

Test Report

No. CANEC1920201804

Date: 30 Oct 2019

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QPL LIMITED

NO 1,PIN ZHI ROAD, XIN AN IND.PARK, CHANG AN TOWN, DONGGUAN, GUANGDONG

The following sample(s) was/were submitted and identified on behalf of the clients as : CDA70250 (C7025)

SGS Job No. : CP19-055629 - SZ

Client Ref. Info. : Sample may cover PDIP, PLCC QFN, DFN, LPCC, QFP, LQFP, TQFP SIP, SOIC, SOP, SSOP, TSOP, TSSOP, SOT, TO, ZIP, FBP,LED, LFGA/ELP, HD-BU, HD-EB, HDL Lead frames, Heatsink and Stiffeners

Date of Sample Received : 16 Oct 2019

Testing Period : 16 Oct 2019 - 24 Oct 2019

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

Kelly Qu

Kelly Qu
Approved Signatory



Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	CAN19-202018.004	Copper colored metal

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 : With reference to IEC 62321-4:2013+A1:2017, IEC 62321-5:2013, IEC 62321-7-1:2015 , IEC 62321-6:2015 and IEC 62321-8:2017, analyzed by ICP-OES , UV-Vis and GC-MS .

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	30
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm ²	0.10	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
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
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	50	ND
Butyl benzyl phthalate (BBP)	1000	mg/kg	50	ND
Bis (2-ethylhexyl) phthalate (DEHP)	1000	mg/kg	50	ND
Diisobutyl Phthalates (DIBP)	1000	mg/kg	50	ND

Notes :

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863. IEC 62321 series is equivalent to EN 62321 series
https://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25
- (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.

Halogen

Test Method : With reference to EN 14582:2016, analysis was performed by IC.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

Elementary Analysis

Test Method : SGS In-house method (GZTC CHEM-TOP-009-01, with reference to US EPA Method 3050B:1996), analysis was performed by ICP-OES.



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<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Tin (Sn)	mg/kg	5	96
Arsenic (As)	mg/kg	10	ND
Beryllium (Be)	mg/kg	5	ND
Antimony (Sb)	mg/kg	10	ND
Antimony trioxide(Sb ₂ O ₃)	mg/kg	12	ND

Notes :

(1) Sb₂O₃: Calculate from Antimony content.

Polychlorinated Naphthalenes (PCNs)

Test Method : SGS In-house method (GZTC CHEM-TOP-032-01), analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
1-Chlorinated Naphthalene	mg/kg	5	ND
2-Chlorinated Naphthalene	mg/kg	5	ND
1,4-Dichlorinated Naphthalene	mg/kg	5	ND
1,5-Dichlorinated Naphthalene	mg/kg	5	ND
1,2-Dichlorinated Naphthalene	mg/kg	5	ND
1,8-Dichlorinated Naphthalene	mg/kg	5	ND
1,2,3-Trichlorinated Naphthalene	mg/kg	5	ND
1,2,3,4-Tetrachlorinated Naphthalene	mg/kg	5	ND
1,2,3,4,6-Pentachlorinated Naphthalene	mg/kg	5	ND
Octa-chlorinated Naphthalene	mg/kg	5	ND

Tetrabromobisphenol A (TBBP-A)

Test Method : SGS In-house method (GZTC CHEM-TOP-065, with reference to US EPA Method 3540C:1996), analysis was performed by GC-MS&HPLC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND

PVC (Polyvinyl chloride)

Test Method : SGS in house method(GZTC CHEM-TOP-066), analysis was performed by FTIR.



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<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Polyvinyl Chloride (PVC)	9002-86-2	-	-	Negative

Notes :

(1) Negative=Undetectable,Positive=Detectable

Dimethyl Fumarate (DMF)

Test Method : SGS In-house method(GZTC CHEM-TOP-095), analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND
Comment				PASS

Notes :

(1) The maximum permissible limit is quoted from the document Commission Regulation (EU) No 412/2012 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Commission Decision 2012/48/EU)

Polychlorinated Terphenyls (PCTs)

Test Method : SGS In-house method (GZTC CHEM-TOP-032-01), analysis was performed by GC-ECD/MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Aroclor 5432	mg/kg	5	ND
Aroclor 5442	mg/kg	5	ND
Aroclor 5460	mg/kg	5	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>004</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

Phthalates

Test Method : With reference to IEC 62321-8:2017, analyzed by GC-MS .



