

Test Report

No. SHAEC2116310509

Date: 10 Aug 2021

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TANAKA ELECTRONICS (HANGZHOU) CO.,LTD.

F1 AREA, WEST NO.19 STREET, NORTH NO.10 STREET, HANGZHOU ECONOMIC&TECHNOLOGICAL DEVELOPMENT ZONE,HANGZHOU

The following sample(s) was/were submitted and identified on behalf of the clients as : Au Bonding Wire

SGS Job No. : SP21-023194 - SH

Date of Sample Received : 30 Jul 2021

Testing Period : 30 Jul 2021 - 10 Aug 2021

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) 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.

Jenny Lan

Jenny Lan
Approved Signatory



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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	SHA21-163105.002	Golden metal wire

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+AMD1:2017, IEC62321-5:2013, IEC62321-7-1:2015, IEC 62321-6:2015 and IEC62321-8:2017, analyzed by ICP-OES, AAS, UV-Vis and GC-MS.

Test Item(s)	Limit	Unit	MDL	002
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 ²	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



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
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	50	ND
Benzyl Butyl Phthalate (BBP)	1000	mg/kg	50	ND
Di-2-Ethyl Hexyl 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.

Element(s)

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

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Antimony (Sb)		mg/kg	10	ND
Antimony trioxide (Sb ₂ O ₃) ♦		mg/kg	12	ND
Arsenic (As)		mg/kg	10	ND
Diarsenic trioxide (As ₂ O ₃) ♦	1327-53-3	mg/kg	10	ND
Diarsenic pentaoxide (As ₂ O ₅) ♦	1303-28-2	mg/kg	10	ND
Tin (Sn)		mg/kg	5	ND

Notes :

- (1) ♦ Calculated concentration of Sb₂O₃ is based on the identified Sb
 Calculated concentration of diarsenic pentaoxide and diarsenic trioxide are based on the identified



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arsenic

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>002</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

Sulfur

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

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Sulfur (S)	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>002</u>
Tributyl tin (TBT)	mg/kg	0.02	ND
Dibutyl tin (DBT)	mg/kg	0.02	ND
Diocetyl tin (DOT)	mg/kg	0.02	ND
Tripropyltin (TPT)	mg/kg	0.02	ND
Bis(tributyltin) oxide (TBTO) ♦	mg/kg	0.02	ND

Notes :

(1) ♦ = TBTO is back calculated based on the worst-case scenario of TBT.

Polychlorinated Naphthalenes (PCNs)

Test Method : With reference to US EPA 8081B: 2007, analysis was performed by GC-MS



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<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
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
1-Chlorinated Naphthalene	mg/kg	5	ND

Short-chain Chlorinated Paraffin (SCCP) and Medium-chain Chlorinated Paraffin (MCCP)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by GC-ECD / GC-NCI-MS

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Short-chain Chlorinated Paraffin (SCCP) (C ₁₀ -C ₁₃)	mg/kg	50	ND
Medium-chain Chlorinated Paraffin (MCCP) (C ₁₄ -C ₁₇)	mg/kg	50	ND

Red Phosphorus

Test Method : SGS in house method(SHTC- CHEM- SOP -342-T), Analysis was performed by ICP-OES and Pyrolysis-GC/MS

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Red Phosphorus	mg/kg	500	ND

Notes :

For Positive result, the testing result is based on the worst-case scenario, and confirmed by Pyrolysis-GC-MS.

Tetrabromobisphenol A (TBBP-A)



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Test Method : With reference to US EPA 3540C: 1996, analysis was performed by GC-MS/LC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND

Polyvinyl chloride (PVC)

Test Method : In-house method (SHTC-CHEM-SOP-115-T), analysis was performed by FTIR/HATR.

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Polyvinyl chloride (PVC)	9002-86-2	-	-	Negative

Notes :

(1) Negative=Undetectable,Positive=Detectable

Commission Regulation (EU) No 412/2012 and Entry 61 of Annex XVII of REACH Regulation (EC) No 1907/2006 - Dimethyl fumarate(DMF)

Test Method : Solvent extraction, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND

Bisphenol-A

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

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Bisphenol-A	mg/kg	1	ND

Polychlorinated Terphenyls (PCTs)

Test Method : With reference to US EPA 8082A: 2007, analysis was performed by GC-MS

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Aroclor 5432	mg/kg	5	ND
Aroclor 5442	mg/kg	5	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	002
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

