

# Specification For Approval

Date: 2016 / 07 / 27

File No.: 160727001

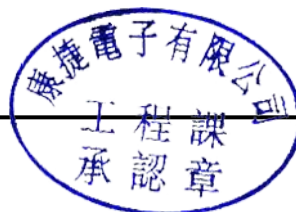
Version: 1.0


Customer : 研華股份有限公司

Customer P/N : 1750002842

INVAX P/N : AN2450-5706RS

Description : Antenna Dipole



Cortec Checked By:	
Customer Approved By:	



**INVAX System Technology Corp.**  
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Product Number: AN2450-5706RS

Product Name: Antenna Dipole



## 1. Revision History


Revision	Date	Change Notification	Description
1.0	2016.07.27	初版	

Product Number: AN2450-5706RS

Product Name: Antenna Dipole



## 2. Specification

Sample Photo	
	
A. Electrical Characteristics	
Frequency	2400 ~ 2500 MHz 5150 ~ 5850 MHz (Antenna)
S.W.R.	$\leq 2.0$ @ 2400 ~ 2500 MHz $\leq 2.5$ @ 5150 ~ 5850 MHz The data is tested with 1M cable
Peak Gain	2.38 dBi @ 2400 ~ 2500 MHz 5.22 dBi @ 5150 ~ 5850 MHz
Radiation Pattern	Omni-Directional
Max Input Power	$\geq 2$ W
Polarization	Linear
Impedance	50 Ohm
B. Material & Mechanical Characteristics	
Material of Radiator	PCB
Material of Plastic	TPEE / ABS
Cable Type	RG-178U
Connector Type	SMA Male Reverse
C. Environmental	
Operation Temperature	- 40 °C ~ + 65 °C
Storage Temperature	- 40 °C ~ + 80 °C
Antenna Color Storage life	< 2 year

### 3. Characteristics and Reliability Test

Test Items 測試項目	Test Condition and Procedure 測試方法	Requirements 要求	Result 結果
C1 V.S.W.R. 電壓駐波比	Set DUT on Network Analyzer; make individual calibration to test 設置網路分析儀參數進行測試	Directive DUT specification 符合待測物規範	PASS
C3 Antenna Gain 天線增益	Set DUT on Antenna Chamber; make individual calibration to test 設置天線暗室參數進行測試	Directive DUT specification 符合待測物規範	PASS
M1 Vibration 震動	GB / T2423.48-2008 Amplitude: 0.03 inch (1.5mm); Freq: 20 to 80 to 20 Hz 3 directions; 2 hours for each direction 振幅 1.5mm ; 頻率 20~80~20Hz ; 3 個方向各 2H	1. No Visual Damage 2. Frequency Tol. ≤5% 無明顯外觀不良; 頻率偏移 ≤5%	PASS
M2 Random Drop 跌落	GB / T2423.8-1995 Single : Height: 1.0 Meter; 3 directions; 1 time for each direction 單支天線, 高 1m ; 3 個方向各 1 次	1. No parts separated · fracture 2. Frequency Tol. ≤5% 產品無脫落、斷裂; 頻率偏移 ≤5%	PASS
	Packing : Height: 0.76 Meter; 1 corner, 3 edges, 6 surface 包裝 : 高 0.76m , 一角、三棱、六面各一次		PASS
	Antenna+Machine: Height: 0.76 Meter; 1 corner, 3 edges, 6 surface. 整機 : 高 0.76m , 一角、三棱、六面各一次		N/A
M4 Pull Test 拉力	Holding with individual specification; force applied to axis of terminal .單獨定義產品端子拉力	1. Directive DUT specification 2. Frequency Tol. ≤5% 符合待測物規範; 頻率偏移 ≤5%	PASS
M5 Torque Test 扭力	Holding with individual specification; applied clockwise and counterclockwise to the axis of terminal 單獨定義產品端子之順時針及逆時針扭力	1. Directive DUT specification 2. Frequency Tol. ≤ 5% 符合待測物規範; 頻率偏移 ≤5%	PASS
M6 Dimension 尺寸	Inspection of dimension, color, material, package, surface process. 檢查尺寸, 顏色, 材料, 包裝, 表面處理	Directive DUT specification 符合待測物規範	PASS
E3 Temperature and Humidity Chamber 恒溫恒濕	GB / T 2423.3-2006 Temp: 80°C / 12 H; -40°C / 12H RH: ≥ 90%; Time: 24H 溫度 80°C 測試 12H 轉 -40°C 測試 12H ; 濕度 ≥ 90% ; 時間 24H	After 2 Hours Recovery 1. No Visual Damage 2. Frequency Tol. ≤5% 恢復 2H 后, 無明顯外觀不良; 頻率偏移 ≤5%	PASS

Product Number: AN2450-5706RS

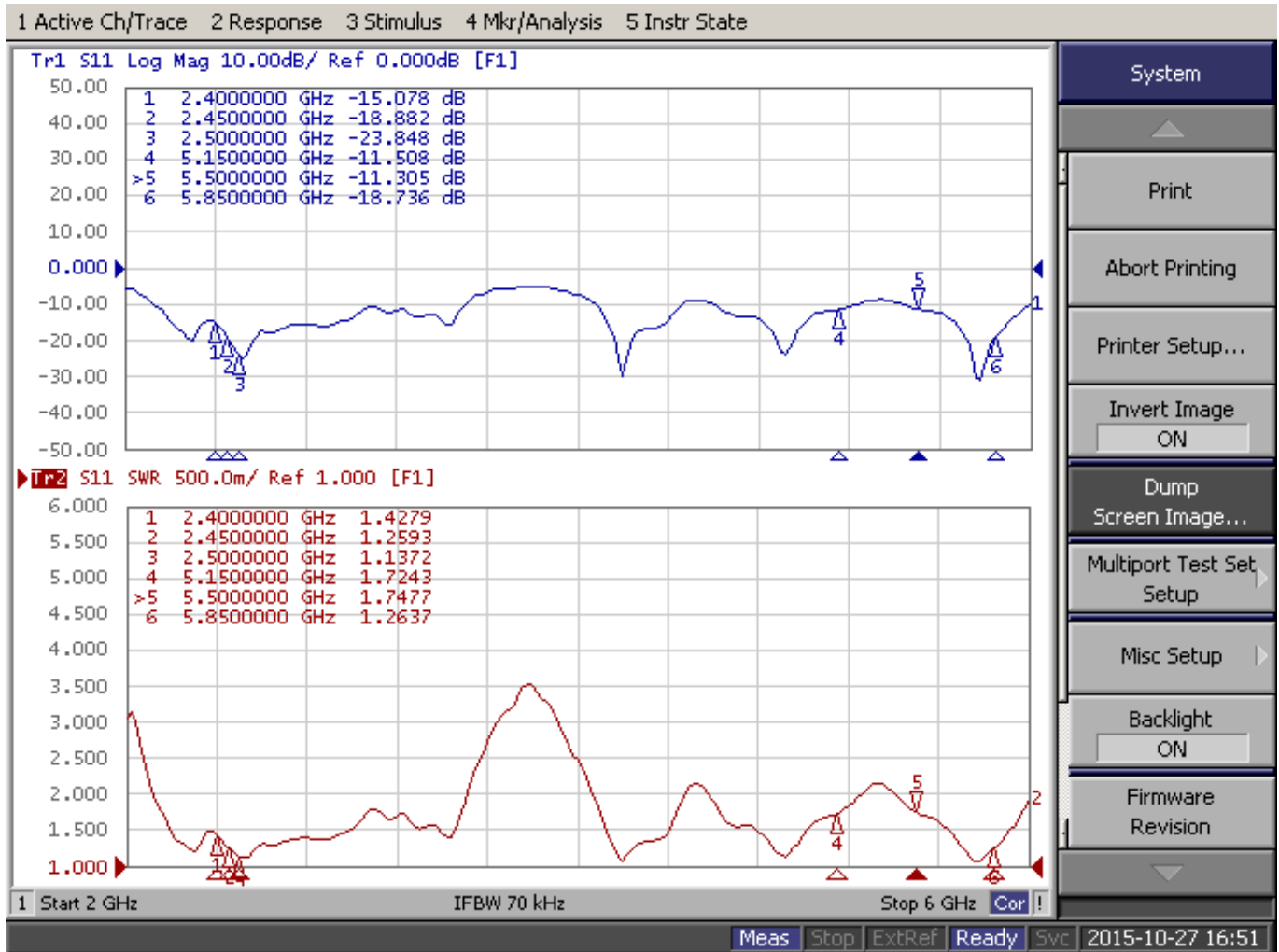
Product Name: Antenna Dipole



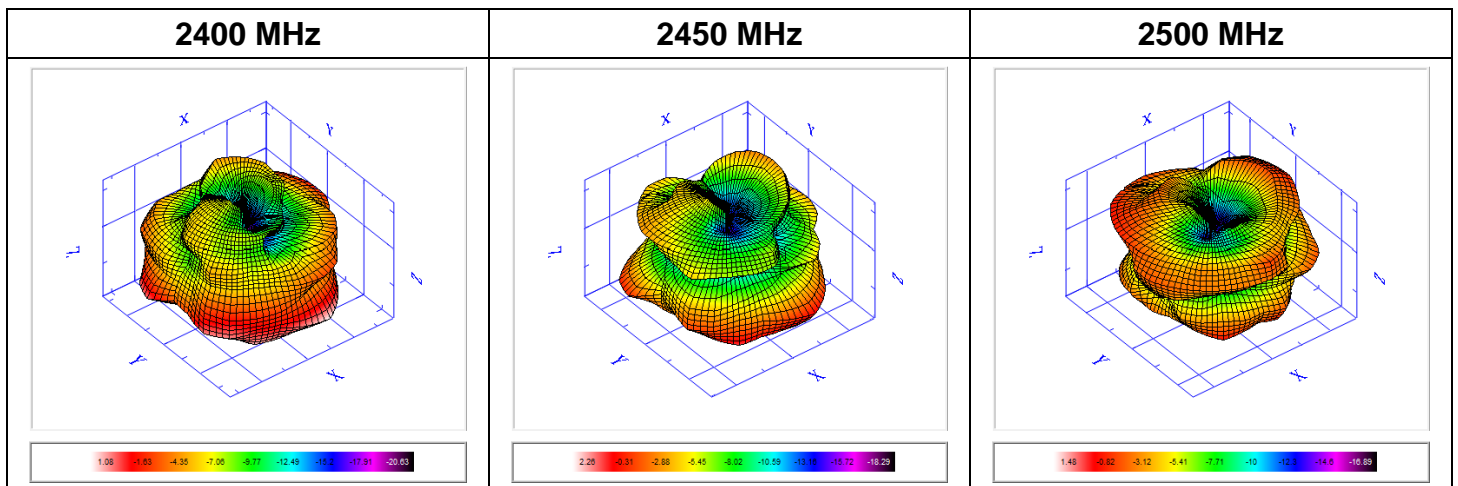
E5	Aging test 老化	GB /T 2423.2 - 2008 Temp: 80°C; Time: 24 hours 溫度 80°C , 測試 24H	After 2 Hours Recovery 1. No Visual Damage 2. Frequency Tol. ≤5% 無明顯外觀不良; 頻率偏移 ≤5%	PASS
R1	RoHS	With Reference to IEC 62321:2008 with flow chart 參考 IEC 62321 測試流程	Directive RoHS 2011/65/EU 符合 RoHS 2011/65/EU 標準	PASS
R2	PFOS	With Reference to USA EPA 3550C:1996 by LC/MS 參考 USA EPA 3550C 測試流程	Directive RoHS 2006/122/EC 符合 RoHS 2011/65/EU 標準	PASS

#### 4. Antenna - S Parameter Test Data

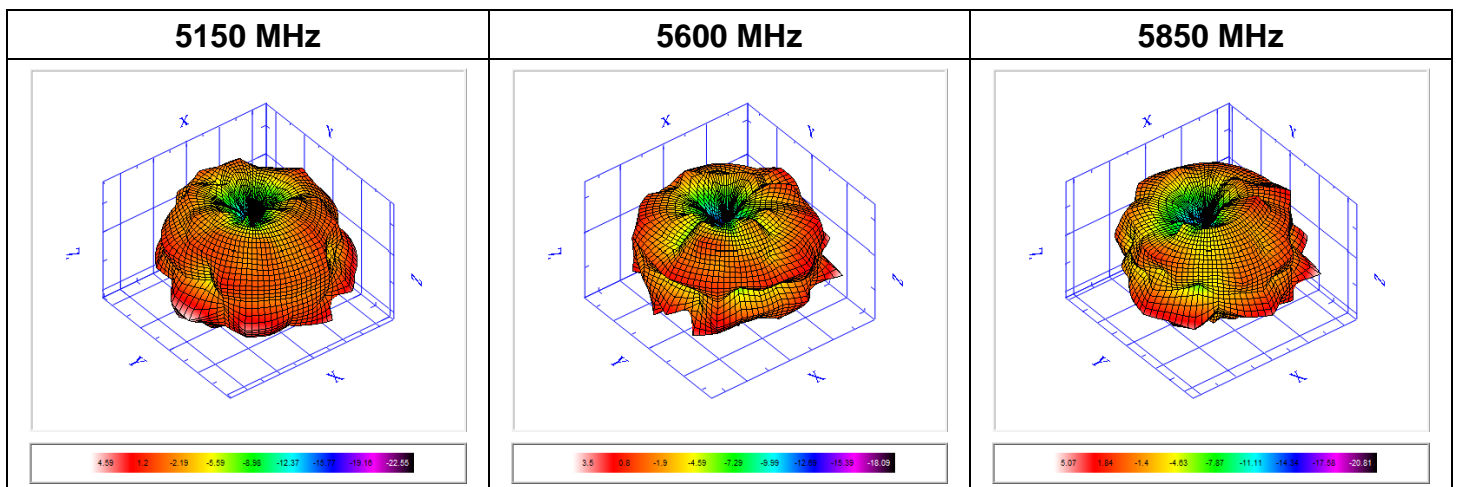
### Antenna



Antenna



Frequency	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
E-Total Peak Gain (dBi)	1.08	1.23	1.57	1.83	2.01	2.26	2.19	2.38	2.21	1.79	1.48
Efficiency (%)	36.72	33.74	32.5	32.15	30.66	33.82	34.98	36.61	38	37.68	38.19
Average Gain (dB)	-4.35	-4.72	-4.88	-4.93	-5.13	-4.71	-4.56	-4.36	-4.2	-4.24	-4.18



Frequency	5150	5250	5350	5470	5600	5725	5785	5800	5850
E-Total Peak Gain (dBi)	4.59	4.14	3.86	2.95	3.5	4.47	4.71	5.22	5.07
Efficiency (%)	72.58	69.25	58.59	60.95	66.37	66.83	66.2	68.17	72.39
Average Gain (dB)	-1.39	-1.6	-2.32	-2.15	-1.78	-1.75	-1.79	-1.66	-1.4