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<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Di-n-octyl Phthalate (DNOP)	117-84-0	%(w/w)	0.005	ND
Diisononyl Phthalate (DINP)	28553-12-0 / 68515-48-0	%(w/w)	0.005	ND
Diisodecyl Phthalate (DIDP)	26761-40-0 / 68515-49-1	%(w/w)	0.005	ND
Dipentyl Phthalates (DPENP/DnPP)	131-18-0	%(w/w)	0.005	ND

Perfluorooctanoic acid (PFOA) & Perfluorooctane sulfonates (PFOS)

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

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Perfluorooctanoic acid (PFOA)	335-67-1	µg/m ²	1.0	ND
Perfluorooctane Sulfonates (PFOS)^	-	µg/m ²	1.0	ND

Notes :

^ 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.

Polychlorinated Biphenyls (PCBs)

Test Method : SGS In-house method (GZTC CHEM-TOP-032-01), analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
2,4,4'-Trichlorobiphenyl (PCB 28)	7012-37-5	mg/kg	0.5	ND
2,2',5,5'-Tetrachloro-biphenyl (PCB 52)	35693-99-3	mg/kg	0.5	ND
2,2',4,5,5'-Pentachloro-biphenyl (PCB 101)	37680-73-2	mg/kg	0.5	ND
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	31508-00-6	mg/kg	0.5	ND
2,2',3,4,4',5'-Hexachloro-biphenyl (PCB 138)	35065-28-2	mg/kg	0.5	ND
2,2',4,4',5,5'-Hexachloro-biphenyl (PCB 153)	35065-27-1	mg/kg	0.5	ND
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	35065-29-3	mg/kg	0.5	ND

European Regulation POPs (EU) 2019/1021 -Chlorinated Paraffins --Articles

Test Method : With reference to ISO 18219: 2015, analysis was performed by GC-NCI-MS / GC-ECD.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Alkanes C10-C13, chloro (short-chain chlorinated paraffins) (SCCPs)	1500	mg/kg	50	ND

Comment

PASS



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Alkanes C14-C17, chloro (medium -chain chlorinated paraffins) (MCCPs)	-	mg/kg	50	ND

Organic-tin compounds

Test Method : With reference to ISO 17353: 2004 , analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>004</u>
Tributyl tin (TBT)	mg/kg	0.02	ND
Tri-n-propyl tin(TPT)	mg/kg	0.02	ND
Bis(tributyltin)oxide (TBTO)◆	mg/kg	0.02	ND
Dibutyl tin (DBT)	mg/kg	0.02	ND
Diocetyl tin (DOT)	mg/kg	0.02	ND

Notes :