Polychlorinated Biphenyls (PCBs)

Test Method : With reference to US EPA 8082A: 2007, analysis was performed by GC-MS

Test Item(s)	CAS NO.	Unit	MDL	002
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

Phthalates Content

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

Test Item(s)	CAS NO.	Unit	MDL	002
Diisononyl Phthalate (DINP)	28553-12-0 /68515-48-0	mg/kg	50	ND
Di-n-octyl Phthalate (DNOP)	117-84-0	mg/kg	50	ND
Diisodecyl Phthalate (DIDP)	26761-40-0 /68515-49-1	mg/kg	50	ND
Dihexyl Phthalates (DnHP)	84-75-3	mg/kg	50	ND
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters(DHNUP)	68515-42-4	mg/kg	50	ND
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	mg/kg	50	ND
Diisoheptyl phthalate (DIHP)	71888-89-6	mg/kg	50	ND
Di-n-pentyl Phthalates (DnPP)	131-18-0	mg/kg	50	ND



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Perfluorooctanesulfonate (PFOS) and its derivatives and Perfluorooctanoic Acid (PFOA)

Test Method : With reference to CEN/TS 15968:2010, analysis is performed by HPLC-MS or LC-MS-MS.

Test Item(s)	CAS NO.	Unit	MDL	002
Perfluorooctane sulfonates (PFOS) and its derivatives		mg/kg	-	ND
Perfluorooctane Sulfonates (PFOS)^	1763-23-1	mg/kg	0.01	ND
2-(N-methylperfluoro-1-octanesulfonamido)- ethanol (MeFOSE)	24448-09-7	mg/kg	0.01	ND
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol (EtFOSE)	1691-99-2	mg/kg	0.01	ND
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	mg/kg	0.01	ND
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	mg/kg	0.01	ND
Perfluorooctane Sulfonamide (PFOSA)	754-91-6	mg/kg	0.01	ND
Perfluorooctanoic Acid (PFOA) and its salts+		mg/kg	0.01	ND

Notes :

- (1) + PFOA refer to its salts including PFOA-Na (CAS No.: 335-95-5), PFOA-K (CAS No.: 2395-00-8), PFOA-Ag (CAS No.: 335-93-3), PFOA-F (CAS No.: 335-66-0) and APFO (CAS No.: 3825-26-1);
- (2) ^ PFOS including PFOS-K (CAS No.: 2795-39-3), PFOS-Li (CAS No.: 29457-72-5), PFOS-NH4 (CAS No.: 29081-56-9), PFOS-NH(OH)2 (CAS No.: 70225-14-8), PFOS-N(C2H5)4 (CAS No.: 56773-42-3), PFOS-DDA(CAS No.:251099-16-8) and POSF (CAS No.: 307-35-7)



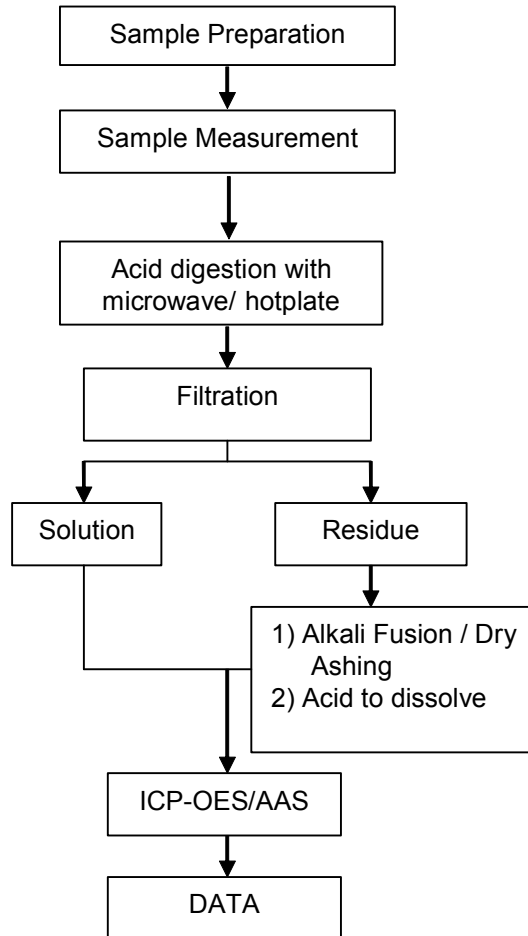
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Elements (IEC62321) Testing Flow Chart

