

## Test Report

No. : CE/2019/B4660

Date : 2019/12/02

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SHINKO ELECTRIC INDUSTRIES CO., LTD.  
80 OSHIMADA-MACHI, NAGANO-SHI, 381-2287 JAPAN

**The following samples was/were submitted and identified by/on behalf of the applicant as :**

Sample Submitted By : SHINKO ELECTRIC INDUSTRIES CO., LTD.  
Sample Description : CDA194+Ag  
Sample Receiving Date : 2019/11/26  
Testing Period : 2019/11/26 to 2019/12/02

**Test Requested :**

- (1) As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted sample(s).
- (2) Please refer to next pages for the other item(s).

**Test Result(s) :** Please refer to following pages.

**Conclusion :** (1) Based on the performed tests on submitted sample(s), the test results of Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

  
Troy Chang / Manager - Tech  
Signed for and behalf of  
SGS TAIWAN LTD.  
Chemical Laboratory - Taipei



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## Test Result(s)

PART NAME No.1 : COPPER/SILVER COLORED METAL (INCLUDING THE PLATING LAYER)

Test Item(s)	Unit	Method	MDL	Result	Limit
				No.1	
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-OES.	2	n.d.	100
Lead (Pb)	mg/kg		2	n.d.	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+AMD1:2017 and performed by ICP-OES.	2	n.d.	1000
Hexavalent Chromium Cr(VI)(#2)	µg/cm <sup>2</sup>	With reference to IEC 62321-7-1 (2015) and performed by UV-VIS.	0.10	n.d.	-
<b>Sum of PBBs</b>	mg/kg	With reference to IEC 62321-6 (2015) and performed by GC/MS.	-	n.d.	1000
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 PBDEs</b>	mg/kg		-	n.d.	1000
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.	-	

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Test Item(s)	Unit	Method	MDL	Result	Limit
				No.1	
Perfluorooctane sulfonates (PFOS-Acid, Metal Salt, Amide)	mg/kg	With reference to CEN/TS 15968 (2010). Analysis was performed by LC/MS.	0.01	n.d.	-
PFOA (CAS No.: 335-67-1)	mg/kg	With reference to CEN/TS 15968 (2010). Analysis was performed by LC/MS.	0.01	n.d.	-
<b>Halogen</b>					
Halogen-Fluorine (F) (CAS No.: 14762-94-8)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.	-
Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.	-
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.	-
Halogen-Iodine (I) (CAS No.: 14362-44-8)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.	-
Polyvinyl chloride (PVC)	**	Analysis was performed by FTIR and FLAME Test.	-	Negative	-
Antimony (Sb)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-OES.	2	n.d.	-
Arsenic (As)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-OES.	2	n.d.	-
Beryllium (Be)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-OES.	2	n.d.	-
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
BBP (Butyl Benzyl phthalate) (CAS No.: 85-68-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
DBP (Dibutyl phthalate) (CAS No.: 84-74-2)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
DIDP (Di-isodecyl phthalate) (CAS No.: 26761-40-0; 68515-49-1)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DINP (Di-isononyl phthalate) (CAS No.: 28553-12-0; 68515-48-0)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-

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Test Item(s)	Unit	Method	MDL	Result	Limit
				No.1	
DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DNPP (Di-n-pentyl phthalate) (CAS No.: 131-18-0)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DIPP (Di-iso-pentyl phthalate) (CAS No.: 605-50-5)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DNHP (Di-n-hexyl phthalate) (CAS No.: 84-75-3)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DIHP (1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich) (CAS No.: 71888-89-6)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DHNUP (1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters) (CAS No.: 68515-42-4)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
DMEP (Bis (2-methoxyethyl) phthalate) (CAS No.: 117-82-8)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	-
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified ( $\alpha$ -HBCDD, $\beta$ -HBCDD, $\gamma$ -HBCDD) (CAS No.: 25637-99-4 and 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8))	mg/kg	With reference to IEC 62321 (2008). Analysis was performed by GC/MS.	5	n.d.	-
Polychlorinated Biphenyls (PCBs) (CAS No.: 1336-36-3)	mg/kg	With reference to US EPA 3550C (2007). Analysis was performed by GC/MS.	0.5	n.d.	-
Polychlorinated Naphthalene (PCNs)	mg/kg	With reference to US EPA 3550C (2007). Analysis was performed by GC/MS.	5	n.d.	-
Polychlorinated Terphenyls (PCTs)	mg/kg	With reference to US EPA 3550C (2007). Analysis was performed by GC/MS.	0.5	n.d.	-
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins) (CAS No.: 85535-84-8)	mg/kg	With reference to US EPA 3550C (2007). Analysis was performed by GC/MS.	100	n.d.	-
Tributyl Tin (TBT)	mg/kg	With reference to ISO 17353 (2004). Analysis was performed by GC/FPD.	0.03	n.d.	-

