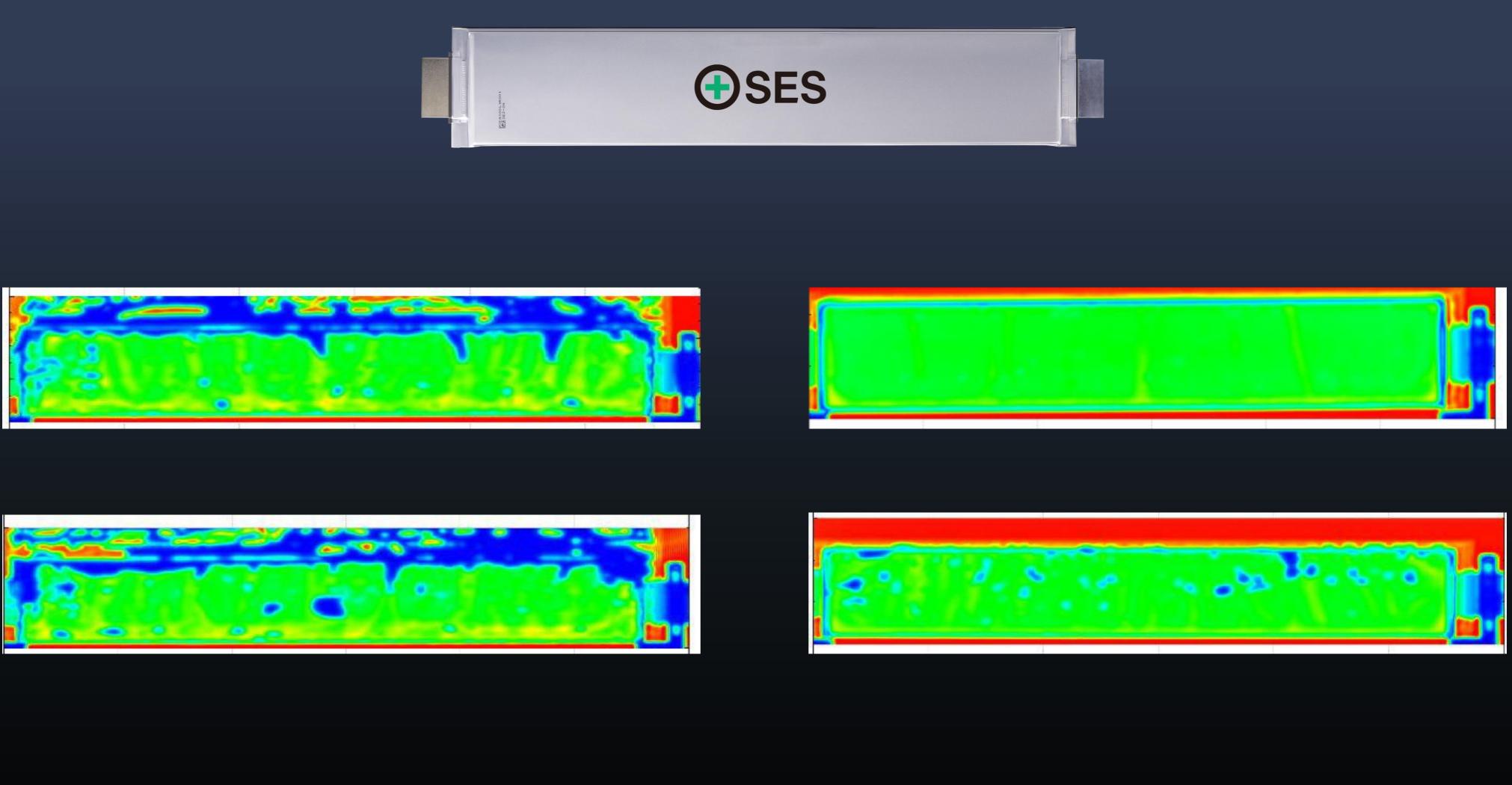










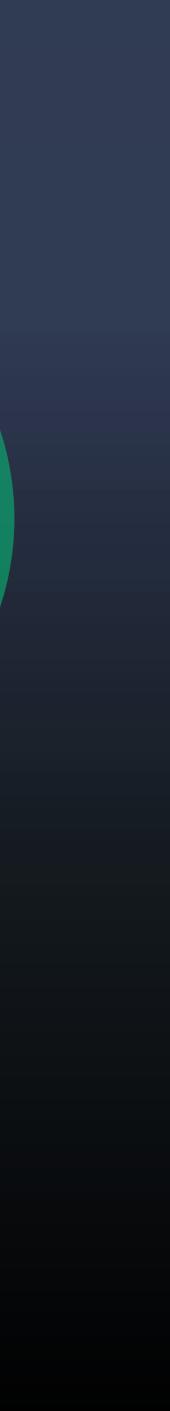


Safety = Quality

	DNA	Life	Style		Pregnancy	1	
	Cell/Material Design		Test	Manu	facturing C	Quality	
Νο	barcode	Has Signal	HI Result	Expl	ExpliRF	Exp II LGB	Summary
1	A100D67E230507B018					X	X
2	A050M7CE3A065	X			X	X	X
3	A050M7BE3A033			X	X	X	X
4	A100N4NS230405D004	X	X				X
5	A100M9DE1A1019	X			X	X	X
6	A100M9DE1A1020				X	X	X
7	A100M9ME4A002	X				X	X
8	A100M9DE1A1016	X	X				X
9	A100MARS3A006	X	X				X
10	A100MARS3A003	X				X	X
11	A050M8PE4A005					X	X
12	A050M8PE4A006						
13	A100M9DE1A1018				X	X	X
14	A100M9EE1A1030				X		X
15	A050M69E1D014	X	X	Х			X
16	A050M59E1C009	X	X	Х			X
17	A050M57E1A025			Х	X	X	X
18	A050M69E1D001	X		Х	X		X
19	A050M58E1B001	X	X	Х			X
20	A050M57E1A014	X	X	Х			X
21	A050M38E1E004	X	X	Х			X
22	A050M59E1C024	X		Х	X		X
23	E211203B006	Х	X				Х
24	A050M37E1B001						
25	A050M59E1C013	Х	X				X

92%

Incident prediction accuracy on large 100Ah Li-Metal cells (23/25), increase from 60% a year ago





S. Shin





If we don't fail quick enough, often enough, we don't innovate fast enough







Urban Air Mobility

ghar.