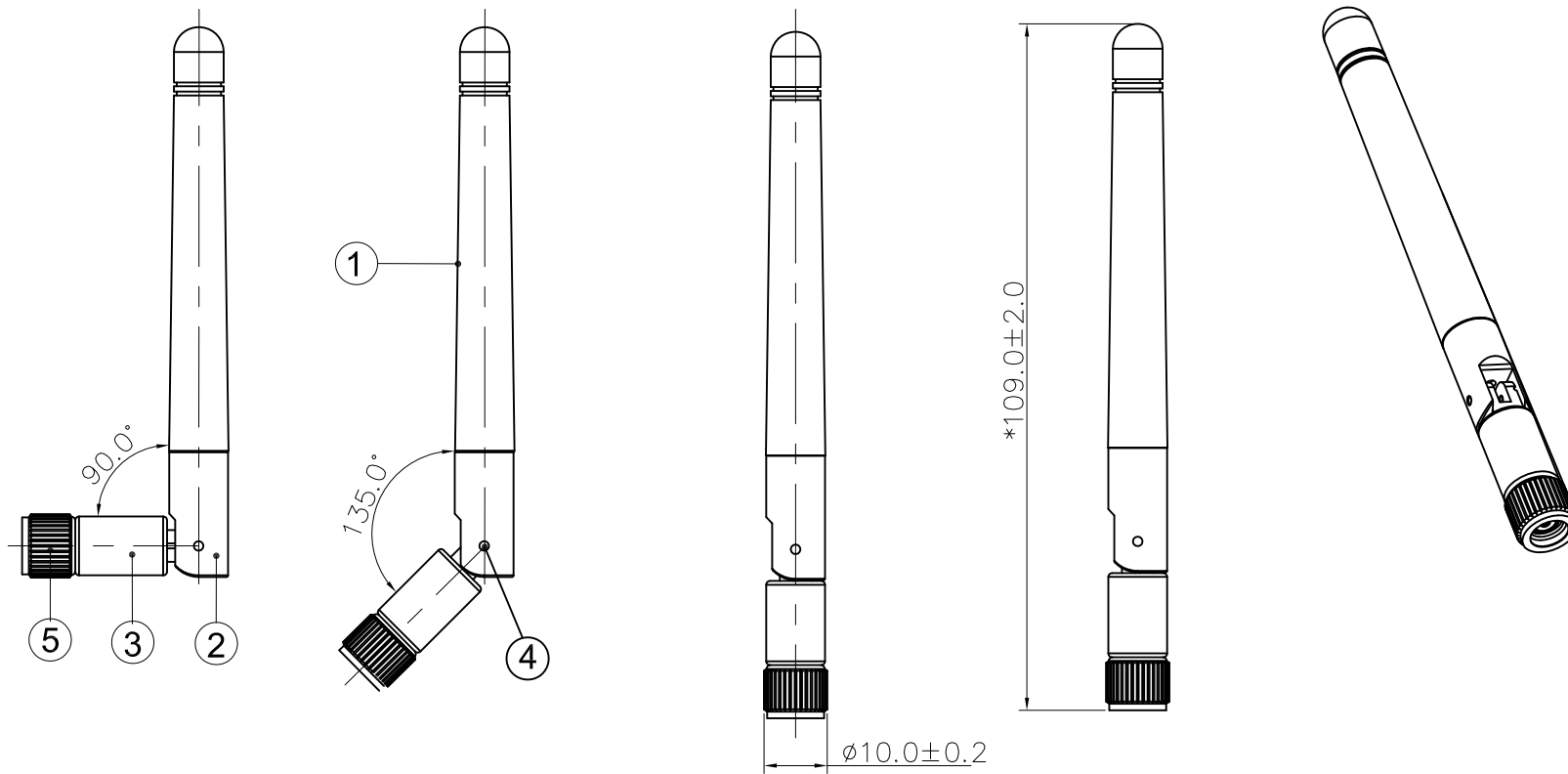


# RoHS

## Compatible



SIGN	DATE	DESCRIPTION	APPROVER
△			
△			
△			



Note:

- 1.Take " \* "is the important dimension.
- 2.Tolerance:Unmarked tolerance refer to the standard tolerance please.

5	SMA402-ZC8MRANT	SMA Male Reverse	Zn Alloy	Eletrodeposition	1
4	R-AN01-1213Z	Hinge Pin	C3604	Black	2
3	R-AN57-01	Body3	ABS	Black	1
2	AN5704-01B	Body2	ABS	Black	1
1	AN5701-03B	Body1	TPEE	Black	1
NO.	Part Number	Description	Material	Finish	Q'ty

Invax System Group.

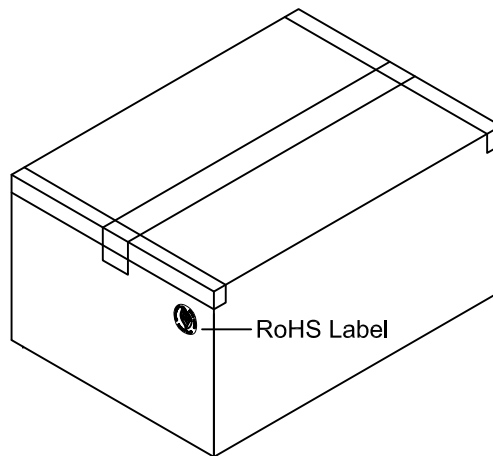
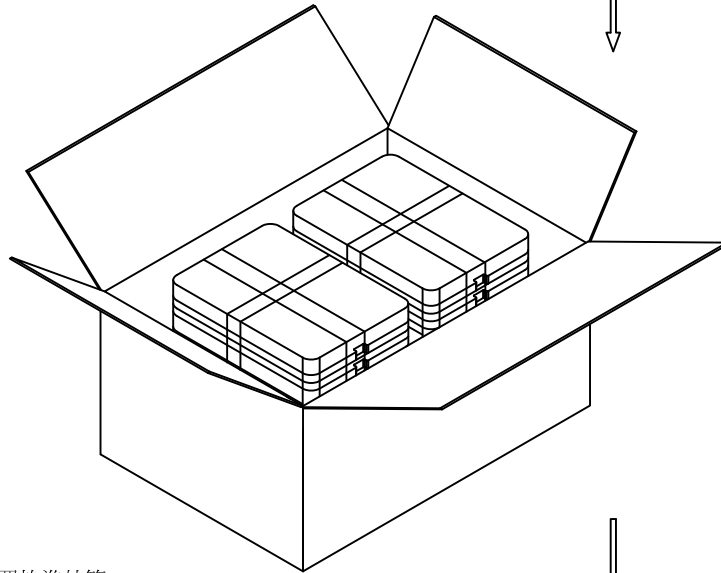
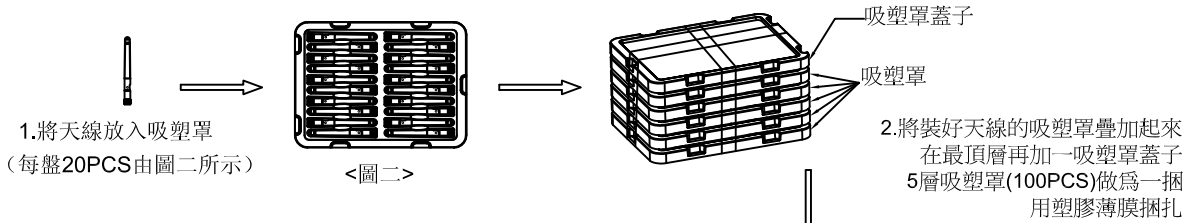
# Cortec

Cortec Technology Inc.

Http://www.invaxsystem.com Tel.:886-2-27885218  
E-mail:info@invax.com.tw Fax:886-2-27831658

TITLE: Antenna					
PART NO.: AN2450-5706RS				CUSTOMER P/N: /	
APP BY	CHK BY	RF BY	DES BY		Tolerance
Grant 2015/03/03	Jack 2015/03/03	SF 2015/03/03	HC 2015/03/03		X.X ±0.5 X.XX ±0.2 X° ±1
				UNITS: mm	
				SCALE: 1/1	
				REVISION: A	

Part Number : AN2450-5706RS	Revision : A
Name: 2.4/5GHz Antenna	Customer : ALL



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請輸入以下報告正確資料及檢查碼以便查核

1. 報告編號
2. 報告日期 (YYYY/MM/DD)
3. 產品名稱 (輸入前 10 個字不含空白)
4. 圖示檢查碼 (依指示畫面)



## 物料中HSF對象物質含量調查表

康捷電子有限公司	
填表：	時麗
部門：	研發部
職務：	文員

物料名稱：AN2450-5706RS

序號	物料型號	物料各構成名稱	各構成物料的材料	測試報告裡RoHS對應物質測試結果						檢測報告編號	測試日期	測試名稱	測試機構名稱
				Cd	Pb	Hg	Cr(VI)	PBBs	PBDEs				
1	AN5701-03	Body-1	TPEE	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	CANEC1604851201	2016.04.01	TPE/TPR/TPU/TPV/TPEE	SGS
2	AN5704-01B R-AN57-01	Body-3 Body-2	ABS	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0114044541d5 001	2015.12.14	PA-757	TuvRheinland
3	R-AN01-1213Z	PIN	銅	16	28703	N.D.	N.D.			CANEC1609598103	2016.05.27	Brass bar	SGS
4	SMA402-ZC8MRANT	SMA Male Reverse	鋅合金	7	20	N.D.	N.D.	N.D.	N.D.	SHAEC1601201806	2016.01.22	Castings zinc alloy	SGS
5	R-RG-178U	Cable RG178	FEP	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	SHAEC1600886303	2016.01.19	PERFLUORINATED	SGS
6			PTFE	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	NGBML1505119902	2016.01.08	聚四氟乙烯分散樹脂	SGS
7			鍍銀銅	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	SHAEC1607788405	2016.04.27	SILVER-COATED	SGS
9	R-504806PCB	PCB	FR4	N.D.	5	N.D.	N.D.	N.D.	N.D.	CANEC1603495801	2016.03.16	The Halogen Free	SGS

根據測試報告如實填寫鉛、鎘、汞、六價鉻、PBBs和PBDEs六項禁用物質的含量

包裝材料中鉛、鎘、汞、六價鉻總含量不超過100ppm，鎘的允許濃度為5ppm

歐盟ROHS指令豁免條款2009/95/BC、鋼中合金元素中的鉛含量達0.35%、鋁含量達0.4%、銅合金中的鉛含量達4%

## Test Report

No. CANEC1604851201

Date: 01 Apr 2016

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DONGGUAN SAMPO CHEMICAL CO., LTD  
NO.1 2 STREET SHENGQIANGANG HUANGJIANG DONGGUAN GUANGDONG  
CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as :  
TPE/TPR/TPU/TPV/TPEE MIXTURE

SGS Job No. : CP16-016453 - GZ  
Date of Sample Received : 28 Mar 2016  
Testing Period : 28 Mar 2016 - 01 Apr 2016  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted sample(s), the results of Cadmium, Lead, Mercury, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) do not exceed the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

Echo

Echo Yeung  
Approved Signatory



SGS-CSTC Standards Technical Services Co., Ltd.  
Guangzhou Branch Testing Service Chemical Laboratory

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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	CAN16-048512.001	White material

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

- Test Method :
- (1)With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2)With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3)With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4)With reference to IEC 62321:2008, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
  - (5)With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	ND
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND



## Test Report

No. CANEC1604851201

Date: 01 Apr 2016

Page 3 of 5

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

### Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) On 4 June 2015, Commission Directive (EU) 2015/863 was published in the Official Journal of the European Union (OJEU) to include the phthalates BBP, DBP, DEHP and DIBP into ANNEX II of the Rohs Recast Directive. The new law restricts each phthalate to no more than 0.1% in each homogeneous material of an electrical product.
- (3) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.
- (4) The restriction of DEHP, BBP, DBP and DIBP shall not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021.
- (5) The restriction of DEHP, BBP and DBP shall not apply to toys which are already subject to the restriction of DEHP, BBP and DBP through entry 51 of Annex XVII to Regulation (EC) No 1907/2006.'

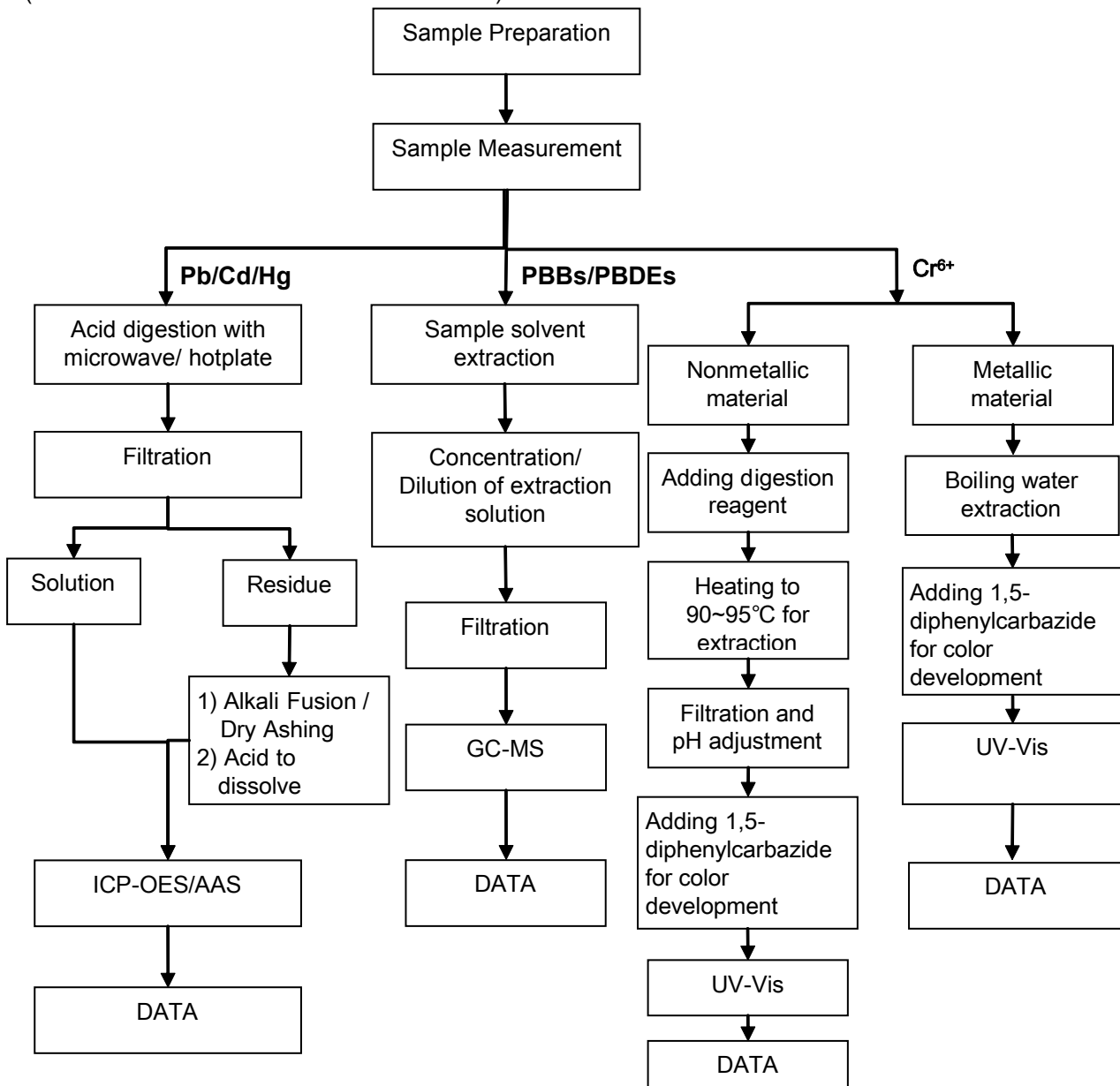




ATTACHMENTS

Pb/Cd/Hg/Cr<sup>6+</sup>/PBBs/PBDEs Testing Flow Chart

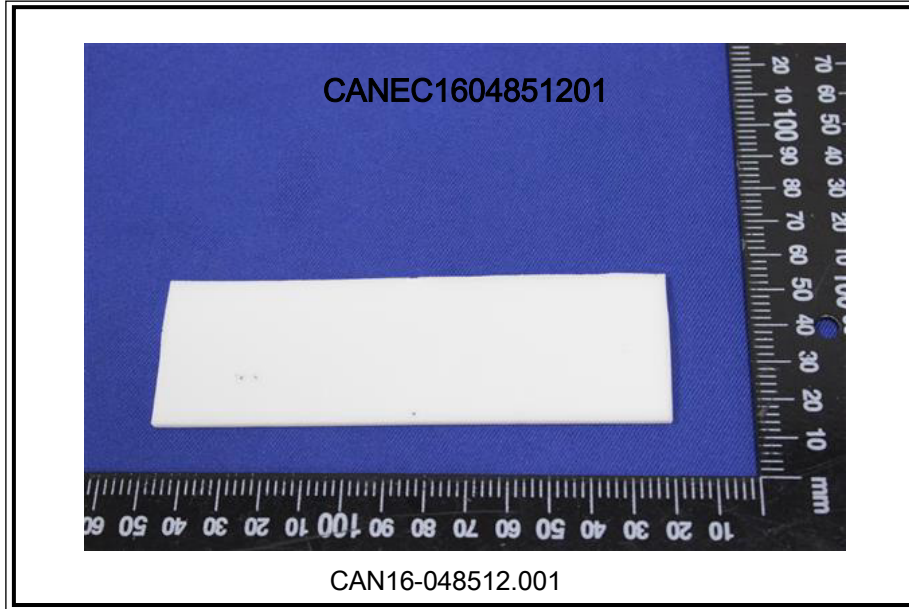
- 1) Name of the person who made testing: Bruce Xiao / Sunny Hu
- 2) Name of the person in charge of testing: Bella Wang / Cutey Yu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded).