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Test Item(s)	Unit	Method	MDL	Result	Limit
				No.1	
Triphenyl Tin (TphT)	mg/kg	With reference to ISO 17353 (2004). Analysis was performed by GC/FPD.	0.03	n.d.	-
Bis(tributyltin)oxide (TBTO) (CAS No.: 56-35-9)	mg/kg	With reference to ISO 17353 (2004). Analysis was performed by GC/FPD. Calculated from the result of Tributyl Tin (TBT).	0.03 (▲)	n.d.	-
Dibutyl Tin (DBT)	mg/kg	With reference to ISO 17353 (2004). Analysis was performed by GC/FPD.	0.03	n.d.	-
Diocetyl Tin (DOT)	mg/kg	With reference to ISO 17353 (2004). Analysis was performed by GC/FPD.	0.03	n.d.	-

**Note :**

1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. MDL = Method Detection Limit
3. n.d. = Not Detected = less than MDL
4. " - " = Not Regulated
5. \*\* = Qualitative analysis (No Unit)
6. Negative = Undetectable / Positive = Detectable
7. (#2) =
  - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 µg/cm<sup>2</sup>.  
The sample coating is considered to contain Cr(VI)
  - b. The sample is negative for Cr(VI) if Cr(VI) is n.d. (concentration less than 0.10 µg/cm<sup>2</sup>).  
The coating is considered a non-Cr(VI) 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.
8. (▲) : The MDL was evaluated for element / tested substance.

Conversion Formula : AX = A × F

AX	A	F
Bis(tributyltin)oxide (TBTO)	Tributyl Tin (TBT)	1.024

Parameter Conversion Table : [http://twap.sgs.com/sgsrsts/chn/download-REACH\\_tw.asp](http://twap.sgs.com/sgsrsts/chn/download-REACH_tw.asp)

**PFOS Reference Information : POPs - (EU) 2019/1021**

Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1%(1000ppm), in textiles or other coated materials above 1µg/m<sup>2</sup>.

