



Technical Report No. 68.402.20.0005.01
Rev. 00
Dated 2020-03-06

Client: Shandong Goldencell Electronics Technology Co., Ltd.

Address: Fuyuan 5 Road, Thailand Industry Park, Hi Tech District, Zaozhuang City, Shandong Province

Attn.: Mr. Li

Sample Description: Materials of Lithium ion cell

Sample Received Date: 2020-01-16

Test Period: From 2020-01-16 to 2020-01-20

Location of Testing: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Purpose of examination: Verification of RoHS (Restriction of Hazardous Substances) directive 2011/65/EU and its amendment (EU) 2015/863 on submitted samples

Test Result: Refer to following page(s)

Remark: The result relates only to the items tested.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
TÜV SÜD Group

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SUMMARY OF TEST RESULTS

No.	Test Requested	Conclusion	Remarks
1.	Heavy Metal (Pb, Cd, Hg and Cr VI) Content	PASS	
2.	Polybrominated Biphenyls (PBBs) and Polybrominated Diphenyl Ethers (PBDEs) Content	PASS	
3.	Phthalates (DEHP, BBP, DBP and DIBP) Content	PASS	



1. TESTED SUBJECT DESCRIPTION

Sample Number	Item Name	Tested Material Description	Photo
001	Ring	Black plastic sheet	
002	Aluminium foil	Silvery metal sheet	
003	Copper foil	Coppery metal sheet	
004	Aluminium strip	Silvery metal sheet	

Sample Number	Item Name	Tested Material Description	Photo
005	Wafer	White plastic wafer	
006	Nickel strip	Silvery metal sheet	
007	Cap	Silvery metal plate	
008		Silvery metal cap	
009		Silvery metal cap	
010		White plastic ring	
011	Case	Silvery metal case	
012	Tape	Green plastic tape	

Sample Number	Item Name	Tested Material Description	Photo
013	Tape	Green plastic tape with black printing	
014	Tape	Red plastic tape with black printing	
015	Tape	White plastic tape	
016	SBR	White liquid	
017	Glue	Black glue	

Sample Number	Item Name	Tested Material Description	Photo
018	PVP	White powder	
019	PVDF	White powder	
020	CMC	White powder	
021	SP	Black powder	
022	Graphite	Black powder	

Sample Number	Item Name	Tested Material Description	Photo
023	Anode material	Black powder	
024	KS-15	Black powder	
025	Lithium iron phosphate	Black powder	
026	Electrolyte	Transparent liquid	

2. TEST RESULTS

2.1. SCREENING TEST

Test method: With reference to EN 62321-1:2013, EN 62321-2:2014, EN 62321-3-1:2014 and EN 62321-8:2017. For Heavy Metals and Flame Retardants, analyzed by Energy Dispersive X-ray Fluorescence Spectrometers (XRF); for phthalates, analyzed by Gas Chromatography and Mass Spectrometry (GC-MS).

Sample No.	Heavy Metals and Flame Retardants					Phthalates			
	Cd	Cr	Hg	Pb	Br	DEHP	BBP	DBP	DIBP
001	BL	BL	BL	BL	BL	BL	BL	BL	BL
002	BL	BL	BL	BL	NA	NA	NA	NA	NA
003	BL	BL	BL	BL	NA	NA	NA	NA	NA
004	BL	BL	BL	BL	NA	NA	NA	NA	NA
005	BL	BL	BL	BL	BL	BL	BL	BL	BL
006	BL	BL	BL	BL	NA	NA	NA	NA	NA
007	BL	BL	BL	BL	NA	NA	NA	NA	NA
008	BL	BL	BL	BL	NA	NA	NA	NA	NA
009	BL	BL	BL	BL	NA	NA	NA	NA	NA
010	BL	BL	BL	BL	BL	BL	BL	BL	BL
011	BL	BL	BL	BL	NA	NA	NA	NA	NA
012	BL	BL	BL	BL	BL	BL	BL	BL	BL
013	BL	BL	BL	BL	BL	BL	BL	BL	BL
014	BL	BL	BL	BL	BL	BL	BL	BL	BL
015	BL	BL	BL	BL	BL	BL	BL	BL	BL
017	BL	BL	BL	BL	BL	BL	BL	BL	BL
018	BL	BL	BL	BL	BL	BL	BL	BL	BL
019	BL	BL	BL	BL	BL	BL	BL	BL	BL
020	BL	BL	BL	BL	BL	BL	BL	BL	BL
021	BL	BL	BL	BL	BL	BL	BL	BL	BL
022	BL	BL	BL	BL	BL	BL	BL	BL	BL
023	BL	BL	BL	BL	BL	BL	BL	BL	BL
024	BL	BL	BL	BL	BL	BL	BL	BL	BL
025	BL	BL	BL	BL	BL	BL	BL	BL	BL