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Sample photo:



SGS authenticate the photo on original report only

\*\*\* End of Report \*\*\*



<b>Prüfbericht - Nr.: 0114044541d5 001</b>		<b>Seite 1 von 5</b>	
<i>Test Report No.:</i>		<i>Page 1 of 5</i>	
<b>Auftraggeber:</b> <i>Client:</i>	Chi Mei Corporation 59-1, San Chia, Jen Te, Tainan City 71702, Taiwan, R.O.C.		
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>	ACRYLONITRILE-BUTADIENE-STYRENE COPOLYMER		
<b>Bezeichnung:</b> <i>Identification:</i>	POLYLAC® PA-757 / Nature		
<b>Anlieferungszustand:</b> <i>Delivery condition:</i>	apparent good	<b>Eingangsdatum:</b> <i>Date of Receipt:</i>	2015-12-14
<b>Prüfart:</b> <i>Testing location:</i>	TÜV Rheinland (Shanghai) Co., Ltd.		
<b>Prüfgrundlage:</b> <i>Test specification:</i>	According to RoHS (recast): Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, 2011/65/EU last amended by (EU) 2015/863: Total Content of Lead, Cadmium, Mercury, Chromium VI, Polybrominated Biphenyls, Polybrominated Diphenyl Ethers; and Benzylbutyl phthalate (BBP), Dibutyl phthalate (DBP), Bis(2-ethylhexyl) phthalate (DEHP), Diisobutyl phthalate (DIBP)		
<b>Prüfresultat:</b> <i>Test result:</i>	According to the kind and extend of tests performed the above mentioned test item passed the test specification.		
<b>geprüft/ tested by:</b>		<b>kontrolliert/ checked by:</b>	
			
2016-01-04 Anne Chen /Coordinator		2016-01-04 Carl Chang /Department Manager	
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>
<b>Sonstiges/ Other Aspects:</b>			
Test period: 2015-12-14 – 2016-01-04			
<b>Abkürzungen:</b>		<b>Abbreviations:</b>	
ok / P = entspricht Prüfgrundlage		ok / P = passed	
fail / F = entspricht nicht Prüfgrundlage		fail / F = failed	
n.a. / N = nicht anwendbar		n.a. / N = not applicable	
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			



Test Report No. : 0114044541d5 001  
 Customer : Chi Mei Corporation  
 Test Method : Total Cadmium, Lead, Mercury, Chromium  
 - Ref. to IEC 62321-4:2013 and IEC 62321-5:2013  
 Chromium (VI) – Ref. to EN 62321:2009 (IEC 62321:2008)  
 (for Leather Material, Chromium (VI) - Ref. to ISO 17075:2007)  
 PBBs, PBDEs – Ref. to IEC 62321-6:2015

2016-01-04

Sample Material Lab.-No.		LoD	POLYLAC® PA-757 plastic / beige TCL151214-36
Cadmium (Cd)	mg/kg	2	n.d.
Lead (Pb)	mg/kg	2	n.d.
Mercury (Hg)	mg/kg	2	n.d.
Chromium VI (Cr VI)	mg/kg	2	n.d.
<b>Sum of Polybrominated biphenyls (PBBs)</b>	mg/kg	-	n.d.
Monobromobiphenyl	mg/kg	5	n.d.
Dibromobiphenyl	mg/kg	5	n.d.
Tribromobiphenyl	mg/kg	5	n.d.
Tetrabromobiphenyl	mg/kg	5	n.d.
Pentabromobiphenyl	mg/kg	5	n.d.
Hexabromobiphenyl	mg/kg	5	n.d.
Heptabromobiphenyl	mg/kg	5	n.d.
Octabromobiphenyl	mg/kg	5	n.d.
Nonabromobiphenyl	mg/kg	5	n.d.
Decabromobiphenyl	mg/kg	5	n.d.
<b>Sum of Polybrominated diphenyl ethers (PBDEs)</b>	mg/kg	-	n.d.
Monobromodiphenyl ether	mg/kg	5	n.d.
Dibromodiphenyl ether	mg/kg	5	n.d.
Tribromodiphenyl ether	mg/kg	5	n.d.
Tetrabromodiphenyl ether	mg/kg	5	n.d.
Pentabromodiphenyl ether	mg/kg	5	n.d.
Hexabromodiphenyl ether	mg/kg	5	n.d.
Heptabromodiphenyl ether	mg/kg	5	n.d.
Octabromodiphenyl ether	mg/kg	5	n.d.
Nonabromodiphenyl ether	mg/kg	5	n.d.
Decabromodiphenyl ether	mg/kg	5	n.d.

**Notes:**

- n.d. - not detected
- n.a. - not applicable
- LoD - Limit of Detection
- mg/kg is equal to ppm (parts per million)

	Cd	Cr(VI)	Pb	Hg	PBBs	PBDEs
<b>Maximum permissible Limit acc. to 2011/65/EU (mg/kg)</b>	100	1000	1000	1000	1000	1000



**Produkte**  
*Products*

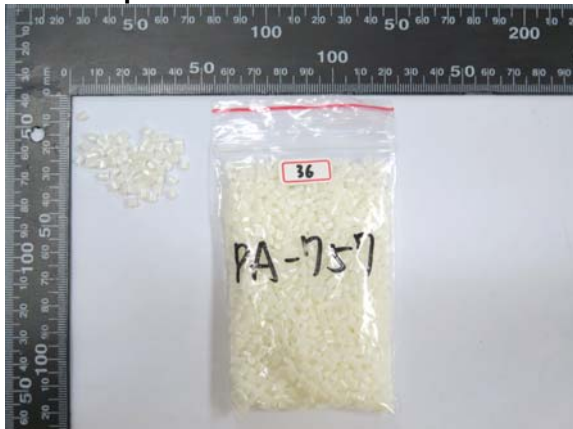
Test Report No. : 0114044541d5 001 2016-01-04  
 Customer : Chi Mei Corporation  
 Test Method : BBP/DBP/DEHP/DIBP - Organic solvent extraction, analyzed by GCMS (Ref. to DIN EN 62321-8:2014/ IEC 62321-8 (111/321/CD))

Sample Material Lab.-No.	LoD	POLYLAC <sup>®</sup> PA-757 plastic / beige TCL151214-36
Diethylhexylphthalate (DEHP) mg/kg	100	n.d.
Dibutylphthalate (DBP) mg/kg	100	n.d.
Benzylbutylphthalate (BBP) mg/kg	100	n.d.
Diisobutylphthalate (DIBP) mg/kg	100	n.d.

**Notes:**

- n.d. - not detected
- n.a. - not applicable
- LoD - Limit of Detection
- mg/kg is equal to ppm (parts per million)

	BBP	DBP	DEHP	DIBP
<b>Maximum permissible Limit acc. to (EU) 2015/863 (mg/kg)</b>	1000	1000	1000	1000

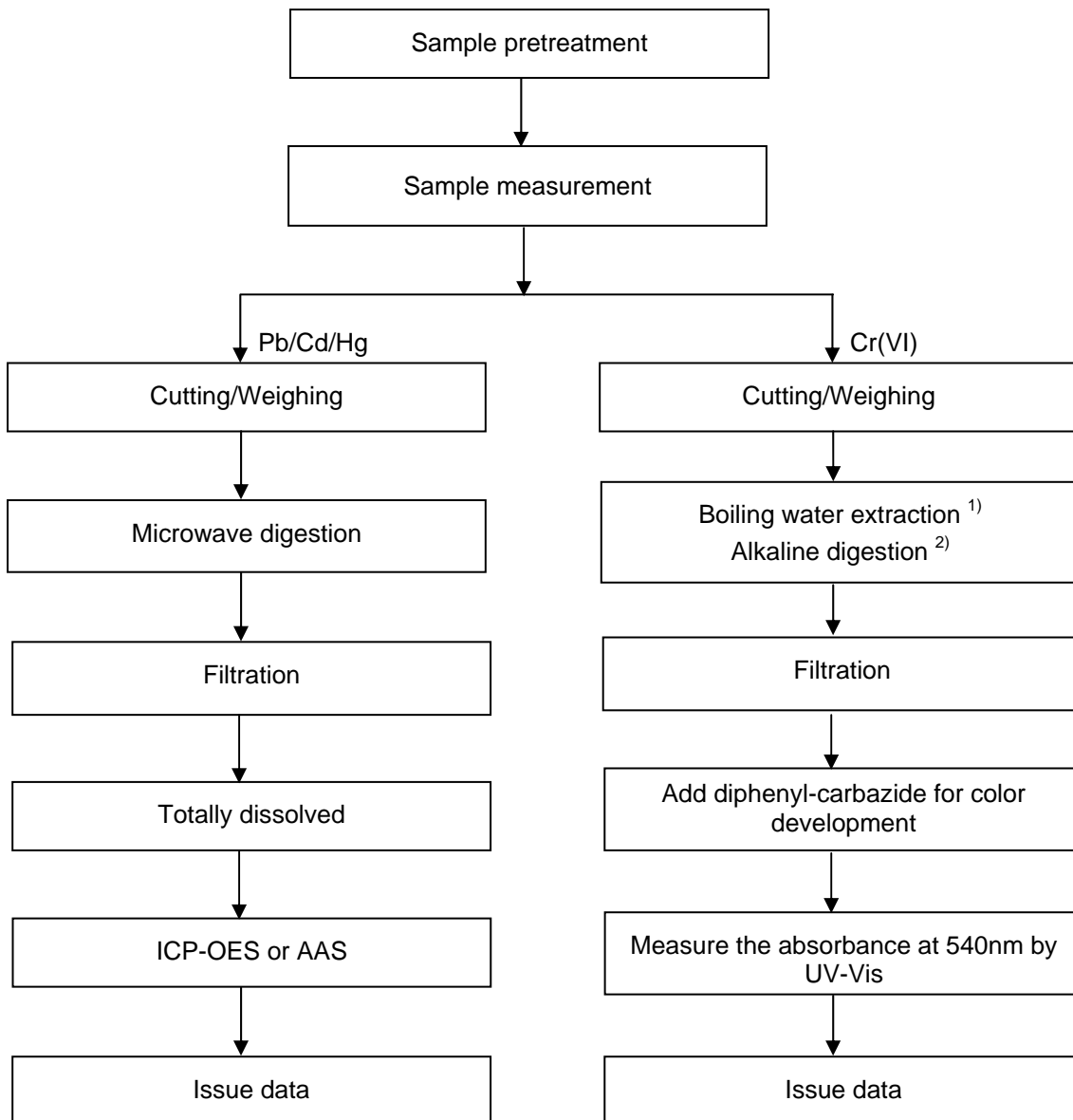
**Test Sample**


Test Report No. : 0114044541d5 001  
Customer : Chi Mei Corporation

2016-01-04

**Testing procedure:**

RoHS (Pb, Cd, Hg, Cr(VI))

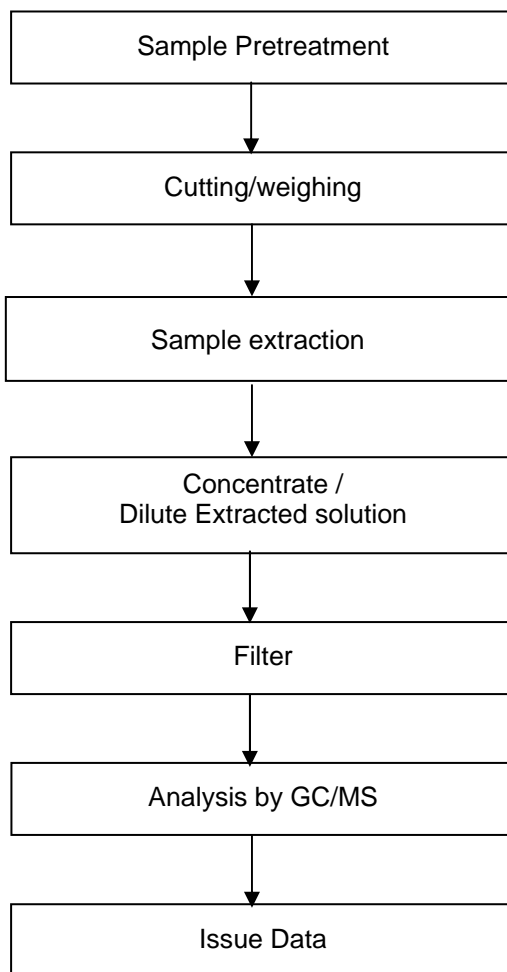
Notes: <sup>1)</sup> For metallic material  
<sup>2)</sup> For non-metallic material

Test Report No. : 0114044541d5 001  
Customer : Chi Mei Corporation

2016-01-04

**Testing procedure:**

RoHS (PBBs/PBDEs), DEHP/DBP/BBP/DIBP



--- End of Test-Report ---



## Test Report

No. CANEC1609598103

Date: 27 May 2016

Page 1 of 5

YI XING COPPER(NAN HAI,FO SHAN)MANUFACTORY CO.,LTD

NO.18 NORTH PARK MID ROAD,ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE,SHI SHAN TOWN,NAN HAI DISTRICT,FOSHAN CITY,GUANG DONG PROVINCE CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : Brass bar

SGS Job No. : CP16-031861 - GZ

Model No. : C3604

Date of Sample Received : 24 May 2016

Testing Period : 24 May 2016 - 27 May 2016


Test Requested : Selected test(s) as requested by client.

Test Method : Please refer to next page(s).

Test Results : Please refer to next page(s).

Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch



Merry Lv  
Approved Signatory



SGS-CSTC Standards Technical Services Co., Ltd.  
Guangzhou Branch Testing Service Chemical Laboratory

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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	CAN16-095981.002	Brassy metal bar

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

Test Method : (1)With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.  
 (2)With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.  
 (3)With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.  
 (4)With reference to IEC 62321-7-1:2015 , determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.

Test Item(s)	Limit	Unit	MDL	002
Cadmium (Cd)	100	mg/kg	2	16
Lead (Pb)	1,000	mg/kg	2	28703▲
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm <sup>2</sup>	0.10	ND

Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) ▼= a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm2. The sample coating is considered to contain CrVI  
 b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm2). The coating is considered a non-CrVI based coating  
 c. The result between 0.10 µg/cm2 and 0.13 µg/cm2 is considered to be inconclusive - unavoidable coating variations may influence the determination

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

IEC 62321 series is equivalent to EN 62321 series

[http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP\\_ORG\\_ID](http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID),

FSP\_LANG\_ID:1258637,25



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Remark A: According to the declaration from the client, Lead (Pb) in specimen is exempted by EU RoHS directive 2011/65/EU based on [ANNEX III 6(c)]: Copper alloy containing up to 4 % lead by weight.