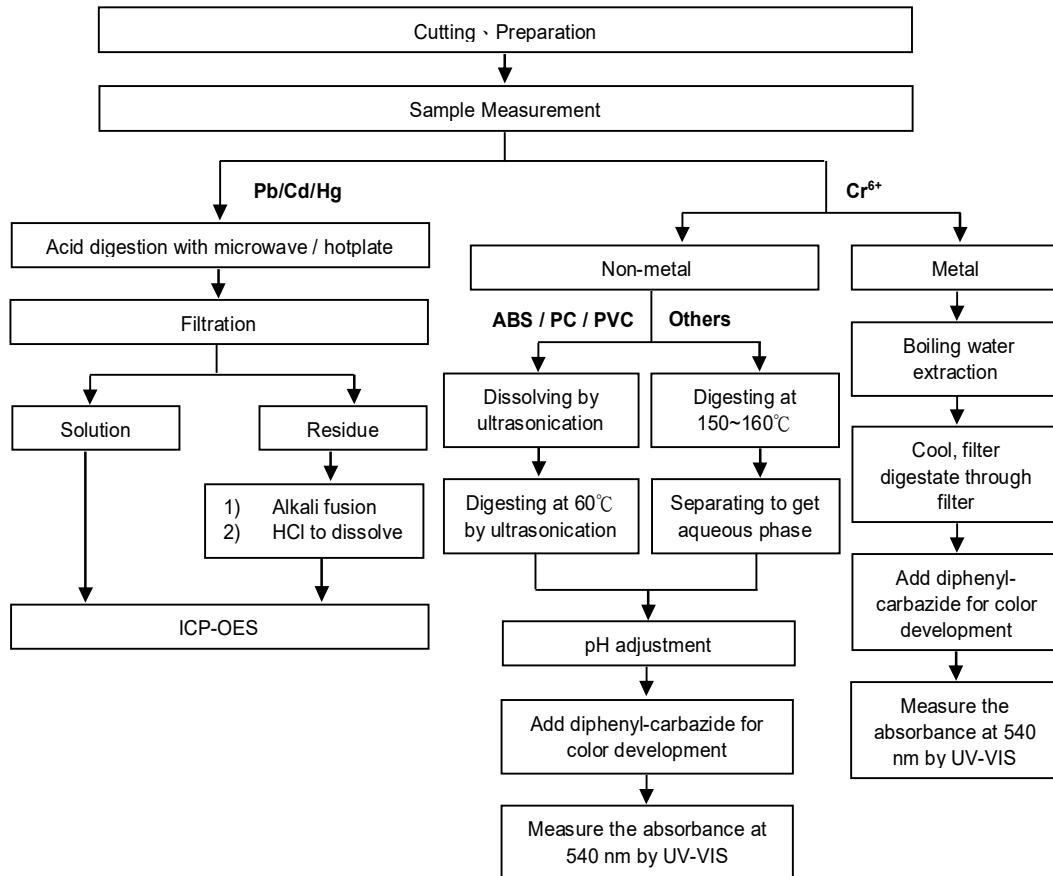
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SHINKO ELECTRIC INDUSTRIES CO., LTD.  
80 OSHIMADA-MACHI, NAGANO-SHI, 381-2287 JAPAN

### Analytical flow chart of Heavy Metal

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> test method excluded)

- Technician : Rita Chen
- Supervisor: Troy Chang

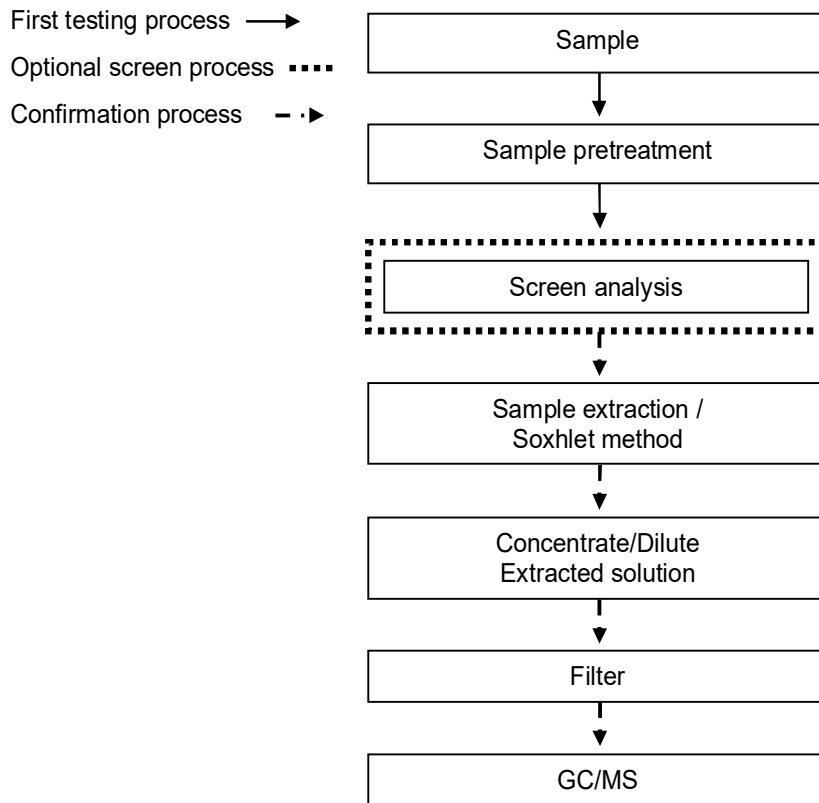


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SHINKO ELECTRIC INDUSTRIES CO., LTD.  
80 OSHIMADA-MACHI, NAGANO-SHI, 381-2287 JAPAN