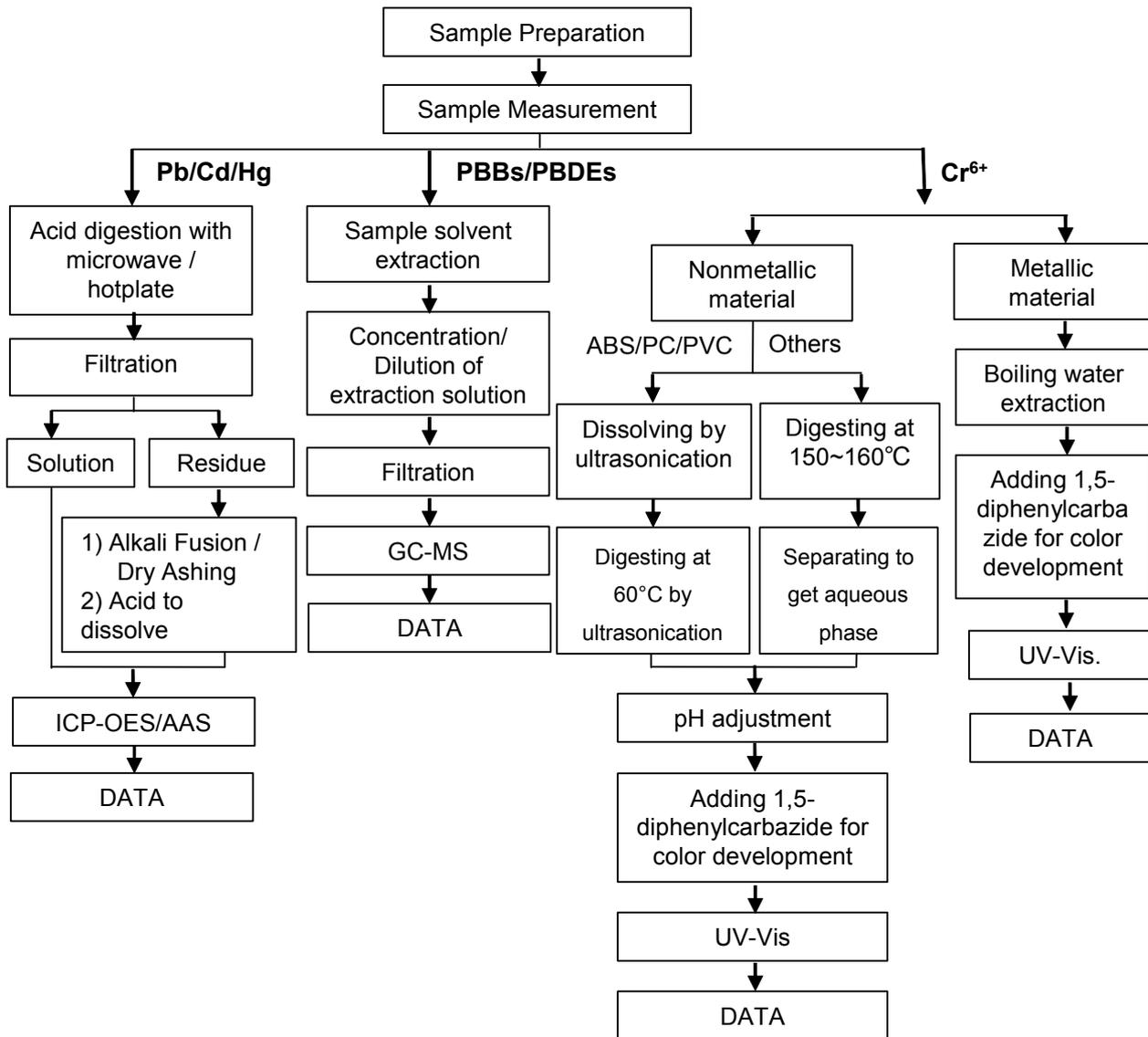
(1)Bis(tributyltin)oxide (TBTO) is calculated by the test result of Tributyltin (TBT)



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Pb/Cd/Hg/Cr⁶⁺/PBBs/PBDEs Testing Flow Chart

- 1) Name of the person who made testing: Edith Zhang / Sunny Hu
- 2) Name of the person in charge of testing: Bella Wang / Qiong Liu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr⁶⁺ and PBBs/PBDEs test method excluded).



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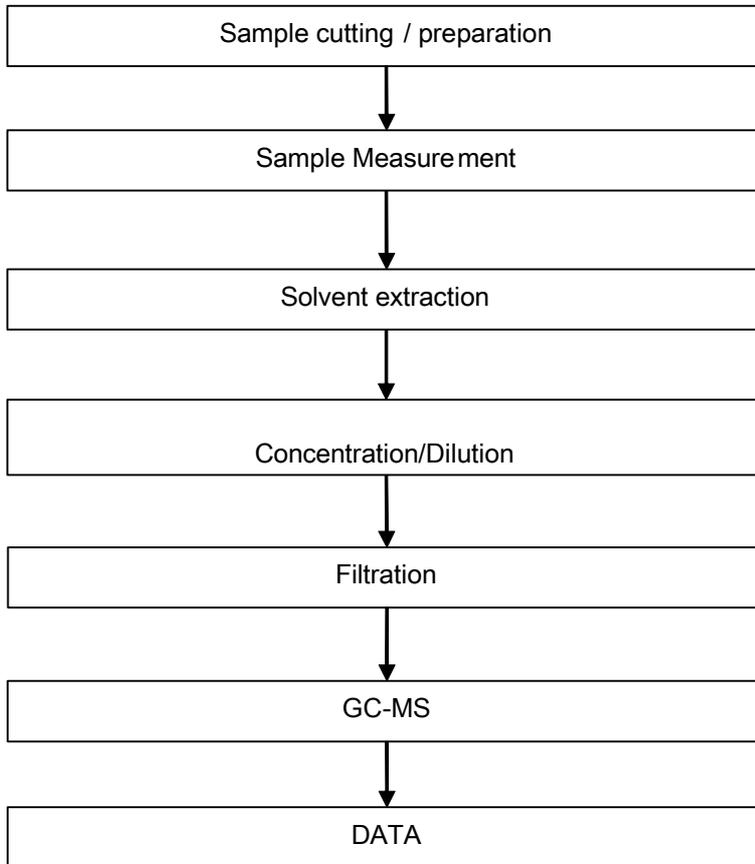
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Phthalates Testing Flow Chart