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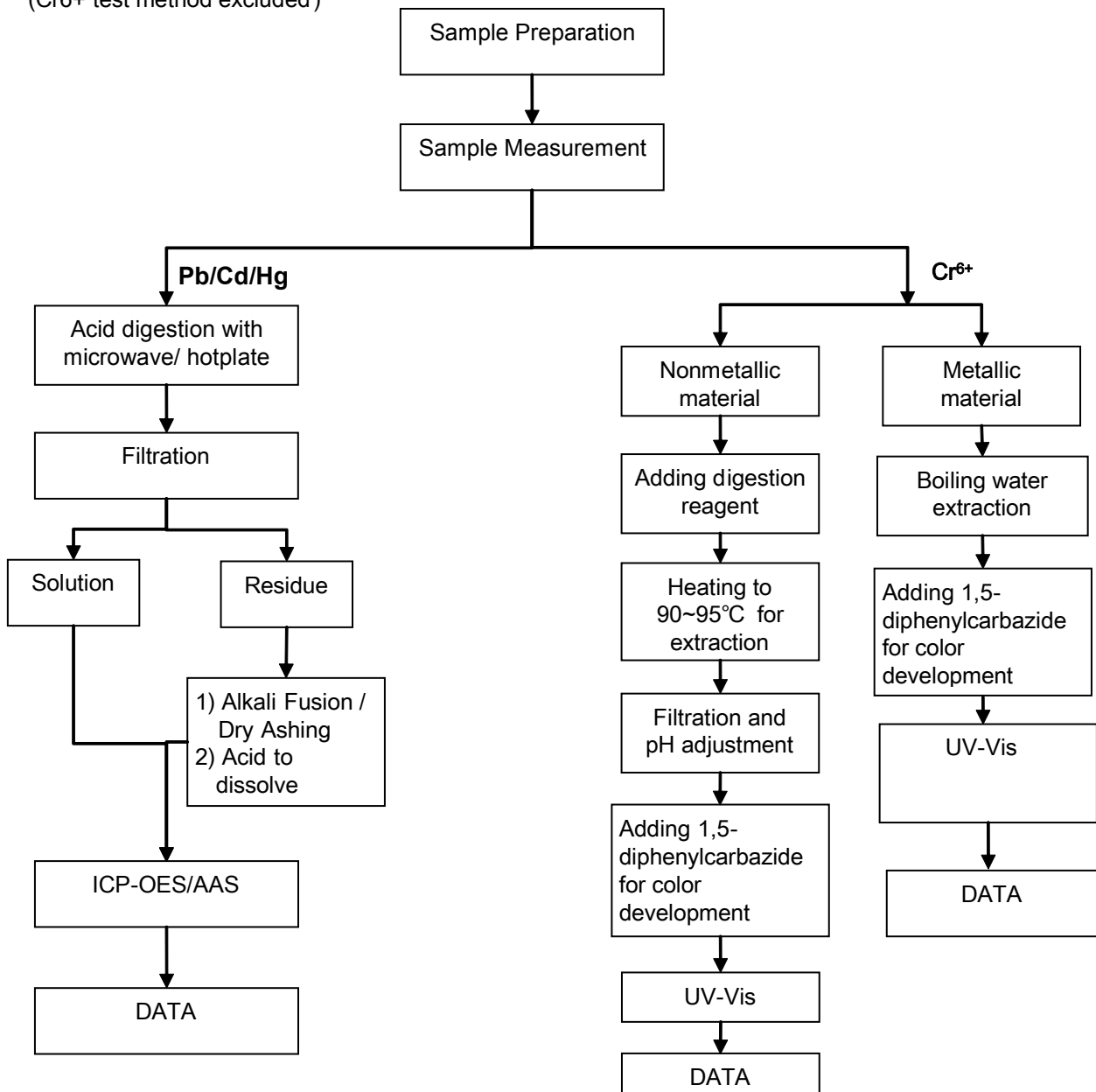
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ATTACHMENTS

Pb/Cd/Hg/Cr<sup>6+</sup> Testing Flow Chart

- 1) Name of the person who made testing: Bruce Xiao
- 2) Name of the person in charge of testing: Bella Wang
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> test method excluded)



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Sample photo:



SGS authenticate the photo on original report only

\*\*\* End of Report \*\*\*

## Test Report

No. SHAEC1601201806

Date: 22 Jan 2016

Page 1 of 5

ZHUZHOU SMELTER GROUP CO.,LTD  
QINGSHUITANG,ZHUZHOU CITY,HUNAN PROVINCE

The following sample(s) was/were submitted and identified on behalf of the clients as : Castings zinc alloy

SGS Job No. : SP16-001957 - SH  
Buyer : Zinc castings parts factory  
Composition : zinc  
Supplier : ZHUZHOU SMELTER GROUP CO.,LTD  
Date of Sample Received : 18 Jan 2016  
Testing Period : 18 Jan 2016 - 22 Jan 2016  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

Marry Ma

Marry Ma  
Approved Signatory



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Testing Center

3<sup>rd</sup> Building, No. 889 Yishan Road Xuhui District, Shanghai China 200233  
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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	SHA16-012018.006	Silvery metal

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

- Test Method :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4) With reference to IEC 62321-7-1:2015 , determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
  - (5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.

Test Item(s)	Limit	Unit	MDL	006
Cadmium (Cd)	100	mg/kg	2	7
Lead (Pb)	1000	mg/kg	2	20
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm <sup>2</sup>	0.10	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND



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# Test Report

No. SHAEC1601201806

Date: 22 Jan 2016

Page 3 of 5

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) ▼= a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm<sup>2</sup>. The sample coating is considered to contain CrVI
  - b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm<sup>2</sup>). The coating is considered a non-CrVI based coating
  - c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> is considered to be inconclusive - unavoidable coating variations may influence the determination

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

IEC 62321 series is equivalent to EN 62321 series

<http://www.cenelec.eu/dyn/www/ff?>

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Testing Center

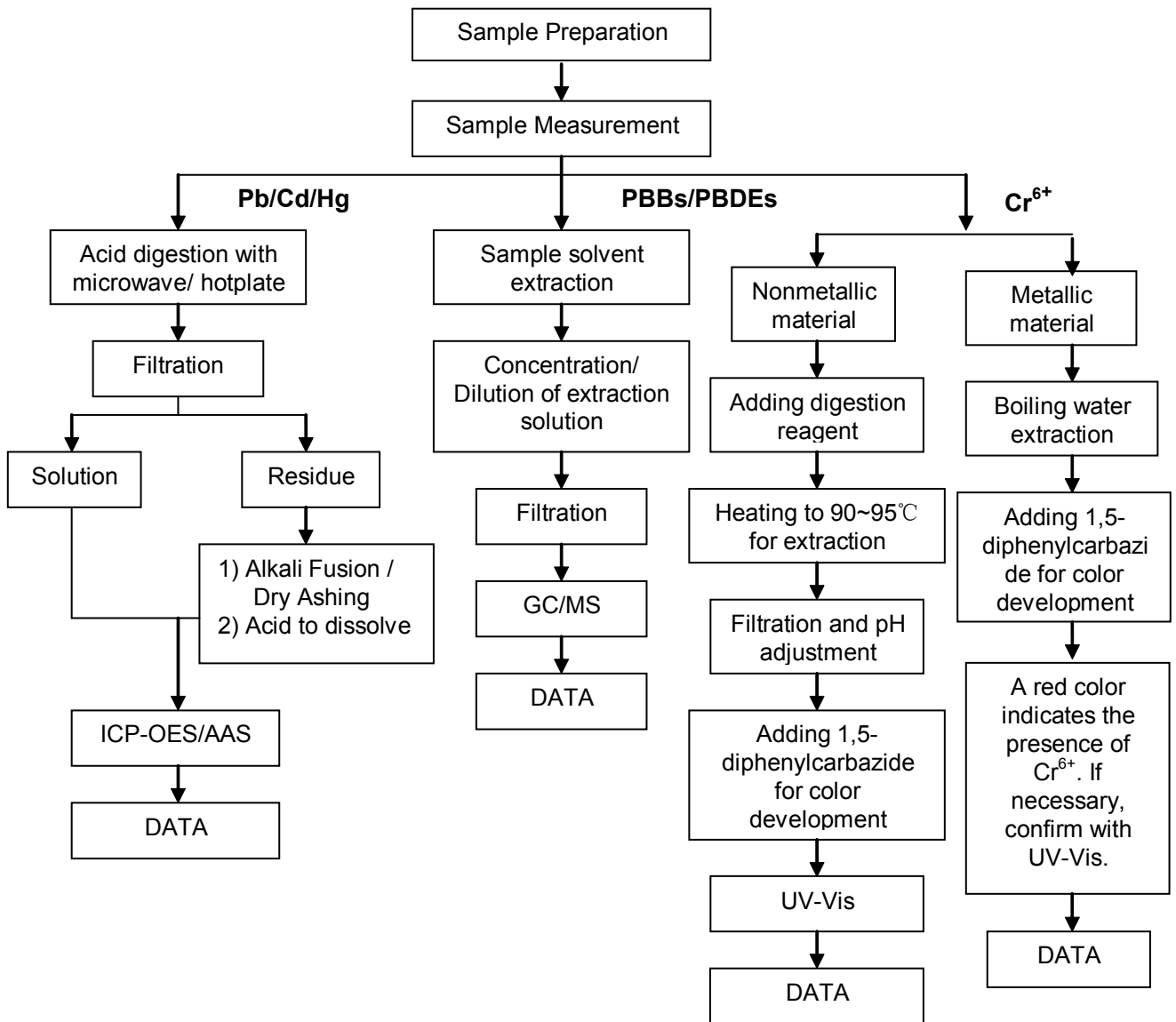
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ATTACHMENTS

RoHS Testing Flow Chart

- 1) Name of the person who made testing: David Lee/Gary Xu/Shimin Zhang/Sunny Qin
- 2) Name of the person in charge of testing: Jan Shi/Summer Jin/Jessy Huang/Stone Chen
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



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## Test Report

No. SHAEC1600886303

Date: 19 Jan 2016

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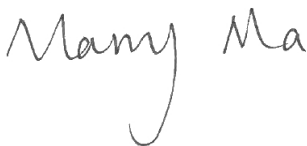
SHANDONG HUAXIA SHENZHOU NEW MATERIAL CO.,LTD

TANGSHAN TOWN, HUANTAI COUNTRY, ZIBO CITY, SHANDONG PROVINCE, CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : PERFLUORINATED ETHYLENE-PROPYLENE COPOLYMER RESINS

SGS Job No. : SP16-001287 - SH  
Client Ref. Information : 610, 618, 611, 600, 601, 602, 608  
Composition : PERFLUORINATED ETHYLENE-PROPYLENE COPOLYMER  
Date of Sample Received : 13 Jan 2016  
Testing Period : 13 Jan 2016 - 19 Jan 2016  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.



Marry Ma  
Approved Signatory



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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	SHA16-008863.002	Translucent plastic grain

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

- Test Method :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4) With reference to IEC 62321:2008, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
  - (5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.
  - (6) With reference to EN 14372:2004, determination of phthalates by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	2	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND
Di-butyl Phthalate (DBP)	1000	mg/kg	30	ND
Benzyl Butyl Phthalate (BBP)	1000	mg/kg	30	ND
Di-2-Ethyl Hexyl Phthalate (DEHP)	1000	mg/kg	30	ND
Diisobutyl Phthalates (DIBP)	1000	mg/kg	30	ND

### Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) On 4 June 2015, Commission Directive (EU) 2015/863 was published in the Official Journal of the European Union (OJEU) to include the phthalates BBP, DBP, DEHP and DIBP into ANNEX II of the Rohs Recast Directive. The new law restricts each phthalate to no more than 0.1% in each homogeneous material of an electrical product.
- (3) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.
- (4) The restriction of DEHP, BBP, DBP and DIBP shall not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021.
- (5) The restriction of DEHP, BBP and DBP shall not apply to toys which are already subject to the restriction of DEHP, BBP and DBP through entry 51 of Annex XVII to Regulation (EC) No 1907/2006.

### Halogen

Test Method : With reference to EN 14582: 2007, analysis was performed by Ion Chromatograph (IC).

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Fluorine (F)	mg/kg	50	>100000
Chlorine (Cl)	mg/kg	200	ND
Bromine (Br)	mg/kg	50	ND



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<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Iodine (I)	mg/kg	50	ND

### Hexabromocyclododecane (HBCDD)

Test Method : With reference to IEC 62321:2008, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

### PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by HPLC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Perfluorooctanesulfonate (PFOS)^	1000	mg/kg	10	ND
Perfluorooctanoic Acid (PFOA)	-	mg/kg	10	ND

Notes :

- (1) Max. limit specified by commission regulation (EU) No. 757/2010 amending regulation (EC) No 850/2004
- (2) ^ PFOS refer to Perfluorooctanesulfonic acid and its derivatives including esulfonic acid, Perfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamide, N-Ethylperfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamidoethanol and N-Ethylperfluorooctane sulfonamidoethanol.

### Polycyclic aromatic hydrocarbons (PAHs)

Test Method : With reference to AfPS GS 2014:01 PAK, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Benzo(a)pyrene(BaP)	mg/kg	0.1	ND
Benzo(e)pyrene(BeP)	mg/kg	0.1	ND
Benzo(a)anthracene(BaA)	mg/kg	0.1	ND
Benzo(k)fluoranthene(BkF)	mg/kg	0.1	ND
Chrysene(CHR)	mg/kg	0.1	ND
Dibenzo(a,h)anthracene(DBA)	mg/kg	0.1	ND



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Test Item(s)	Unit	MDL	002
Benzo(g,h,i)perylene(BPE)	mg/kg	0.1	ND
Indeno(1,2,3-c,d)pyrene(IPY)	mg/kg	0.1	ND
Acenaphthylene(ANY)	mg/kg	0.1	ND
Acenaphthene(ANA)	mg/kg	0.1	ND
Fluorene(FLU)	mg/kg	0.1	ND
Phenanthrene(PHE)	mg/kg	0.1	ND
Pyrene(PYR)	mg/kg	0.1	ND
Anthracene(ANT)	mg/kg	0.1	ND
Fluoranthene(FLT)	mg/kg	0.1	ND
Sum of Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Pyrene, Anthracene, Fluoranthene	mg/kg	-	ND
Naphthalene(NAP)	mg/kg	0.1	ND
Sum of 18 PAHs	mg/kg	-	ND
Benzo(b)fluoranthene(BbF) and Benzo(j)fluoranthene(BjF)	mg/kg	0.1	ND
Material Category	-	-	3



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AfPS ( German commission for Product Safety ) : GS PAHs requirements

Parameter	Category 1 Material indented to be put in the mouth or toys with intended skin contact (longer than 30 s).	Category 2		Category 3	
		Toy under 2009/48/EC	Other products under ProdSG	Toy under 2009/48/ EC	Other products under ProdSG
Benzo(a)pyrene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Benzo(e)pyrene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Benzo(a)anthracene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Benzo(b)fluoranthene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Benzo(j)fluoranthene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Benzo(k)fluoranthene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Chrysene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Dibenzo(a,h)anthracene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Benzo(g,h,i)perylene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Indeno(1,2,3-cd)pyrene mg/kg	<0.2	<0.2	<0.5	<0.5	<1
Acenaphthylene, Acenaphthene, fluorene,phenanthrene , pyrene, anthracene, fluoranthene, mg/kg	< 1 Sum	< 5 Sum	< 10 Sum	< 20 Sum	< 50 Sum
Naphthalene, mg/kg	< 1	< 2		< 10	
Sum of 18 PAHs	<1	< 5	< 10	< 20	< 50