### Analytical flow chart – PBB / PBDE

- Technician : Yaling Tu
- Supervisor: Troy Chang

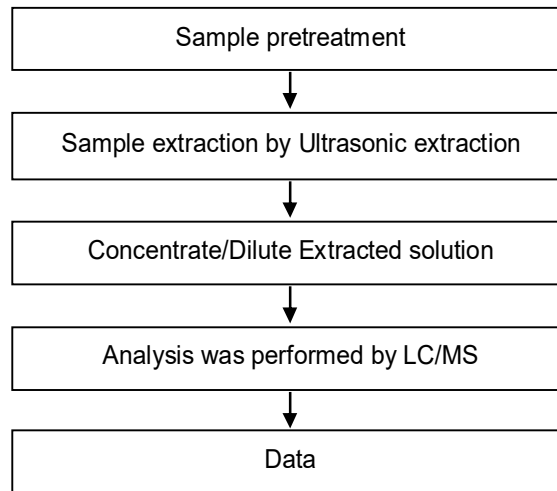


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### Analytical flow chart - PFO/PFOS

- Technician: Yaling Tu
- Supervisor: Troy Chang



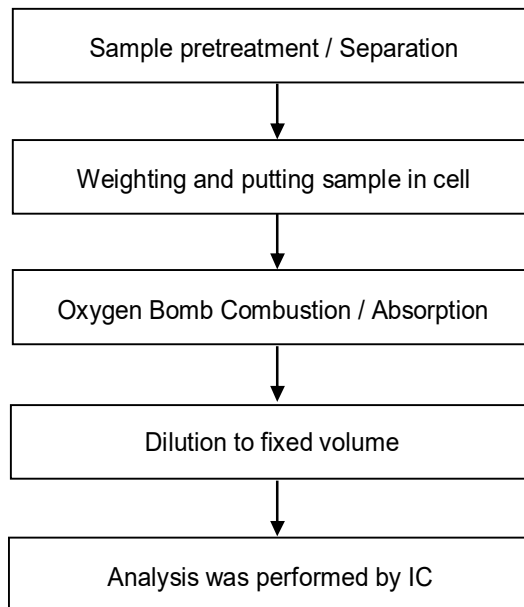
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### Analytical flow chart - Halogen

- Technician: Rita Chen
- Supervisor: Troy Chang

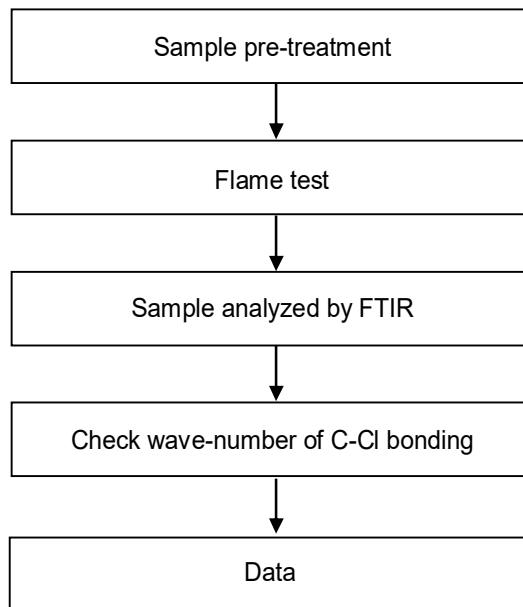


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### Analysis flow chart - PVC