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



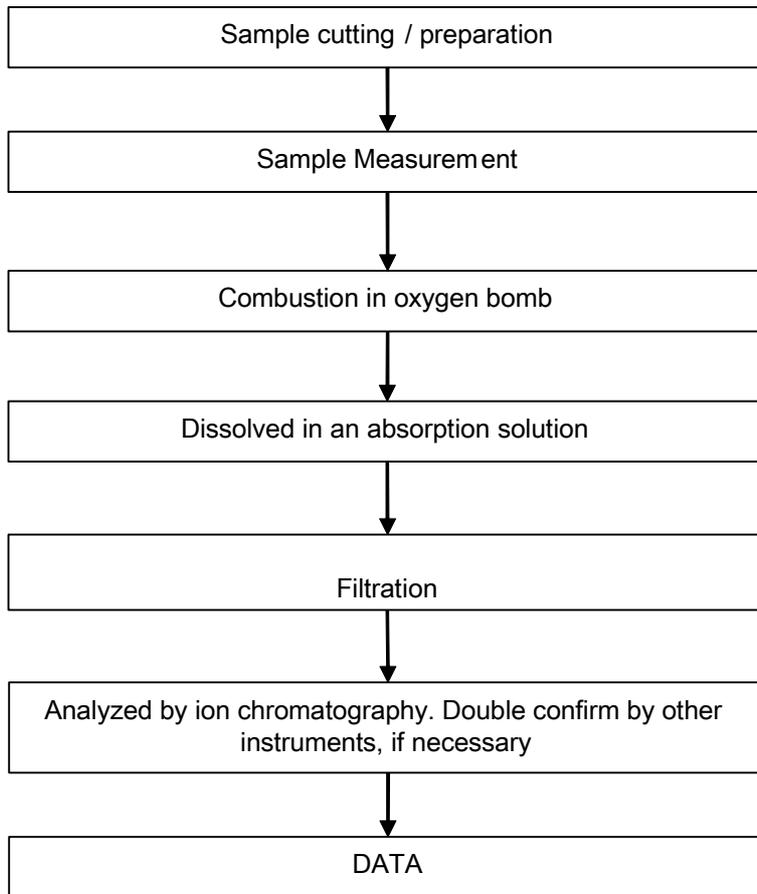
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Halogen Testing Flow Chart