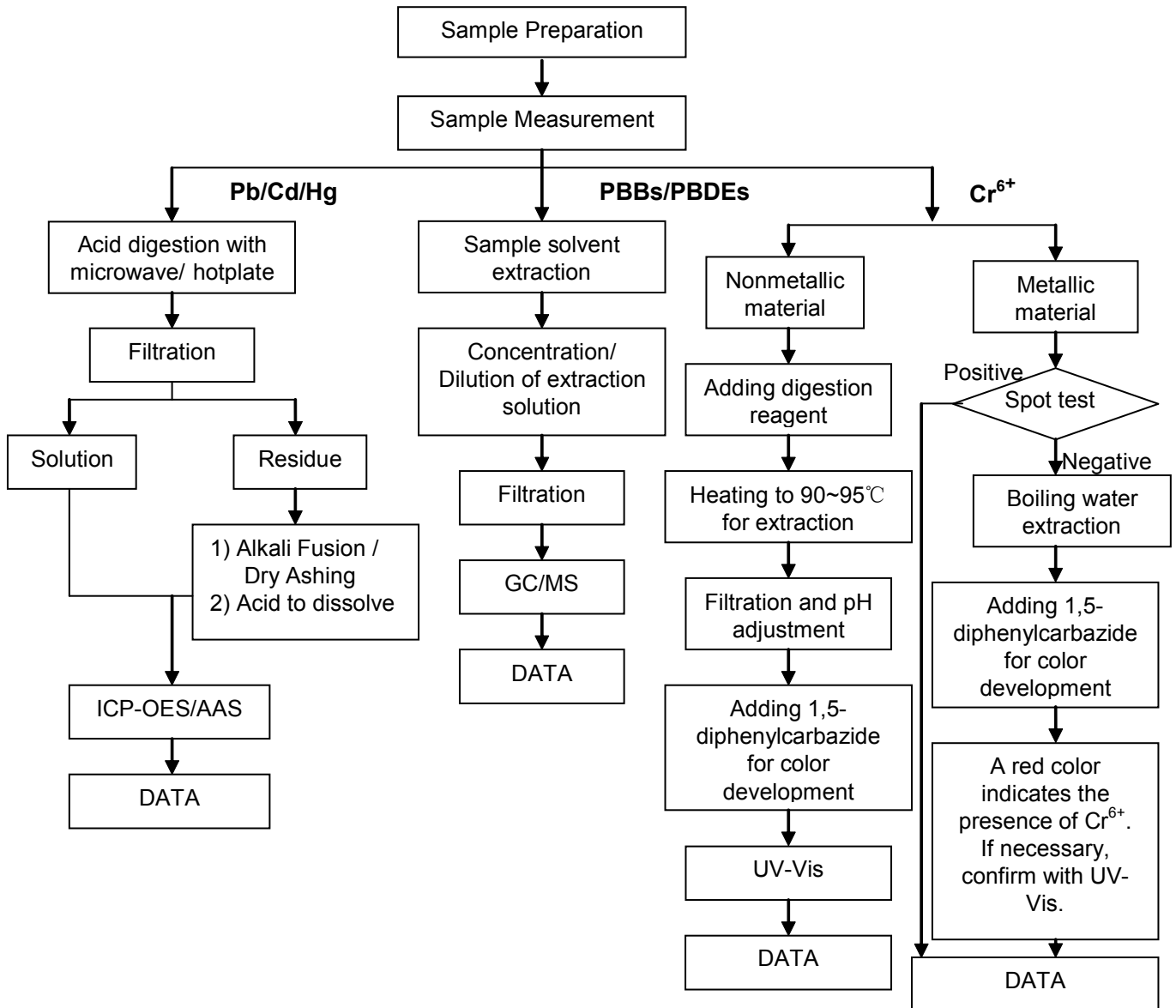


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RoHS Testing Flow Chart

- 1) Name of the person who made testing: David Lee/Gary Xu/Shimin Zhang/Sunny Qin
- 2) Name of the person in charge of testing: Jan Shi/Summer Jin/Jessy Huang/Stone Chen
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



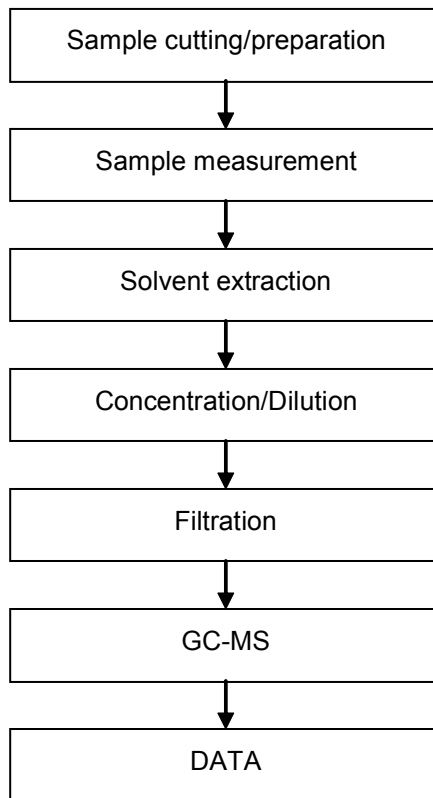
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Phthalates Testing Flow Chart

- 1) Name of the person who made testing: Sherlock Gao
- 2) Name of the person in charge of testing: Jessy Huang



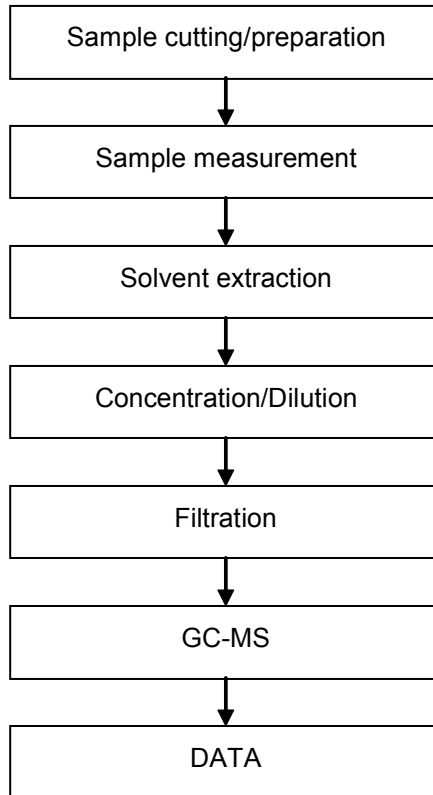
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HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Gary Xu
- 2) Name of the person in charge of testing: Jessy Huang



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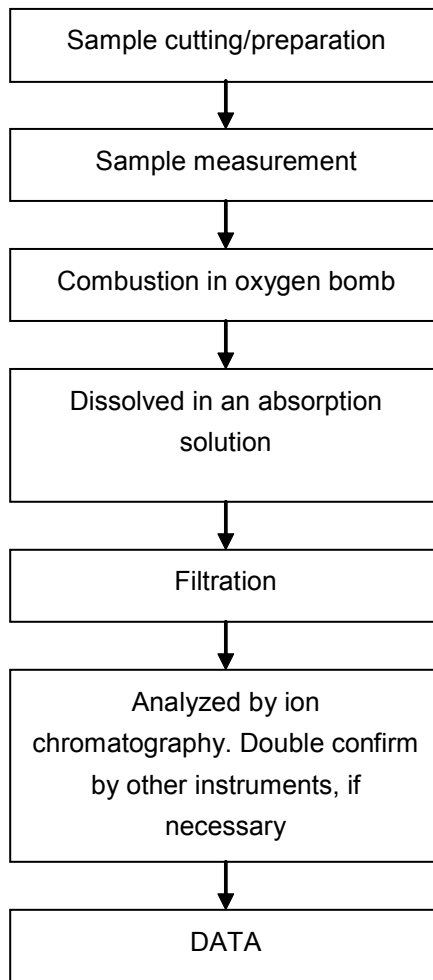
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**Halogen Testing (oxygen bomb) Flow Chart**

- 1) Name of the person who made testing: Kevin Xu
- 2) Name of the person in charge of testing: Sisily Yin



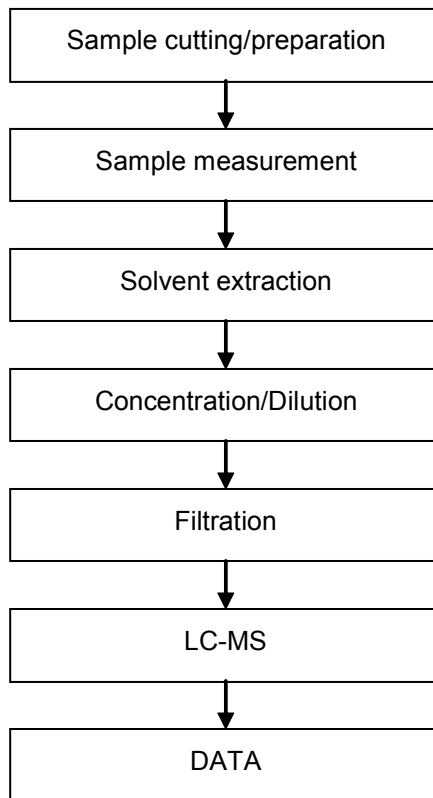
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## ATTACHMENTS

### PFOS/PFOA Testing Flow Chart

- 1) Name of the person who made testing: Jane Yang
- 2) Name of the person in charge of testing: Myra Ma



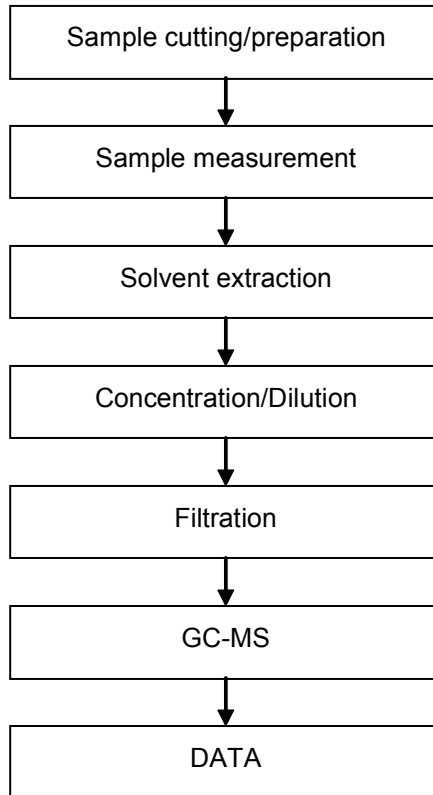
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ATTACHMENTS

PAHs Testing Flow Chart

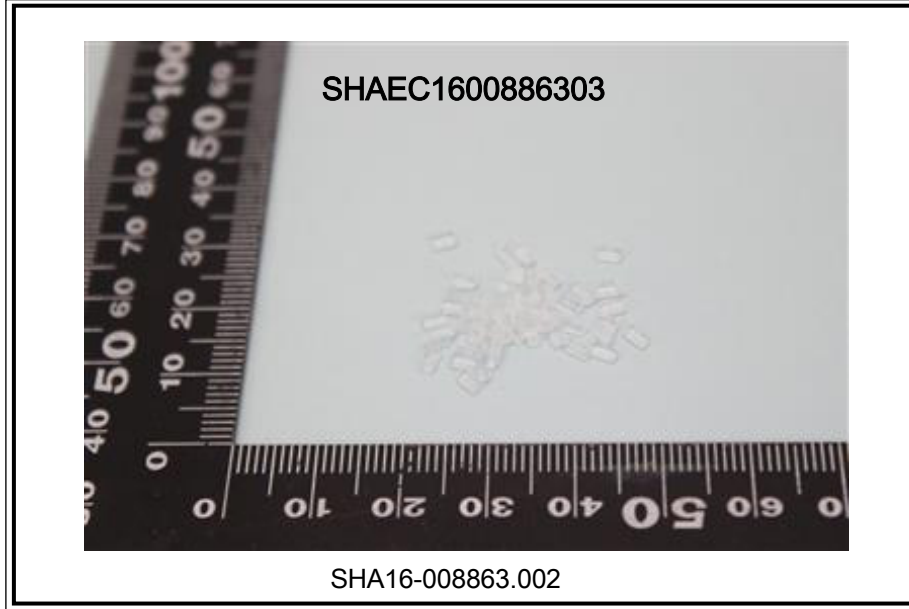
- 1) Name of the person who made testing: Lisa Duan
- 2) Name of the person in charge of testing: Myra ma



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Sample photo:



SGS authenticate the photo on original report only

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## 测试报告

No. NGBML1505119902

日期: 2016年01月08日 第1页,共8页

浙江巨化股份有限公司  
浙江省衢州市柯城区巨化

以下测试之样品是由申请者所提供及确认: 聚四氟乙烯分散树脂

SGS工作编号: NBIN1601000155PC - NB  
样品接收日期: 2015年12月30日  
测试周期: 2015年12月30日 - 2016年01月07日  
测试要求: 根据客户要求测试  
测试方法: 请参见下一页  
测试结果: 请参见下一页

通标标准技术服务有限公司宁波分公司  
授权签名



Iris Xiao 肖玲艳  
批准签署人

本报告是编号为NGBML1505119901 报告的中文版本



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SGS-通标标准技术服务有限公司  
Ningbo Branch Technical Laboratory

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中国·浙江·宁波市国家高新区凌云路1177号凌云产业园4号楼西1-5层 邮编: 315040 t HL (86-574)89070271 t TY (86-574)89070211 e [sgs.china@sgs.com](mailto:sgs.china@sgs.com)



## 测试报告

No. NGBML1505119902

日期: 2016年01月08日 第2页,共8页

测试结果:

### 测试样品描述:

样品编号	SGS样品ID	描述
SN1	NGB15-051199.001	白色粉末

备注:

- (1) 1 mg/kg = 0.0001%
- (2) MDL = 方法检测限
- (3) ND = 未检出 (< MDL)
- (4) "-" = 未规定

### RoHS 指令2011/65/EU附录II的修正指令(EU) 2015/863

测试方法:

- (1) 参考IEC 62321-5:2013, 用ICP-OES测定镉的含量
- (2) 参考IEC 62321-5:2013, 用ICP-OES测定铅的含量
- (3) 参考IEC 62321-4:2013, 用ICP-OES测定汞的含量
- (4) 参考IEC 62321:2008, 用紫外-可见分光光度计比色法测定六价铬的含量
- (5) 参考IEC 62321-6:2015, 用GC-MS测定PBBs(多溴联苯)和PBDEs(多溴二苯醚)的含量
- (6) 参考EN 14372:2004, 用GC-MS测定邻苯二甲酸酯的含量

测试项目	限值	单位	MDL	001
镉(Cd)	100	mg/kg	2	ND
铅(Pb)	1000	mg/kg	2	ND
汞(Hg)	1000	mg/kg	2	ND
六价铬(CrVI)	1000	mg/kg	2	ND
多溴联苯(PBBs)之和	1000	mg/kg	-	ND
一溴联苯	-	mg/kg	5	ND
二溴联苯	-	mg/kg	5	ND
三溴联苯	-	mg/kg	5	ND
四溴联苯	-	mg/kg	5	ND
五溴联苯	-	mg/kg	5	ND
六溴联苯	-	mg/kg	5	ND
七溴联苯	-	mg/kg	5	ND
八溴联苯	-	mg/kg	5	ND
九溴联苯	-	mg/kg	5	ND
十溴联苯	-	mg/kg	5	ND
多溴二苯醚之和(PBDEs)	1000	mg/kg	-	ND
一溴二苯醚	-	mg/kg	5	ND
二溴二苯醚	-	mg/kg	5	ND



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Ningbo Branch Analytical Laboratory

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## 测试报告

No. NGBML1505119902

日期: 2016年01月08日 第3页,共8页

测试项目	限值	单位	MDL	001
三溴二苯醚	-	mg/kg	5	ND
四溴二苯醚	-	mg/kg	5	ND
五溴二苯醚	-	mg/kg	5	ND
六溴二苯醚	-	mg/kg	5	ND
七溴二苯醚	-	mg/kg	5	ND
八溴二苯醚	-	mg/kg	5	ND
九溴二苯醚	-	mg/kg	5	ND
十溴二苯醚	-	mg/kg	5	ND
邻苯二甲酸二丁酯 (DBP)	1000	mg/kg	30	ND
邻苯二甲酸丁苄酯(BBP)	1000	mg/kg	30	ND
邻苯二甲酸二(2-乙基己基)酯(DEHP)	1000	mg/kg	30	ND
邻苯二甲酸二异丁酯(DIBP)	1000	mg/kg	30	ND

备注:

(1) 最大允许极限值引用自RoHS指令(EU) 2015/863。

### 六溴环十二烷(HBCDD)

测试方法: 参照US EPA 3550C: 2007方法测定, 采用GC-MS进行分析.