- Technician: Yaling Tu
- Supervisor: Troy Chang



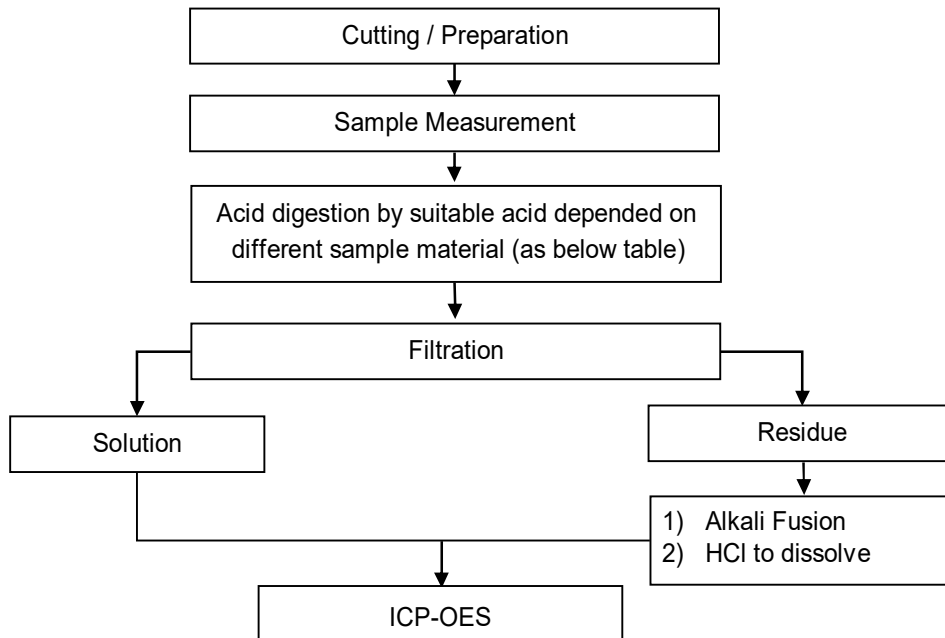
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80 OSHIMADA-MACHI, NAGANO-SHI, 381-2287 JAPAN

These samples were dissolved totally by pre-conditioning method according to below flow chart.

- Technician: Rita Chen
- Supervisor: Troy Chang

### Flow Chart of digestion for the elements analysis performed by ICP-OES



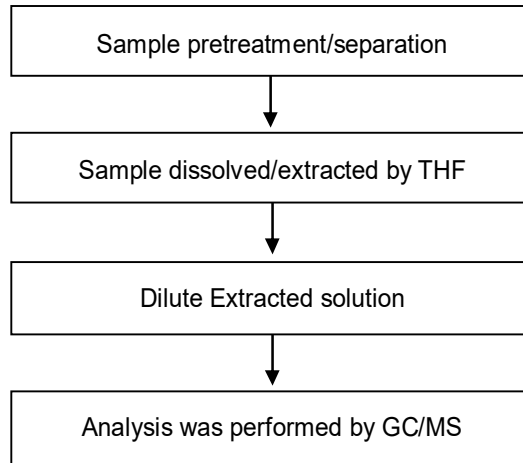
Steel, copper, aluminum, solder	Aqua regia, HNO <sub>3</sub> , HCl, HF, H <sub>2</sub> O <sub>2</sub>
Glass	HNO <sub>3</sub> /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO <sub>3</sub>
Plastic	H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O <sub>2</sub> , HNO <sub>3</sub> , HCl
Others	Added appropriate reagent to total digestion

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### Analytical flow chart - Phthalate

- Technician: Yaling Tu
- Supervisor: Troy Chang

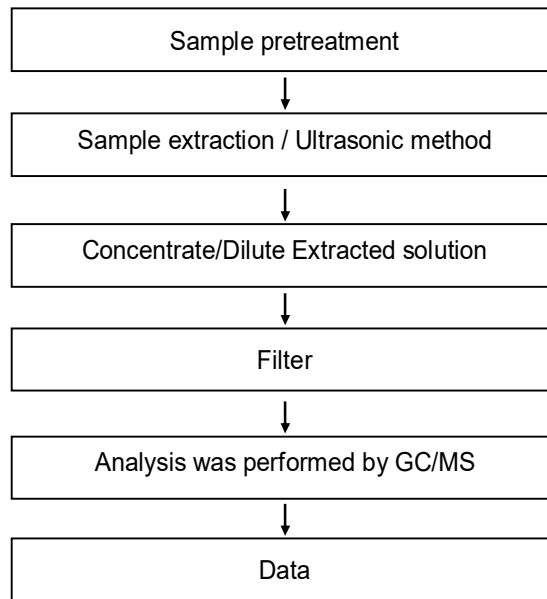
**【Test method: IEC 62321-8】**



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### Analytical flow chart - HBCDD