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

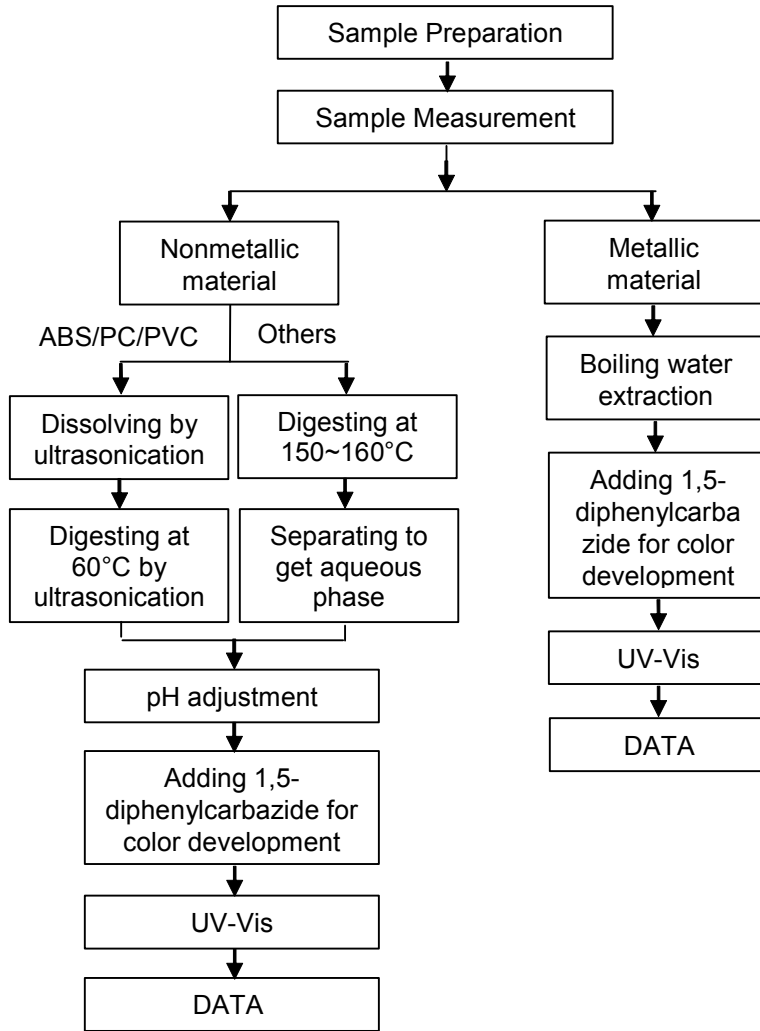


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Hexavalent Chromium (Cr(VI)) Testing Flow Chart

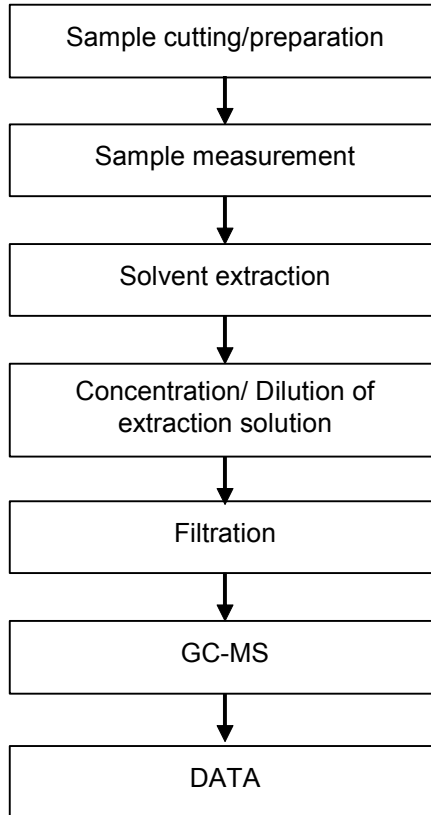


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PBBs/PBDEs Testing Flow Chart