Note:

- “BL” denotes below limit
- “NA” denotes not applicable

– XRF screening limits in mg/kg for regulated elements in various matrices

ELEMENT	POLYMER		
	BL	INCONCLUSIVE	OL
Cd	$X < (70-3\sigma)$	$(70-3\sigma) < X < (130+3\sigma)$	$X > (130+3\sigma)$
Pb	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Hg	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Br	$X < (300-3\sigma)$	$X > (300-3\sigma)$	NA
Cr	$X < (700-3\sigma)$	$X > (700-3\sigma)$	NA

ELEMENT	METAL		
	BL	INCONCLUSIVE	OL
Cd	$X < (70-3\sigma)$	$(70-3\sigma) < X < (130+3\sigma)$	$X > (130+3\sigma)$
Pb	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Hg	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Cr	$X < (700-3\sigma)$	$X > (700-3\sigma)$	NA

ELEMENT	COMPLEX MATERIAL		
	BL	INCONCLUSIVE	OL
Cd	$X < (50-3\sigma)$	$(50-3\sigma) < X < (150+3\sigma)$	$X > (150+3\sigma)$
Pb	$X < (500-3\sigma)$	$(500-3\sigma) < X < (1500+3\sigma)$	$X > (1500+3\sigma)$
Hg	$X < (500-3\sigma)$	$(500-3\sigma) < X < (1500+3\sigma)$	$X > (1500+3\sigma)$
Br	$X < (250-3\sigma)$	$X > (250-3\sigma)$	NA
Cr	$X < (500-3\sigma)$	$X > (500-3\sigma)$	NA

– Screening limits in mg/kg for regulated phthalates in various matrices

PHTHALATES	BL	INCONCLUSIVE
DEHP	$X < 600$	$X \geq 600$
BBP	$X < 600$	$X \geq 600$
DBP	$X < 600$	$X \geq 600$
DIBP	$X < 600$	$X \geq 600$

2.2. HEAVY METAL CONTENT

Test method: With reference to EN 62321-4:2014 /A1:2017, EN 62321-5:2014, EN 62321-7-1:2015 and EN 62321-7-2:2017, analyzed by Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) and UV-Vis spectrophotometer. [Reporting Limit: 2.0 mg/kg for Cadmium; 10.0 mg/kg or 0.10 µg/cm² for Hexavalent Chromium, 10.0 mg/kg for Lead and Mercury.]

Sample No.	Result				
	Total Cadmium	Hexavalent Chromium	Hexavalent Chromium	Total Mercury	Total Lead
016	<2.0	<10.0	/	<10.0	<10.0
026	<2.0	<10.0	/	<10.0	<10.0
Unit	mg/kg	mg/kg	µg/cm ²	mg/kg	mg/kg
RoHS Requirement	100	1000	Negative [#]	1000	1000

Note:

- “mg/kg” denotes milligram per kilogram
- “µg/cm²” denotes micrograms per square centimeter
- “<” denotes less than
- “Negative” denotes the absorbance value of sample is < 0.10 µg/cm², the sample is considered to be negative for Hexavalent Chromium.
- “#” According to DIRECTIVE 2011/65/EU Article 4(1) and Annex II. While, positive means the presence of CrVI on tested areas and the result(s) was (were) regarded as in conflict with European Parliament and Council Directive 2011/65/EU, Article 4(1) and Annex II.