+C/3 -UAM mission profile

1000

Cycle



Lack of serious competition



Chance to set industry standards





2020s Li-Metal -> UAM

1990s Li-ion -> Consumer Electronics



atter .



Subsize aircraft

Π

2 Fullsize aircraft (unmanned)

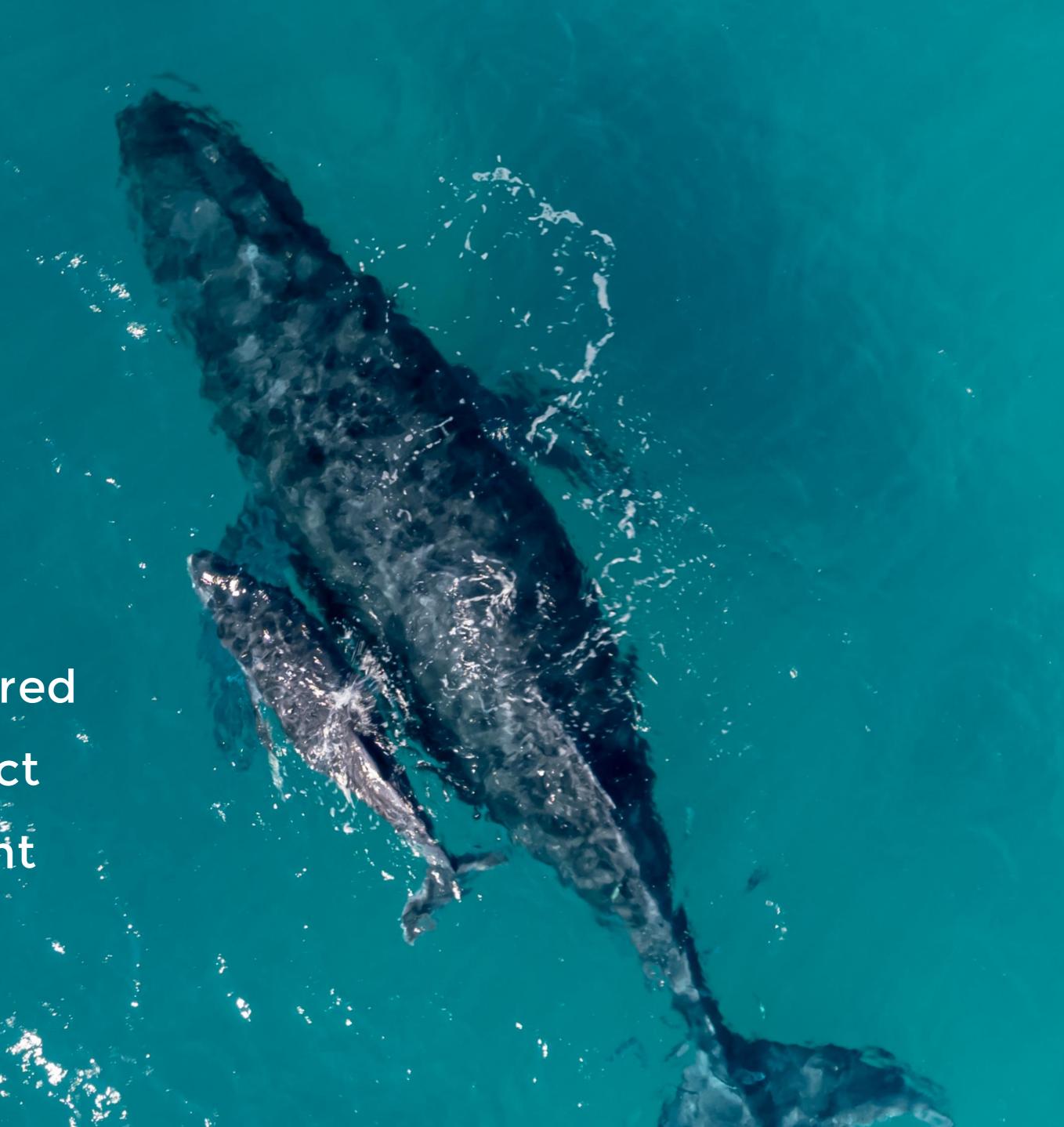
3 Fullsize aircraft (manned)

great.

The second



OBJECT OF CONTROL OF



Enhanced Avatar prediction accuracy

Prismatic Li-Metal cell offering more options to OEMs



World's first automotive B-sample JDA for Li-Metal

Test data on 100Ah Li-Metal cells

New human and machine-based deep learning tools for material discovery

SES cares

"A person often meets his destiny on the road he took to avoid it."

Jean de la Fontaine









World's first automotive A-sample and B-sample in Li-Metal



A 100L9R001

Destiny has a way of keep calling you



Today, SES is officially re-entering UAM





Born to Fly