测试项目	CAS NO.	单位	MDL	001
六溴环十二烷 (HBCDD)	25637-99-4/3194-55-6	mg/kg	10	ND

### 全氟辛烷磺酸 (PFOS)和全氟辛酸(PFOA)

测试方法: 参照US EPA 3550C: 2007方法测定, 采用HPLC-MS进行分析.

测试项目	单位	MDL	001
全氟辛烷磺酸 (PFOS) <sup>^</sup>	mg/kg	10	ND
全氟辛酸 (PFOA)	mg/kg	10	ND

备注:

(1) <sup>^</sup>=全氟辛烷磺酸(PFOS)及其衍生物包含全氟辛烷磺酸(PFOS)、全氟辛基磺酰胺(PFOSA)、2-(N-乙基全氟辛基磺酰胺)乙醇(EtFOSE)、N-甲基全氟辛烷磺酰胺(MeFOSA)、N-乙基全氟辛烷磺酰胺(EtFOSA)和2-(N-甲基全氟辛基磺酰胺)乙醇(MeFOSE)。



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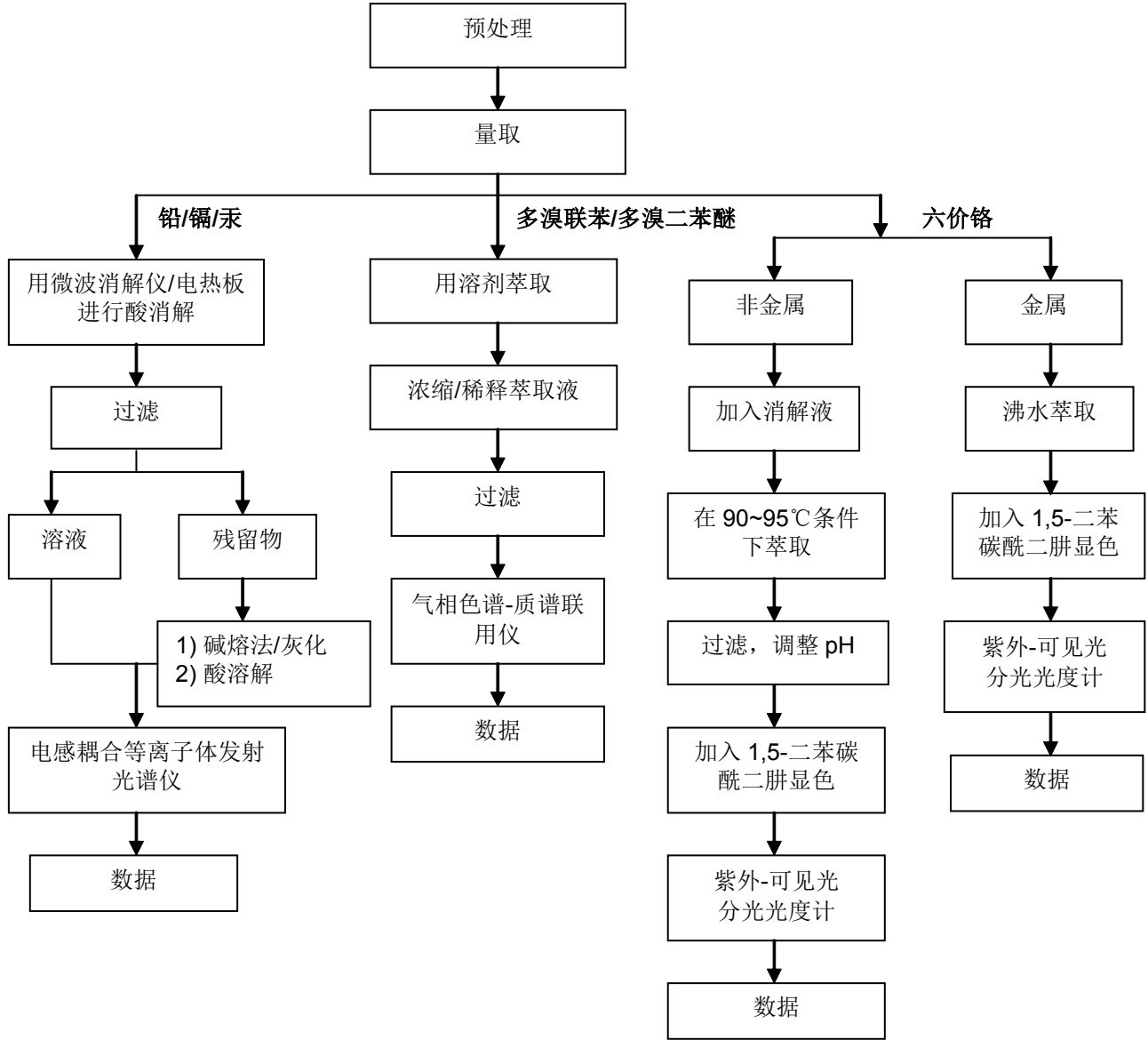
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附件

RoHS 测试流程图

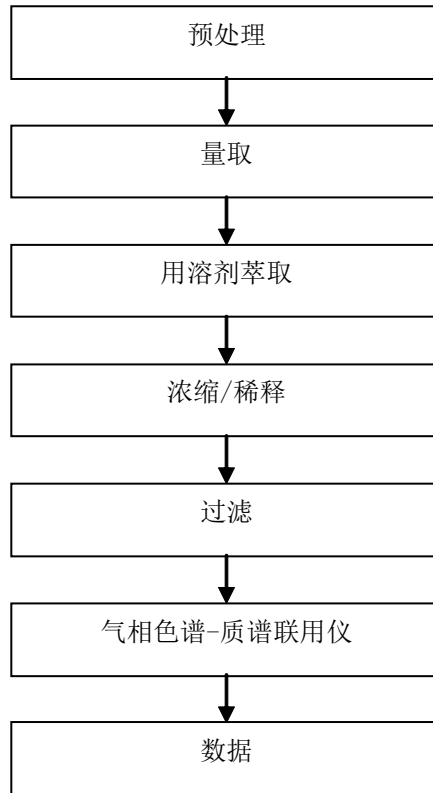
1) 样品按照下述流程被完全消解（六价铬和多溴联苯/多溴二苯醚测试除外）。



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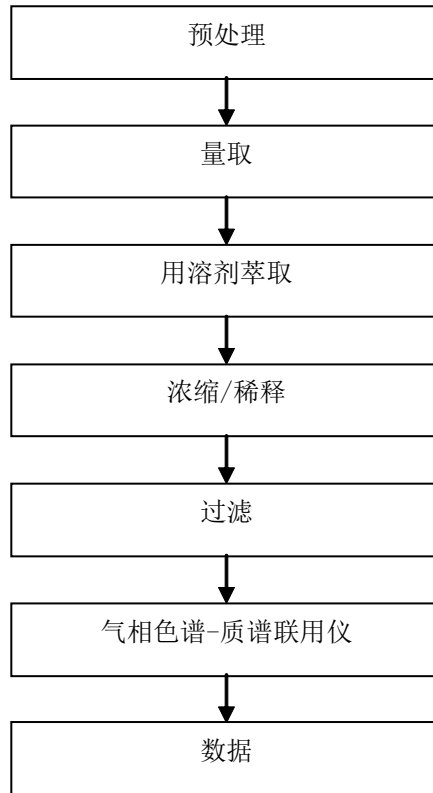
## 邻苯测试流程图



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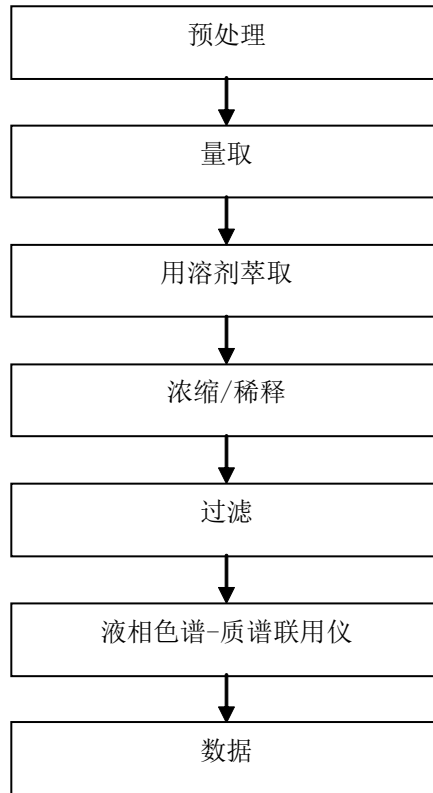
## 六溴环十二烷测试流程图



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## 全氟辛烷磺酰基化合物/全氟辛酸测试流程图



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## Test Report

No. SHAEC1607788405

Date: 27 Apr 2016

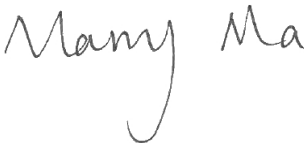
Page 1 of 12

CHANGZHOU HENGFENG SPECIAL CONDUCTOR CO., LTD.  
26 FENGHUANG ROAD, CHANGZHOU CITY

The following sample(s) was/were submitted and identified on behalf of the clients as : SILVER-COATED COPPER WIRE

SGS Job No. : SP16-013405 - SH  
Composition : Cu、Ag  
Date of Sample Received : 19 Apr 2016  
Testing Period : 19 Apr 2016 - 26 Apr 2016  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.



Marry Ma  
Approved Signatory



SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.  
Testing Center-Chenmiao Laboratory

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t HL (86-21) 61402594 f HL (86-21) 61156899 e sgs.china@sgs.com

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	SHA16-077884.005	Copper metal(base)
SN2	SHA16-077884.006	Silvery metal(plating)

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

Test Method : (1) Determination of Cadmium and Lead by ICP-OES after application of modified surface etching digestion based on IEC62321-5:2013  
 (2) Determination of Mercury by ICP-OES after application of modified surface etching digestion based on IEC 62321-4:2013  
 (3)With reference to IEC 62321-7-1:2015 , determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.

Test Item(s)	Limit	Unit	MDL	006
Cadmium (Cd)	100	mg/kg	10	ND
Lead (Pb)	1000	mg/kg	10	ND
Mercury (Hg)	1000	mg/kg	10	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm <sup>2</sup>	0.10	ND

Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) ▼= a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm<sup>2</sup>. The sample coating is considered to contain CrVI  
 b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm<sup>2</sup>). The coating is considered a non-CrVI based coating  
 c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> is considered to be inconclusive - unavoidable coating variations may influence the determination

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.



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IEC 62321 series is equivalent to EN 62321 series

<http://www.cenelec.eu/dyn/www/f?>

p=104:30:1742232870351101:::FSP\_ORG\_ID,FSP\_LANG\_ID:1258637,25

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

- Test Method :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2) With reference to IEC 62321-5:2013, determination of Lead by AAS.
  - (3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4) With reference to IEC 62321-7-1:2015 , determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
  - (5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.
  - (6) With reference to EN 14372:2004, determination of phthalates by GC-MS.

Test Item(s)	Limit	Unit	MDL	005
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm <sup>2</sup>	0.10	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND



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# Test Report

No. SHAEC1607788405

Date: 27 Apr 2016

Page 4 of 12

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Decabromodiphenyl ether	-	mg/kg	5	ND
Di-butyl Phthalate (DBP)	1000	mg/kg	30	ND
Benzyl Butyl Phthalate (BBP)	1000	mg/kg	30	ND
Di-2-Ethyl Hexyl Phthalate (DEHP)	1000	mg/kg	30	ND
Diisobutyl Phthalates (DIBP)	1000	mg/kg	30	ND

Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) ▽= a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm<sup>2</sup>. The sample coating is considered to contain CrVI
  - b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm<sup>2</sup>). The coating is considered a non-CrVI based coating
  - c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> is considered to be inconclusive - unavoidable coating variations may influence the determination

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

IEC 62321 series is equivalent to EN 62321 series

<http://www.cenelec.eu/dyn/www/f?>

p=104:30:1742232870351101:::FSP\_ORG\_ID,FSP\_LANG\_ID:1258637,25

**Element(s)**

Test Method : With reference to US EPA Method 3050B:1996, analysis was performed by ICP-OES.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Antimony (Sb)	mg/kg	10	ND

**Hexabromocyclododecane (HBCDD)**

Test Method : With reference to IEC 62321:2008, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND



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**PFOS (Perfluorooctane Sulfonates)**

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by HPLC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Perfluorooctanesulfonate (PFOS)^	1000	mg/kg	10	ND

Notes :

- (1) Max. limit specified by commission regulation (EU) No. 757/2010 amending regulation (EC) No 850/2004
- (2) ^ PFOS refer to Perfluorooctanesulfonic acid and its derivatives including esulfonic acid, Perfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamide, N-Ethylperfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamidoethanol and N-Ethylperfluorooctane sulfonamidoethanol.

**Benzenamine,N-phenyl-,Reaction Products with Styrene and 2,4,4-Trimethylpentene (BNST)**

Test Method : With reference to EPA method 3550C:2007 & EPA method 8270D: 2007, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Benzenamine,N-phenyl-,Reaction Products with Styrene and 2,4,4-Trimethylpentene (BNST)	68921-45-9	mg/kg	10	ND



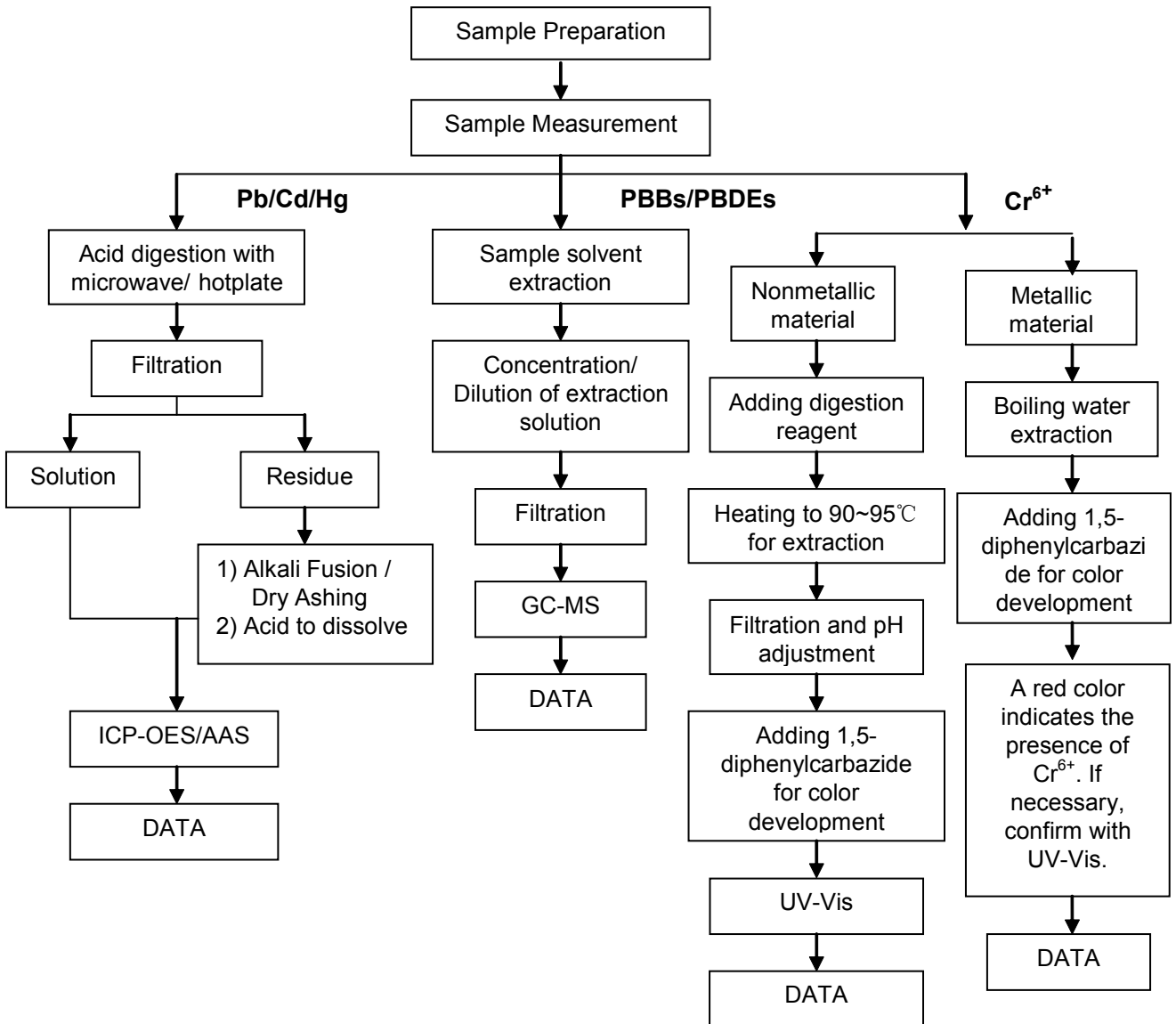
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RoHS Testing Flow Chart