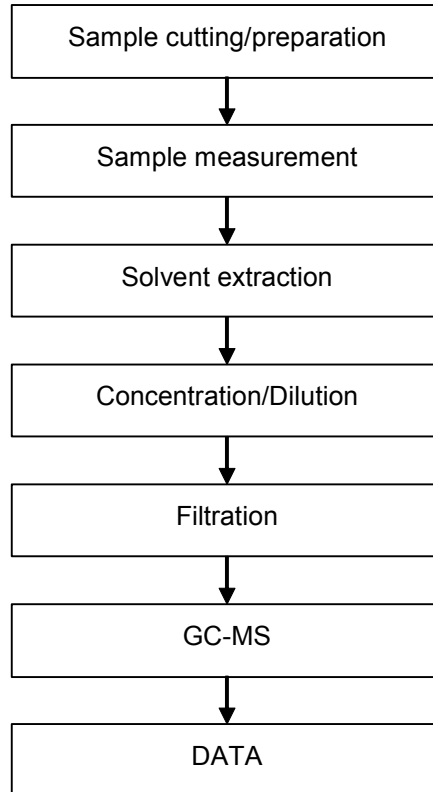


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Phthalates Testing Flow Chart

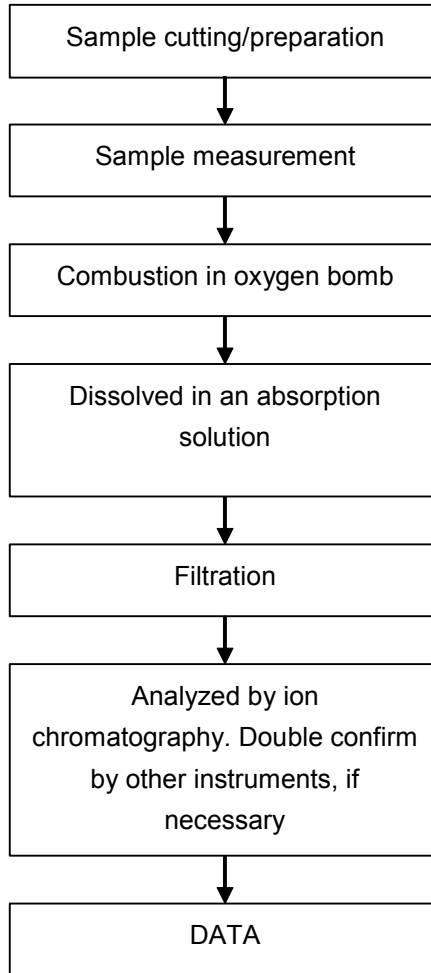


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Halogen Testing (oxygen bomb) Flow Chart

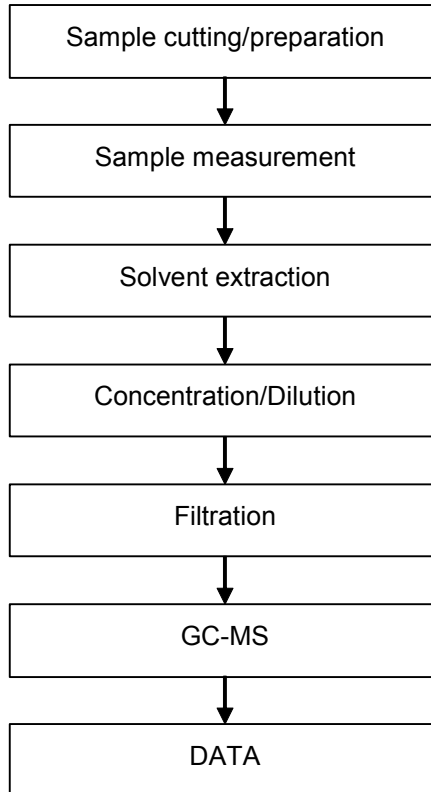


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HBCDD Testing Flow Chart

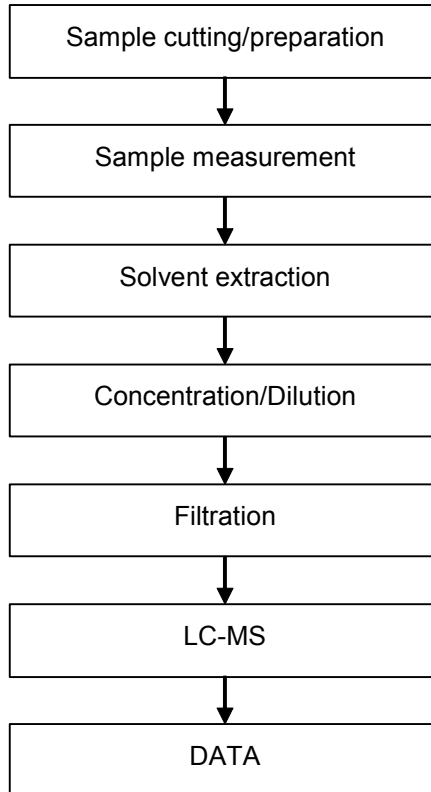


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PFOS/PFOA Testing Flow Chart