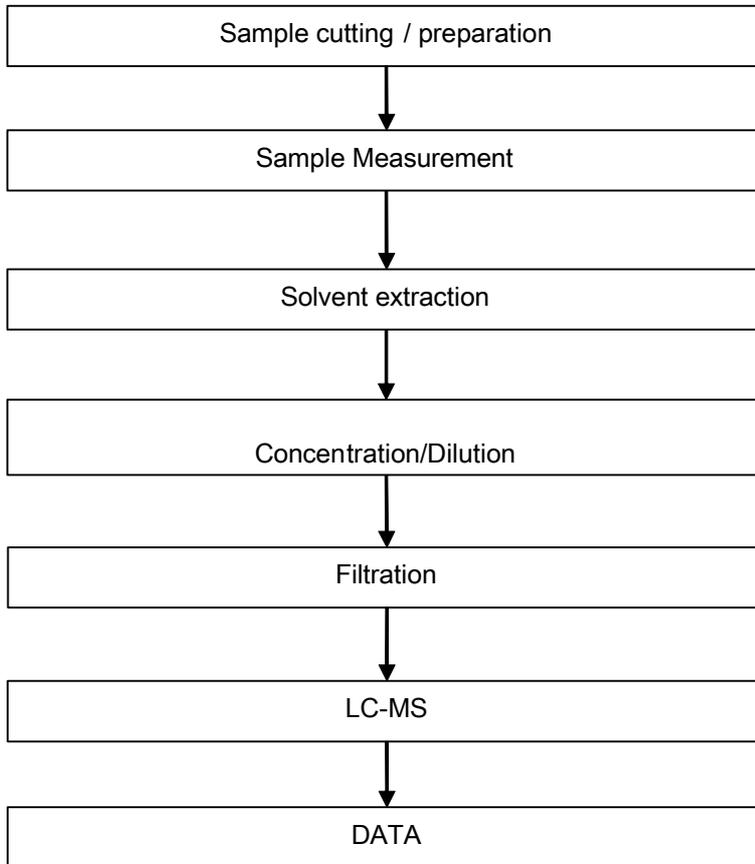
- 1) Name of the person who made testing: Bruce Xiao
- 2) Name of the person in charge of testing: Bella Wang



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PFOA / PFOS Testing Flow Chart

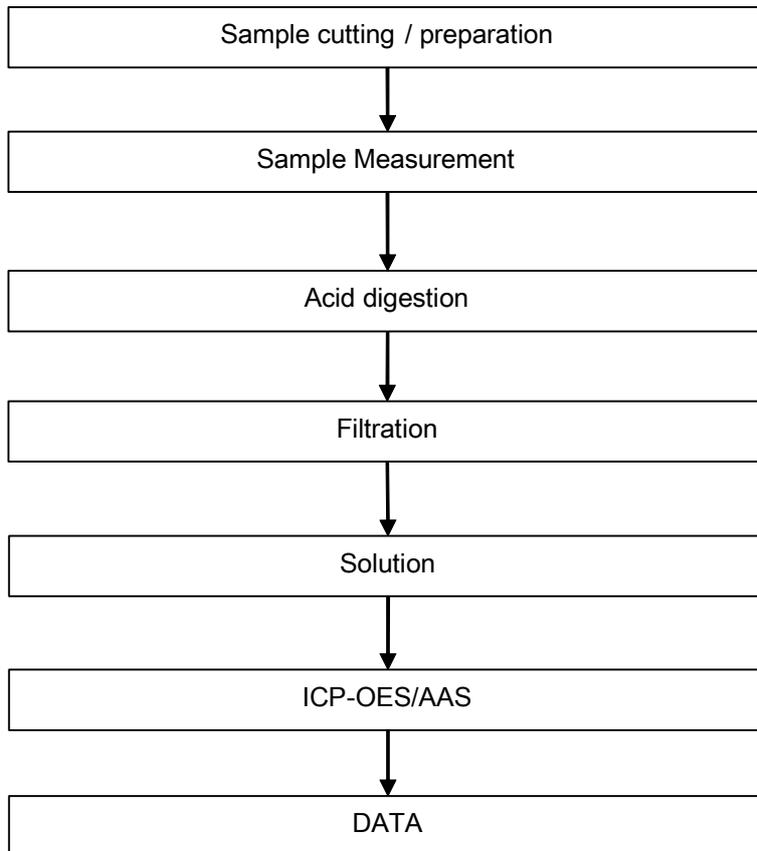
- 1) Name of the person who made testing: Olivia Li
- 2) Name of the person in charge of testing: Qiong Liu



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Elementary Testing Flow Chart