- 1) Name of the person who made testing: David Lee/Gary Xu/Shimin Zhang/Sunny Qin
- 2) Name of the person in charge of testing: Jan Shi/Luna Xu/Jessy Huang/Stone Chen
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



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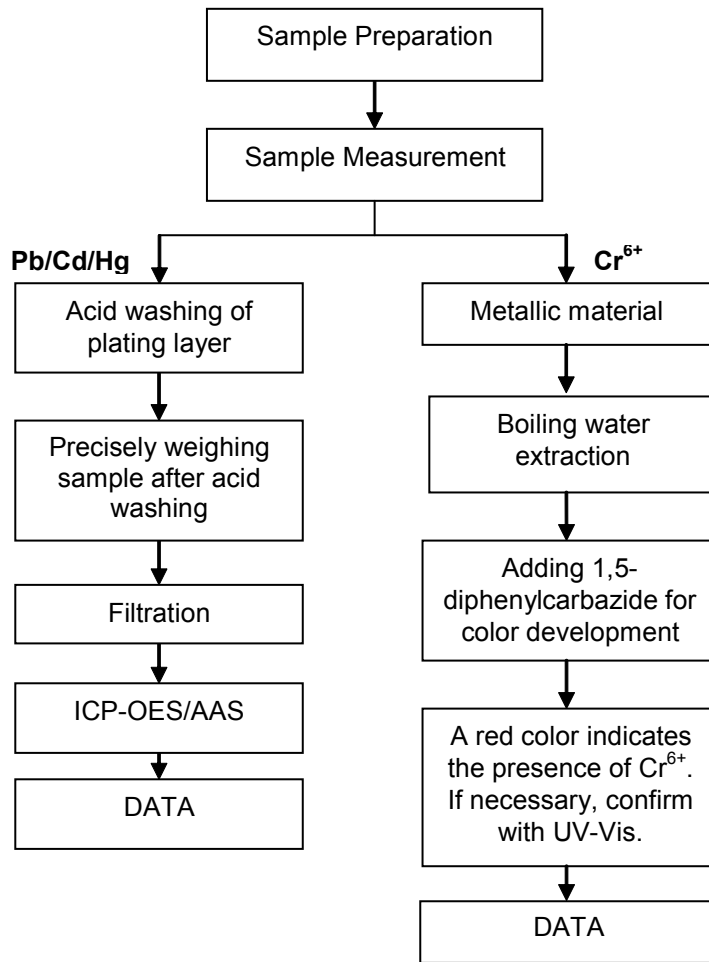
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ATTACHMENTS

Plating Pb/Cd/Hg/Cr<sup>6+</sup> Testing Flow Chart

- 1) Name of the person who made testing: Selina song / Shimin Zhang
- 2) Name of the person in charge of testing: Luna Xu/ Stone Chen



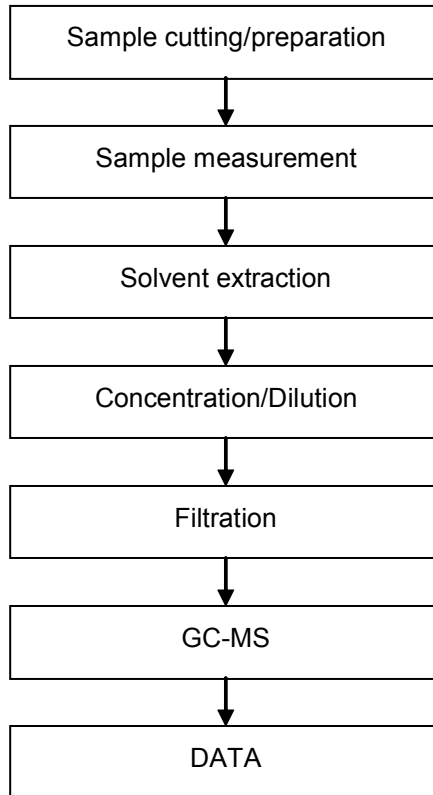
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Phthalates Testing Flow Chart

- 1) Name of the person who made testing: Sherlock Gao
- 2) Name of the person in charge of testing: Jessy Huang



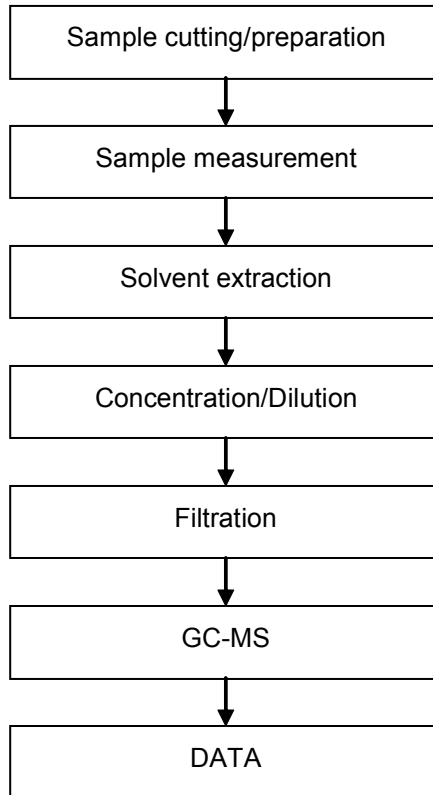
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## ATTACHMENTS

### HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Gary Xu
- 2) Name of the person in charge of testing: Jessy Huang



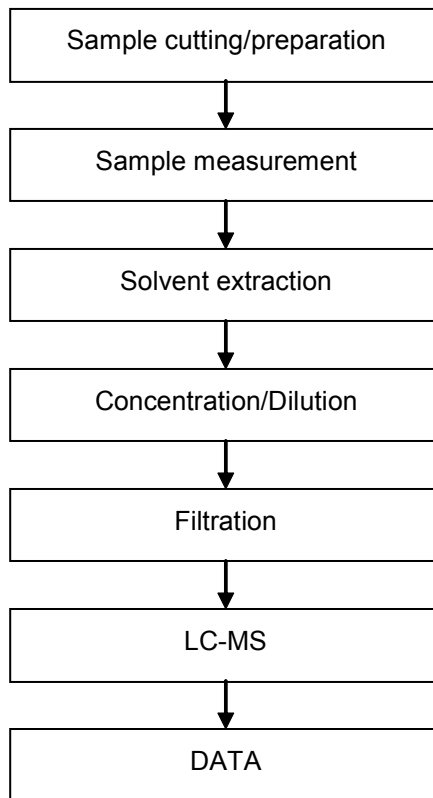
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### PFOS Testing Flow Chart

- 1) Name of the person who made testing: Jane Yang
- 2) Name of the person in charge of testing: Myra Ma



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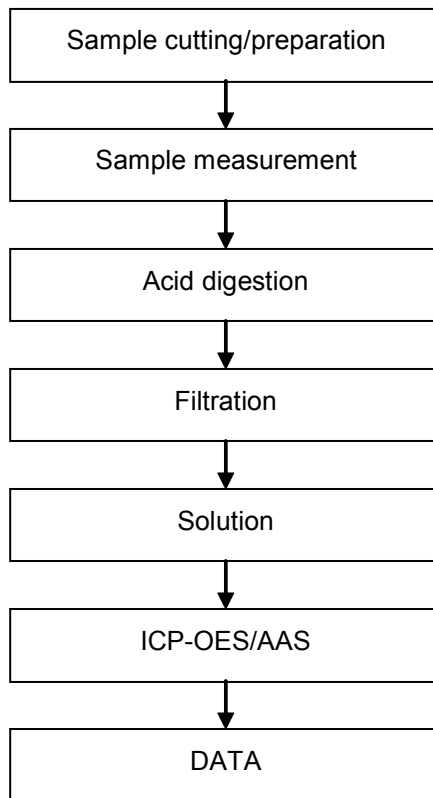
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### Elements Testing Flow Chart

- 1) Name of the person who made testing: David Lee/Sunny Qin
- 2) Name of the person in charge of testing: Luna Xu/Jan Shi



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Sample photo:



SGS authenticate the photo on original report only

\*\*\* End of Report \*\*\*



## Test Report

No. CANEC1603495801

Date: 16 Mar 2016

Page 1 of 12

SHENGYI TECHNOLOGY CO., LTD.

5 WESTERN INDUSTRY ROAD, SONGSHAN LAKE, DONGGUAN CITY, GUANGDONG, P.R.  
CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : The Halogen Free Copper Clad Laminate

SGS Job No. : CP16-010723 - GZ

Model No. : S1150G; Prepreg: S1150GB

Date of Sample Received : 10 Mar 2016

Testing Period : 10 Mar 2016 - 16 Mar 2016

Test Requested : Selected test(s) as requested by client.

Test Method : Please refer to next page(s).

Test Results : Please refer to next page(s).

Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis(2-ethylhexyl) phthalate (DEHP) , Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) , and Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

*Violet*

Violet, Shi  
Approved Signatory



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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	CAN16-034958.001	Yellow board

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

- Test Method :
- (1)With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2)With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3)With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4)With reference to IEC 62321:2008, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
  - (5)With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.
  - (6)With reference to IEC 62321-8 (111/321/CD) , determination of phthalates by GC-MS.

Test Item(s)	Limit	Unit	MDL	001
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	5
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND



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## Test Report

No. CANEC1603495801

Date: 16 Mar 2016

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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND
Dibutyl phthalate (DBP)	1000	mg/kg	30	ND
Butyl benzyl phthalate (BBP)	1000	mg/kg	30	ND
Bis (2-ethylhexyl) phthalate (DEHP)	1000	mg/kg	30	ND
Diisobutyl Phthalates (DIBP)	1000	mg/kg	30	ND

Notes :

(1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.

### Halogen

Test Method : With reference to EN 14582: 2007, analysis was performed by Ion Chromatograph (IC).

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Fluorine (F)	mg/kg	50	1259
Chlorine (Cl)	mg/kg	50	429
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

### Elementary Analysis

Test Method : With reference to US EPA Method 3052:1996, analysis was performed by ICP-OES.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Antimony (Sb)	mg/kg	10	ND



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**Hexabromocyclododecane (HBCDD)**

Test Method : With reference to IEC 62321:2008, analysis was performed by GC-MS.

Test Item(s)	Unit	MDL	001
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

**Phthalate**

Test Method : With reference to EN14372: 2004. Analysis was performed by GC-MS.

Test Item(s)	CAS NO.	Unit	MDL	001
Dibutyl Phthalate (DBP)	84-74-2	%(w/w)	0.003	ND
Benzylbutyl Phthalate (BBP)	85-68-7	%(w/w)	0.003	ND
Bis(2-ethylhexyl) Phthalate (DEHP)	117-81-7	%(w/w)	0.003	ND
Diisononyl Phthalate (DINP)	28553-12-0 / 68515-48-0	%(w/w)	0.010	ND
Di-n-octyl Phthalate (DNOP)	117-84-0	%(w/w)	0.003	ND
Diisodecyl Phthalate (DIDP)	26761-40-0 / 68515-49-1	%(w/w)	0.010	ND
Di-n-hexyl Phthalate (DnHP)	84-75-3	%(w/w)	0.003	ND
Diisobutyl Phthalate (DIBP)	84-69-5	%(w/w)	0.003	ND
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNU)	68515-42-4	%(w/w)	0.010	ND
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	%(w/w)	0.003	ND
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6	%(w/w)	0.010	ND
Diisopentyl Phthalate (DIPP)	605-50-5	%(w/w)	0.003	ND
n-pentyl Isopentyl Phthalate (nPIPP)	776297-69-9	%(w/w)	0.003	ND
1,2-Benzenedicarboxylic acid, dipentyl ester, branched and linear (DPP)	84777-06-0	%(w/w)	0.010	ND
Di-n-pentyl Phthalate (DnPP)	131-18-0	%(w/w)	0.003	ND
1,2-Benzenedicarboxylic acid, dihexyl ester branched and linear (DHP)	68515-50-4	%(w/w)	0.010	ND

Notes :

- (1)DBP,BBP,DEHP Reference information: Entry 51 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2005/84/EC):
  - i) Shall not be used as substances or in mixtures, in concentrations greater than 0.1 % by weight of the



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plasticised material, in toys and childcare articles.

ii) Toys and childcare articles containing these phthalates in a concentration greater than 0.1 % by weight of the plasticised material shall not be placed on the market.

Please refer to Regulation (EC) No 552/2009 to get more detail information

(2) DINP, DNOP, DIDP Reference information: Entry 52 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2005/84/EC).

i) Shall not be used as substances or in mixtures, in concentrations greater than 0.1 % by weight of the plasticised material, in toys and childcare articles which can be placed in the mouth by children.

ii) Such toys and childcare articles containing these phthalates in a concentration greater than 0.1 % by weight of the plasticised material shall not be placed on the market.

Please refer to Regulation (EC) No 552/2009 to get more detail information

**PFOA & PFOS (Perfluorooctanoic acid & Perfluorooctane sulfonates)**

Test Method : With reference to CEN/TS15968:2010, analysis was performed by LC-MS.

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Perfluorooctanoic acid (PFOA)	335-67-1	mg/kg	10	ND
Perfluorooctane Sulfonates (PFOS)^	-	mg/kg	10	ND

Notes :

(1) ^ PFOS refer to Perfluorooctanesulfonic acid and its derivatives including Perfluorooctanesulfonic acid, Perfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamide, N-Ethylperfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamidoethanol and N-Ethylperfluorooctane sulfonamidoethanol.