2.3. POLYBROMINATED BIPHENYLS (PBBs) AND POLYBROMINATED DIPHENYL ETHERS (PBDEs) CONTENT

Test Method: With reference to EN 62321-6:2015, extracted by toluene and analyzed by Gas Chromatography and Mass Spectrometry (GC-MS). [Reporting Limit: 5 mg/kg]

Test Item		Result [mg/kg]		RoHS Requirement [mg/kg]
		Sample 016	Sample 026	
PBBs	Monobromobiphenyl	< 5	< 5	Sum of PBBs 1000
	Dibromobiphenyl	< 5	< 5	
	Tribromobiphenyl	< 5	< 5	
	Tetrabromobiphenyl	< 5	< 5	
	Pentabromobiphenyl	< 5	< 5	
	Hexabromobiphenyl	< 5	< 5	
	Heptabromobiphenyl	< 5	< 5	
	Octabromobiphenyl	< 5	< 5	
	Nonabromobiphenyl	< 5	< 5	
	Decabromobiphenyl	< 5	< 5	
	Sum of PBBs	< 50	< 50	
PBDEs	Monobromodiphenyl Ether	< 5	< 5	Sum of PBDEs 1000
	Dibromodiphenyl Ether	< 5	< 5	
	Tribromodiphenyl Ether	< 5	< 5	
	Tetrabromodiphenyl Ether	< 5	< 5	
	Pentabromodiphenyl Ether	< 5	< 5	
	Hexabromodiphenyl Ether	< 5	< 5	
	Heptabromodiphenyl Ether	< 5	< 5	
	Octabromodiphenyl Ether	< 5	< 5	
	Nonabromodiphenyl Ether	< 5	< 5	
	Decabromodiphenyl Ether	< 5	< 5	
	Sum of PBDEs	< 50	< 50	

Note:

- “mg/kg” denotes milligram per kilogram
- “<” denotes less than

2.4. PHTHALATES (DEHP, BBP, DBP and DIBP) CONTENT TEST

Test method: With reference to EN 62321-8:2017, extracted by organic solvent and analyzed by Gas Chromatography and Mass Spectrometry (GC-MS). [Reporting limit: 100 mg/kg]

Test Item	Result [mg/kg]		RoHS Requirement [mg/kg]
	Sample 016	Sample 026	
Di-(2-ethyl-hexyl) Phthalate (DEHP)	< 100	< 100	1000
Butyl-benzyl Phthalate (BBP)	< 100	< 100	1000
Di-butyl Phthalate (DBP)	< 100	< 100	1000
Di-iso-butyl Phthalate (DIBP)	< 100	< 100	1000

Note:

- “mg/kg” denotes miligram per kilogram
- “<” denotes less than



APPENDIX:

According to client's declaration, tested material would be produced as relevant product(s): Lithium ion cell (HTCFR18650-1500mAh-3.2V, HTCFR18650-1600mAh-3.2V, HTCFR18650-1800mAh-3.2V, HTCFR26650-3200mAh-3.2V, HTCFR26650-3400mAh-3.2V, HTCFR26650-3600mAh-3.2V, HTCFR26650-3800mAh-3.2V, JGPFR26650-3000mAh-3.2V, HTPFR18650-1100mAh-3.2V, HTPFR26650-2300mAh-3.2V, HTCNR18650-2200mAh-3.6V, JGCNR18650-2500mAh-3.6V, HTCNR18650-2600mAh-3.6V, HTCNR26650-4500mAh-3.6V, HTCNR26650-5000mAh-3.6V, HTPNR18650-2200mAh-3.6V)