- Technician: Yaling Tu
- Supervisor: Troy Chang

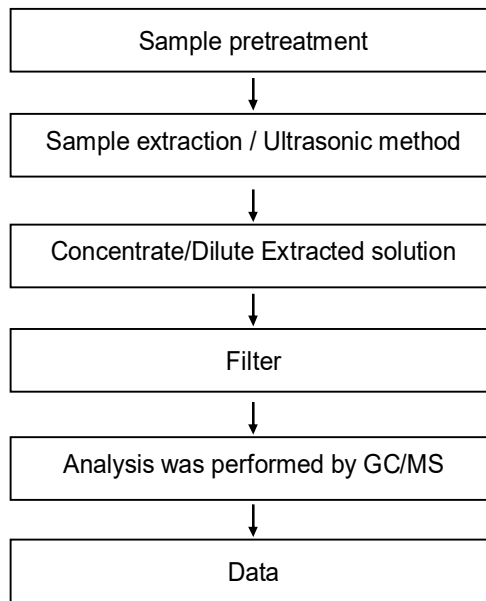


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### Analytical flow chart - PCBs

- Technician: Yaling Tu
- Supervisor: Troy Chang

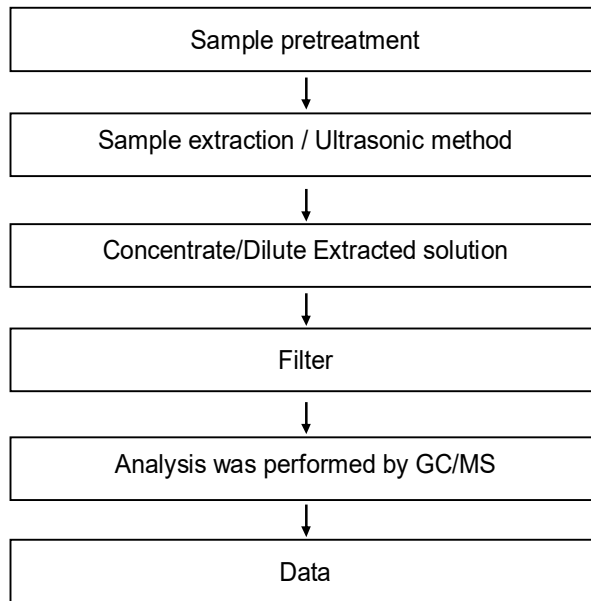


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### Analytical flow chart - PCNs

- Technician: Yaling Tu
- Supervisor: Troy Chang

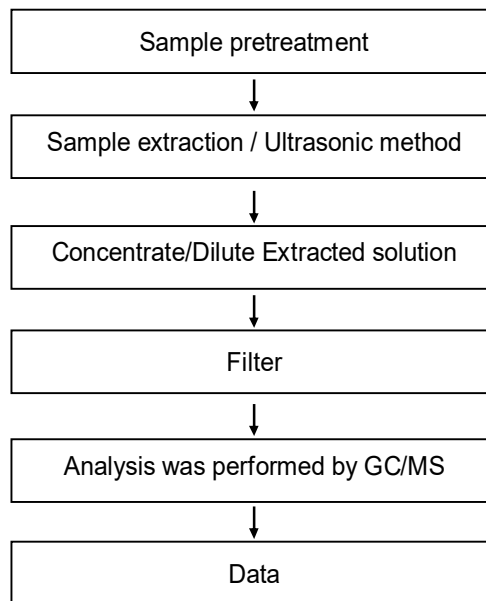


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### Analytical flow chart - PCTs