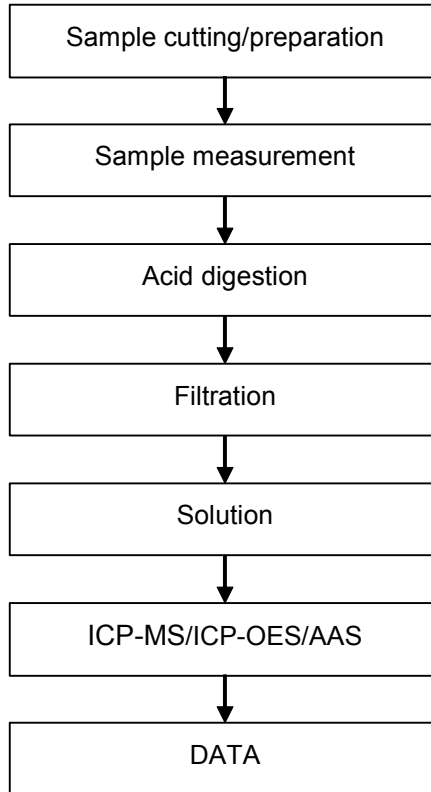


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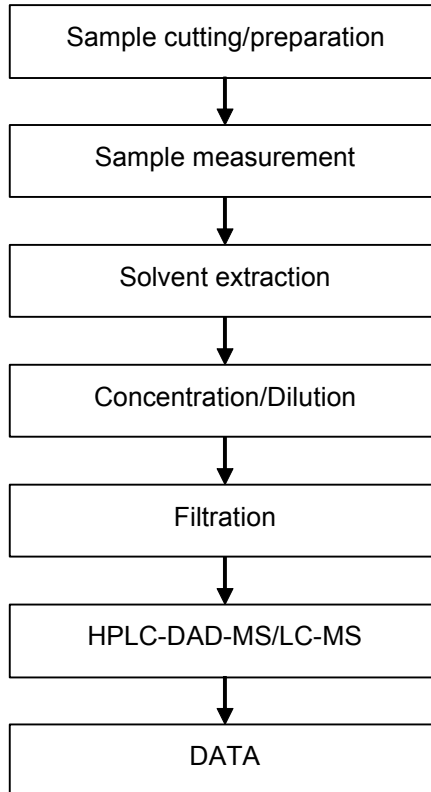
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Elements Testing Flow Chart



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BPA Testing Flow Chart

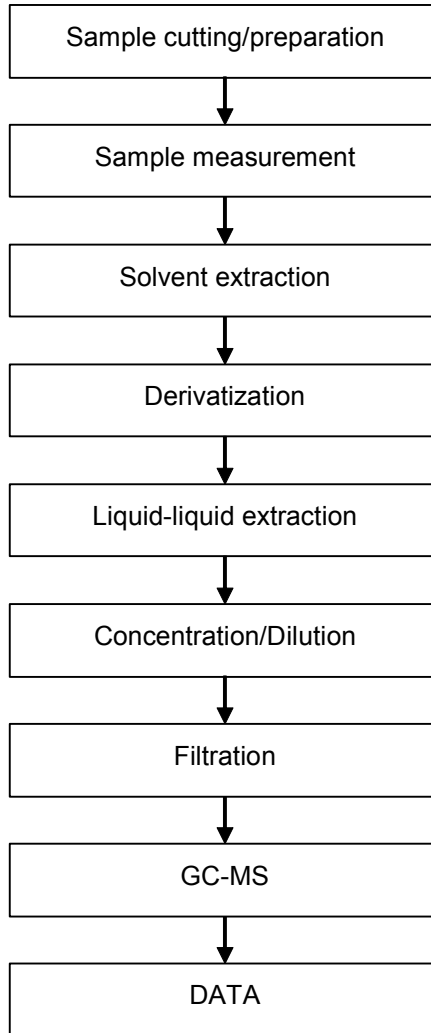


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Organotin Testing Flow Chart