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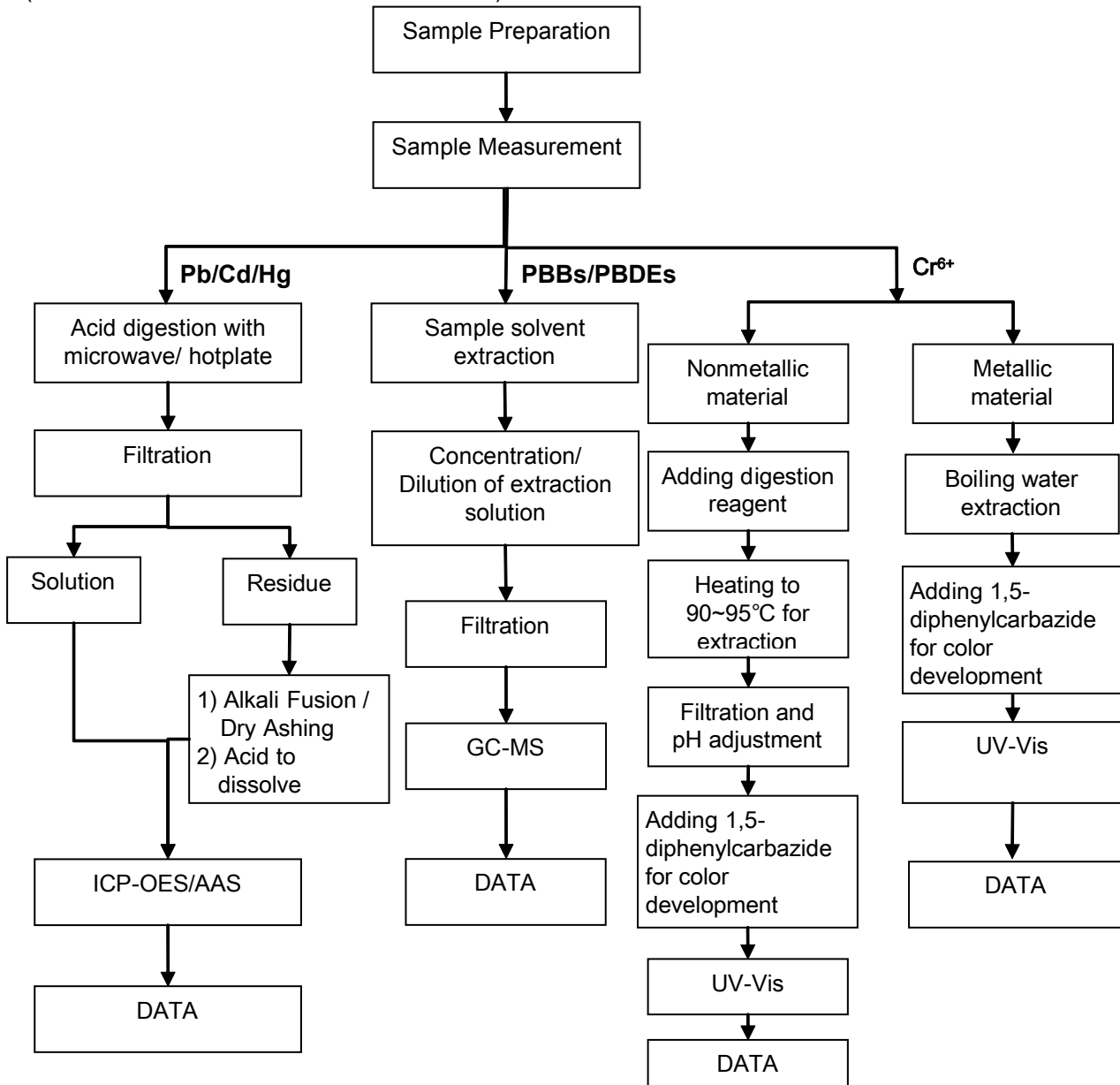
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Pb/Cd/Hg/Cr<sup>6+</sup>/PBBs/PBDEs Testing Flow Chart

- 1) Name of the person who made testing: Bruce Xiao / Sunny Hu
- 2) Name of the person in charge of testing: Bella Wang / Cutey Yu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded).



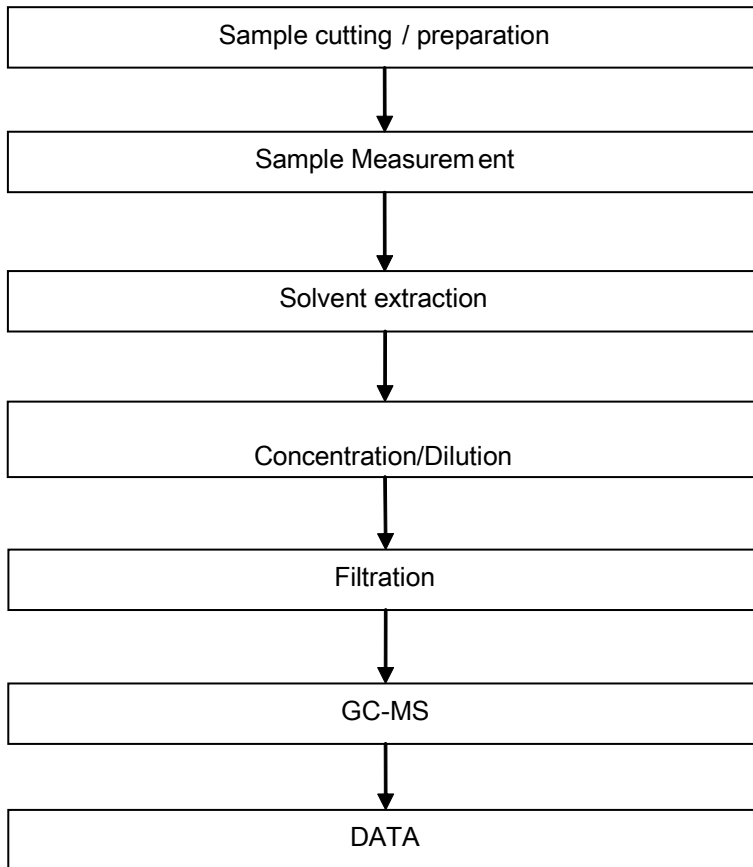
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Phthalates Testing Flow Chart

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- 2) Name of the person in charge of testing: Cutey Yu



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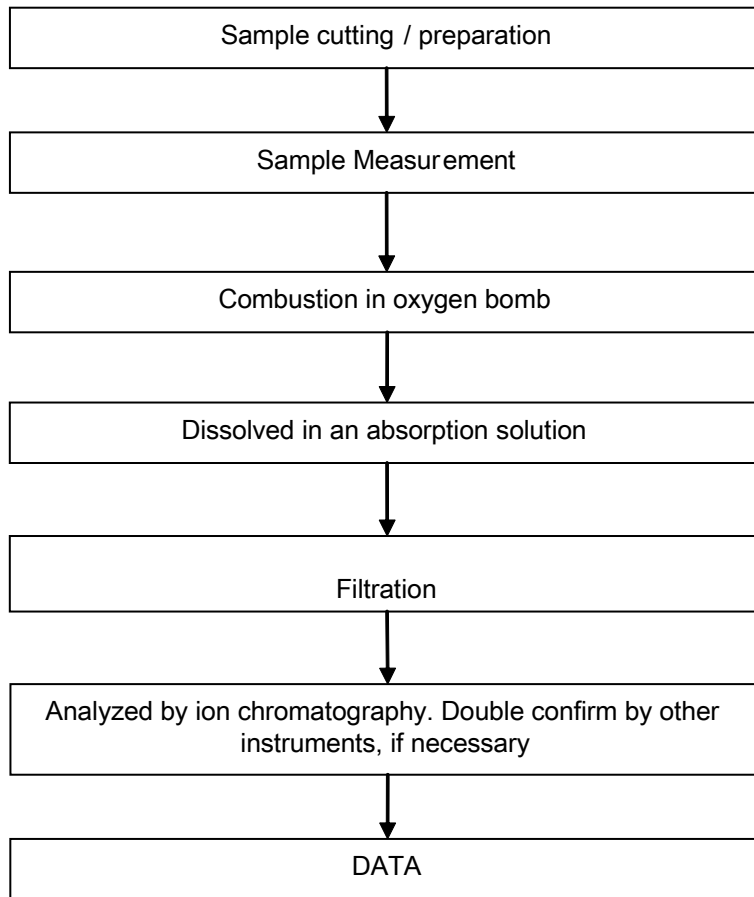
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Halogen Testing Flow Chart

- 1) Name of the person who made testing: Hanming Xiao
- 2) Name of the person in charge of testing: Bella Wang



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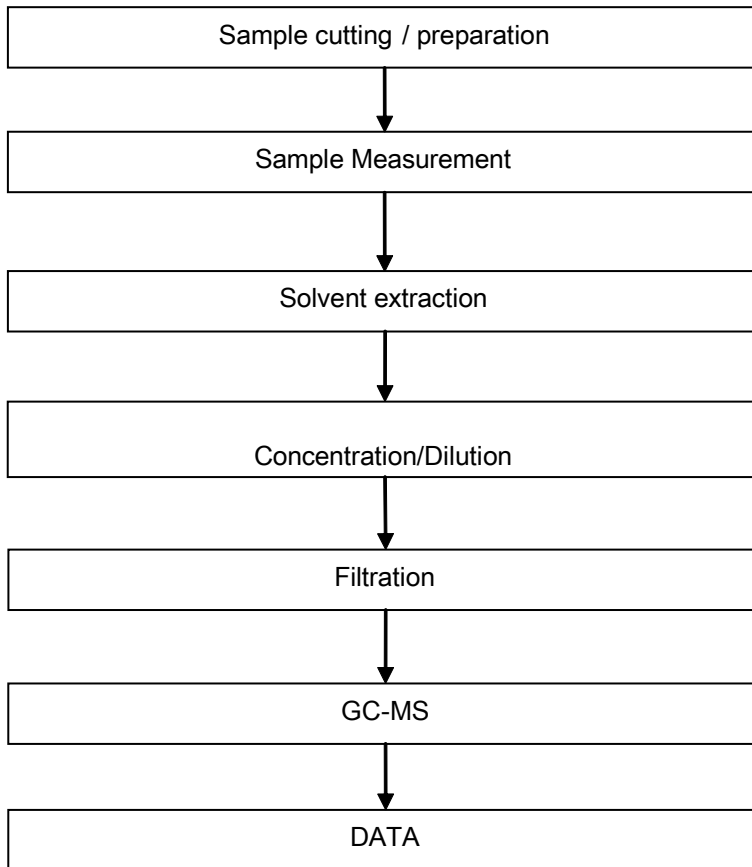
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HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Sunny Hu
- 2) Name of the person in charge of testing: Cutey Yu



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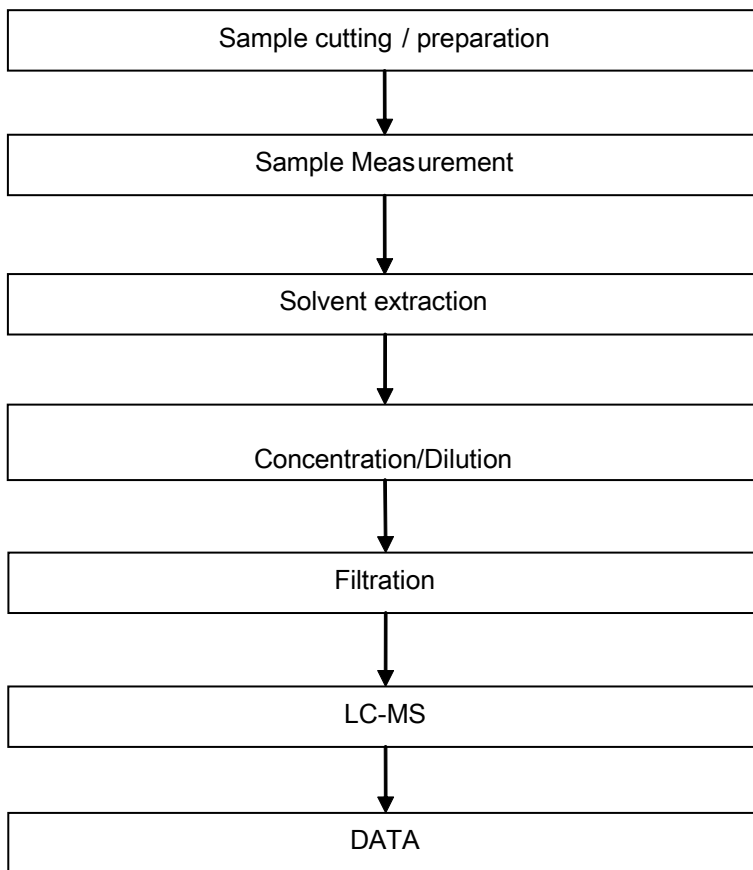
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PFOA / PFOS Testing Flow Chart

- 1) Name of the person who made testing: Zhihong Wang
- 2) Name of the person in charge of testing: Cutey Yu



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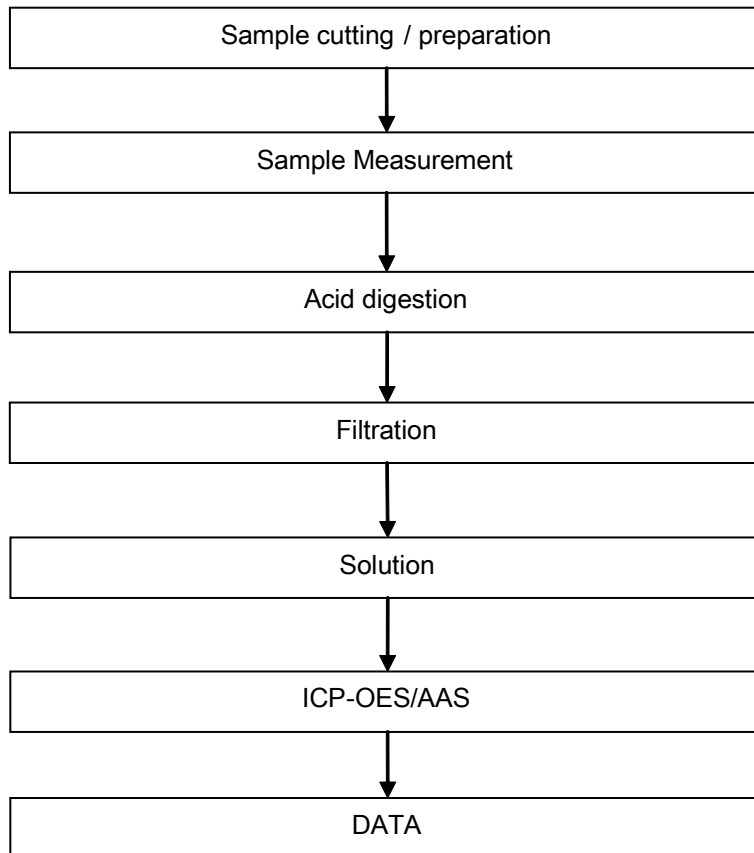
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Elementary Testing Flow Chart

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- 2) Name of the person in charge of testing : Bella Wang

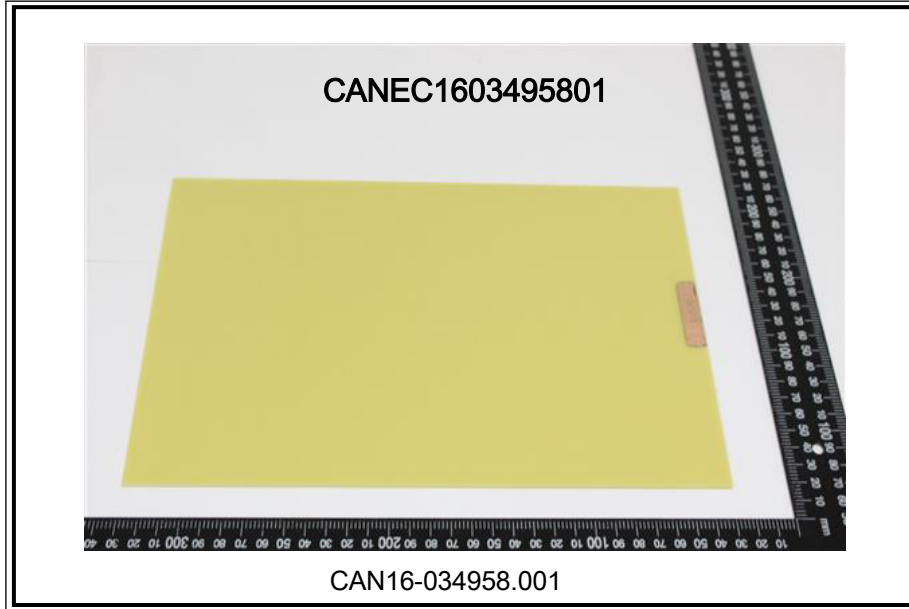


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