- Technician: Yaling Tu
- Supervisor: Troy Chang



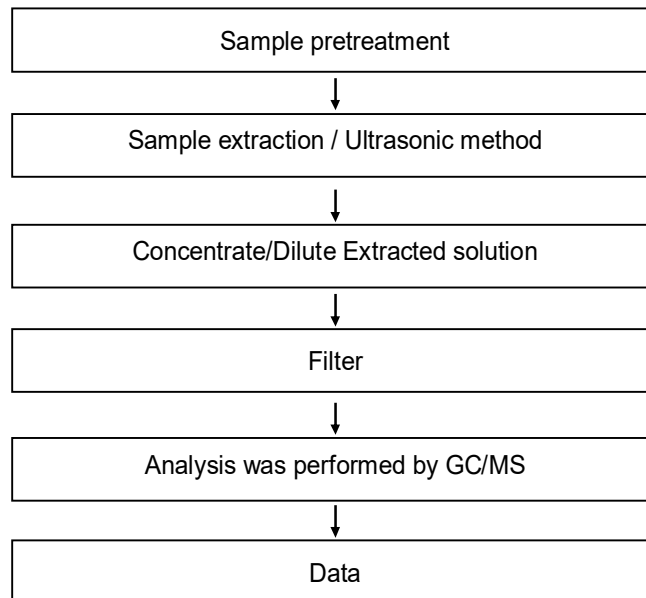
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### Analytical flow chart - Chlorinated Paraffins

- Technician: Yaling Tu
- Supervisor: Troy Chang

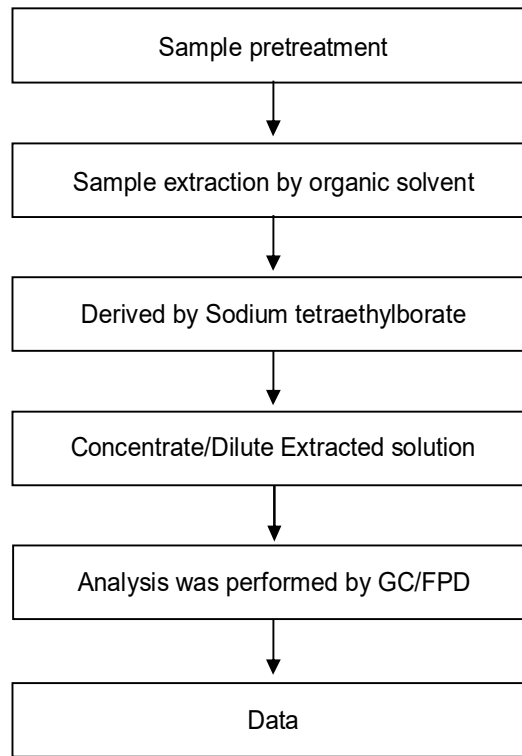


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### Analytical flow chart - Organic-Tin

- Technician: Yaling Tu
- Supervisor: Troy Chang



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## Test Report

No. : CE/2019/B4660

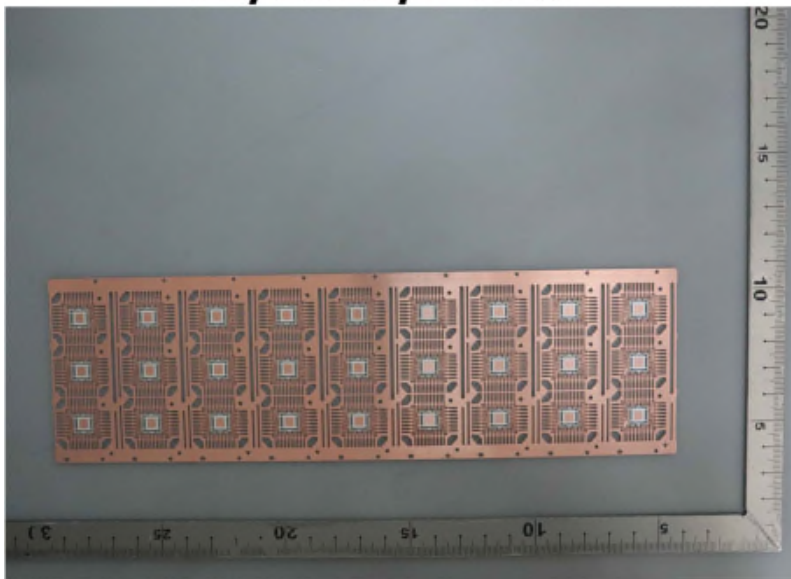
Date : 2019/12/02

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\* The tested sample / part is marked by an arrow if it's shown on the photo. \*

### CE/2019/B4660



\*\* End of Report \*\*