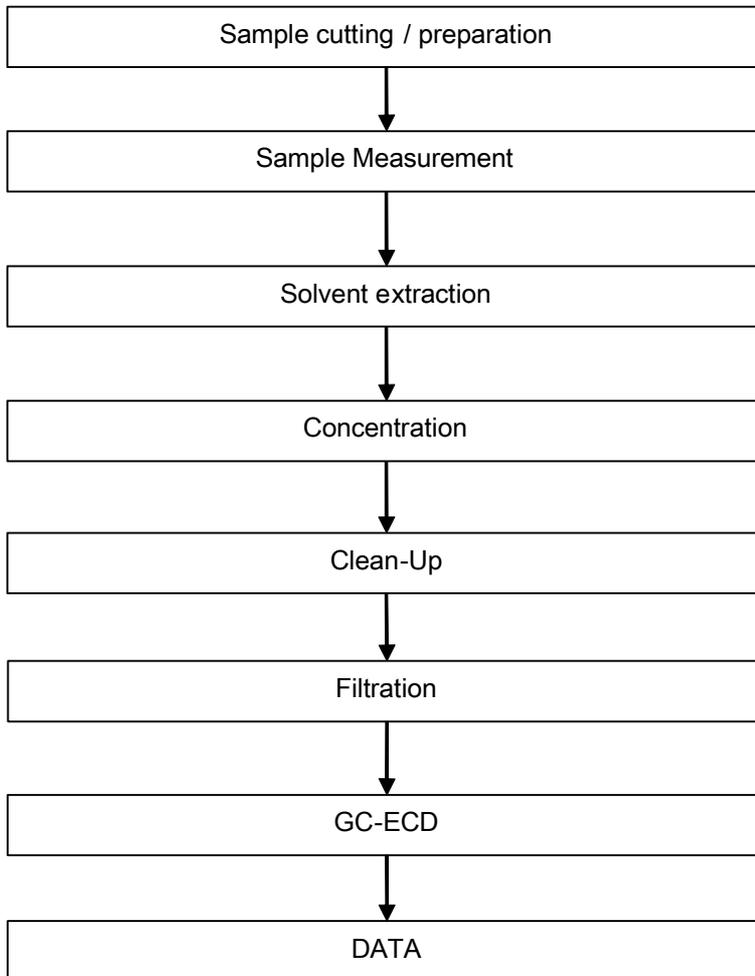
- 1) Name of the person who made testing : Edith Zhang
- 2) Name of the person in charge of testing : Bella Wang



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SCCP/MCCP/LCCP Testing Flow Chart

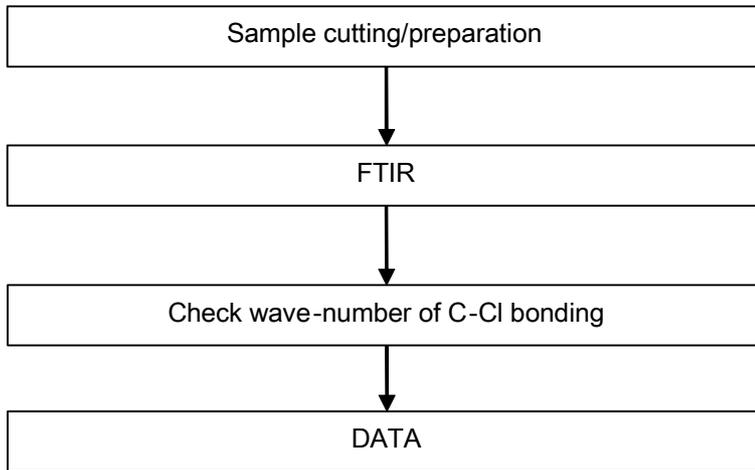
- 1) Name of the person who made testing: Mina Chan
- 2) Name of the person in charge of testing: Qiong Liu



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PVC Testing Flow Chart

- 1) Name of the person who made testing: Krut Huang
- 2) Name of the person in charge of testing: Qiong Liu



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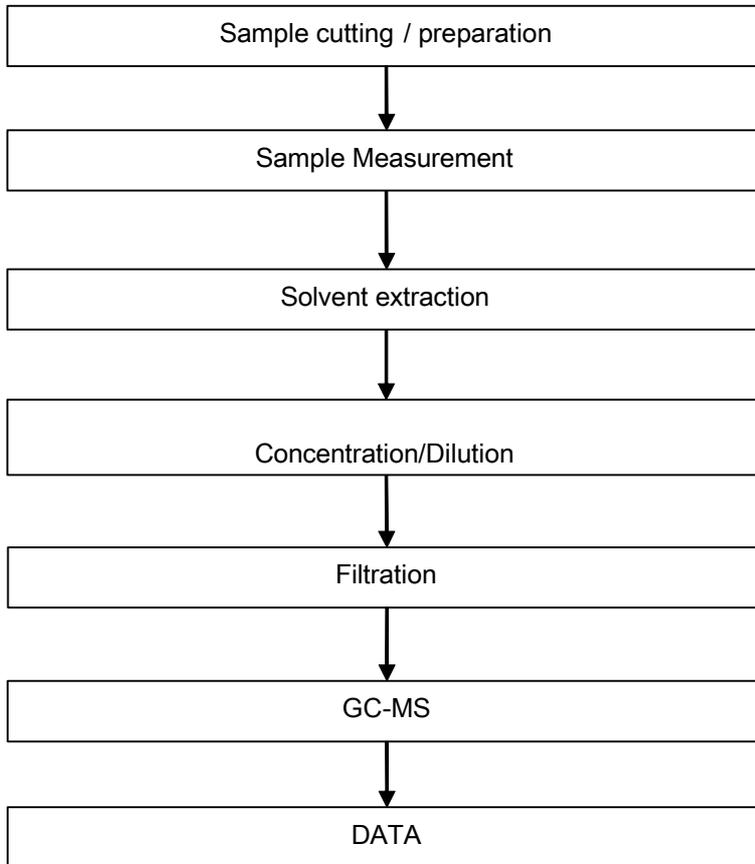
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HBCDD Testing Flow Chart

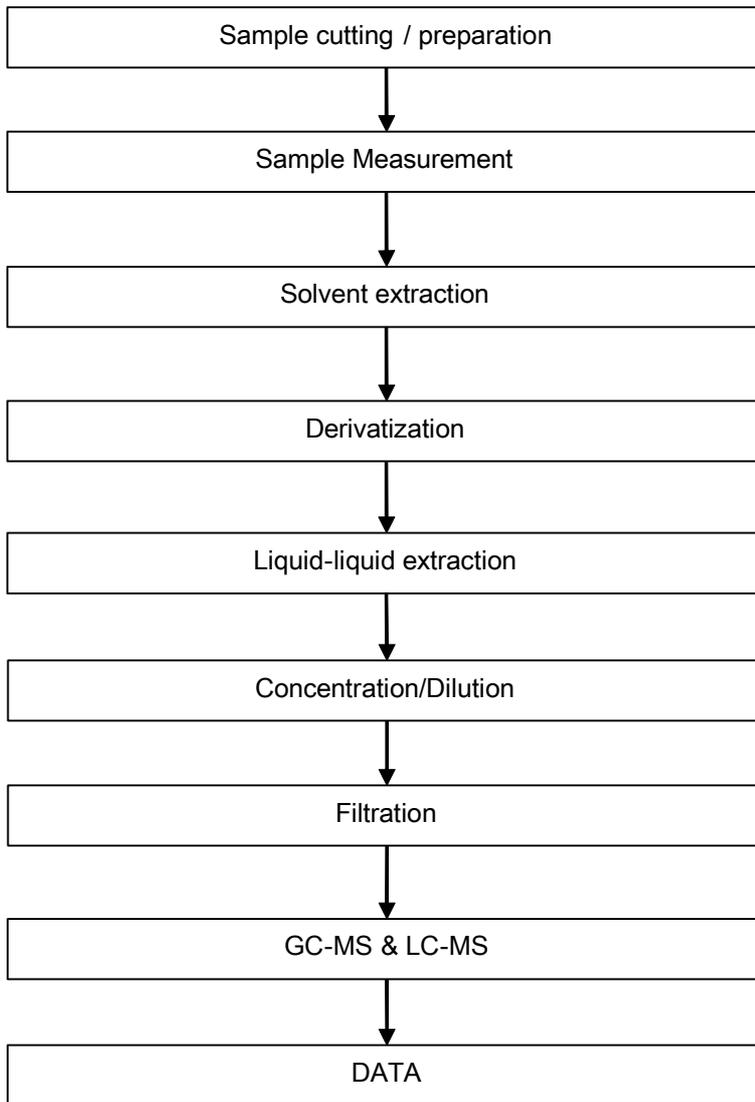
- 1) Name of the person who made testing: Sunny Hu
- 2) Name of the person in charge of testing: Qiong Liu



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TBBP-A Testing Flow Chart

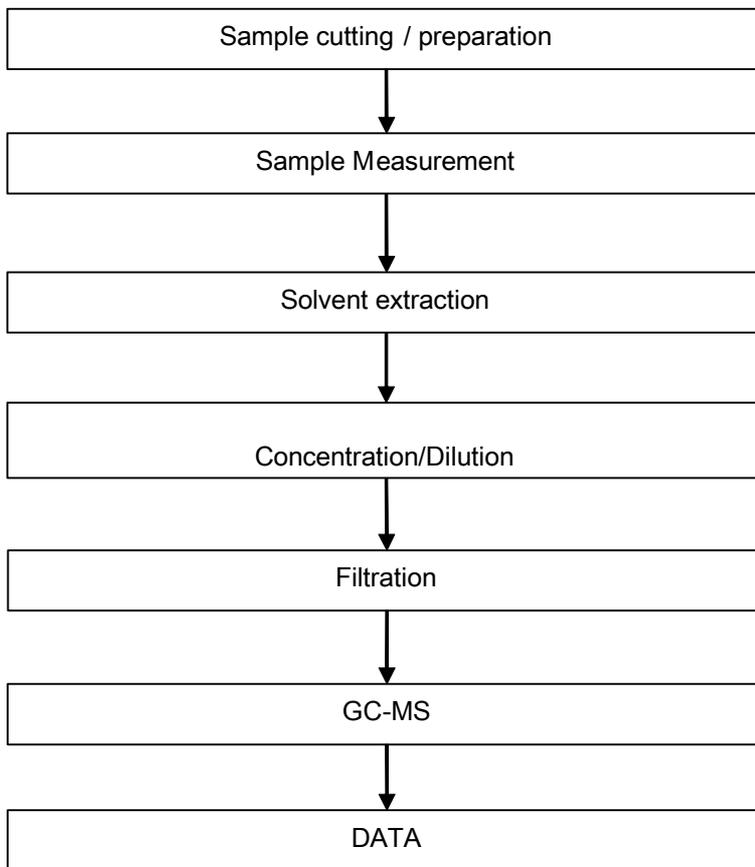
- 1) Name of the person who made testing: Olivia Li
- 2) Name of the person in charge of testing: Qiong Liu



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Dimethyl Fumarate Testing Flow Chart

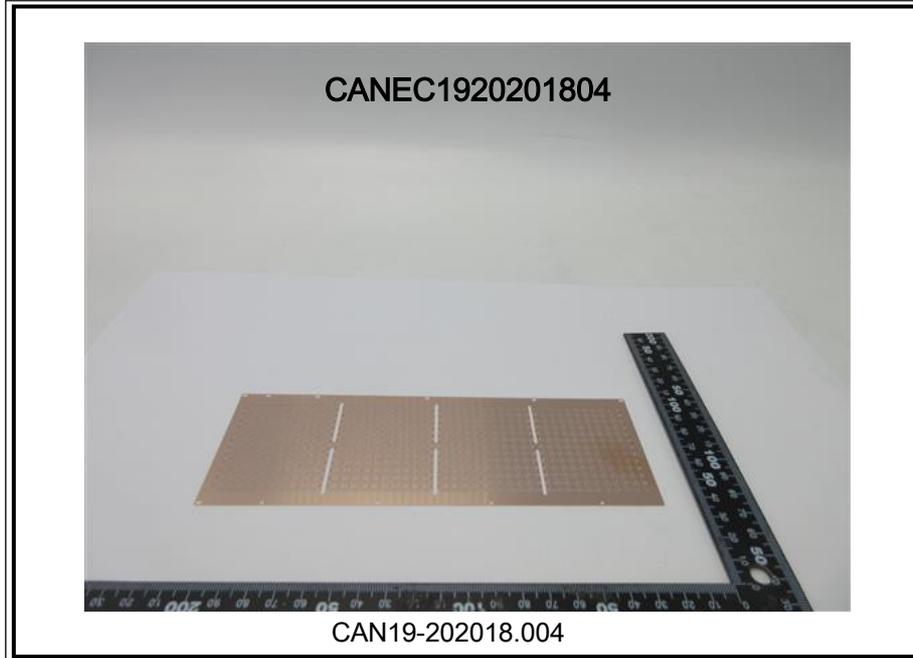
- 1) Name of the person who made testing: Sunny Hu
- 2) Name of the person in charge of testing: Qiong Liu



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