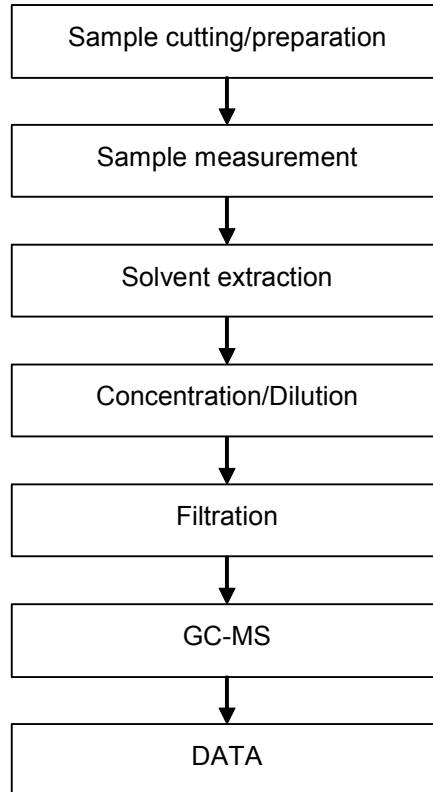


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PCB Testing Flow Chart

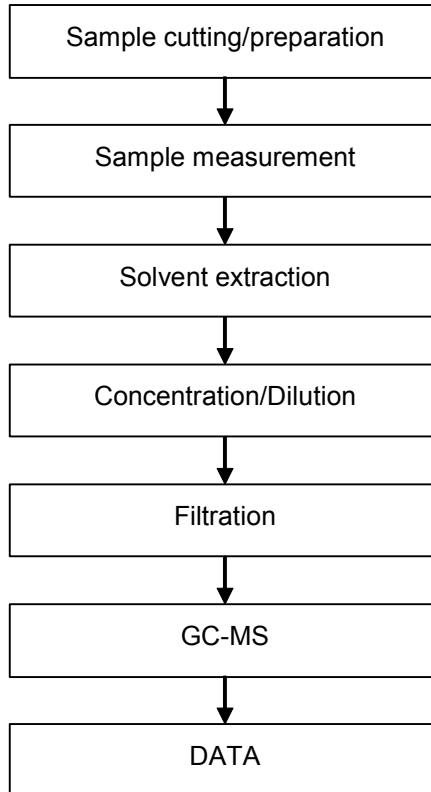


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PCN Testing Flow Chart

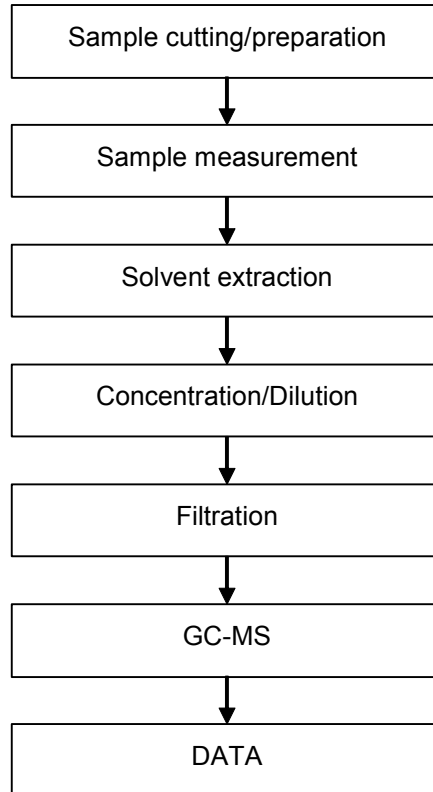


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PCT Testing Flow Chart

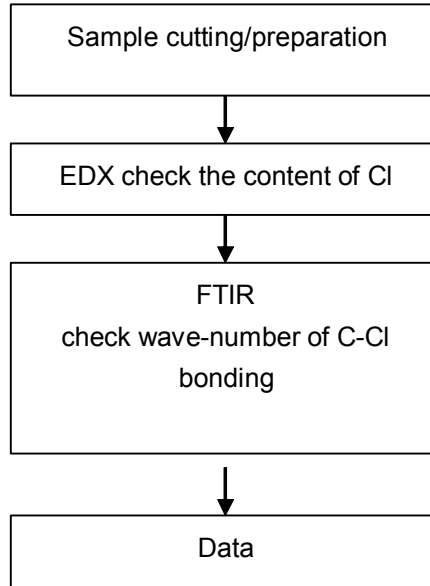


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PVC Testing Flow Chart

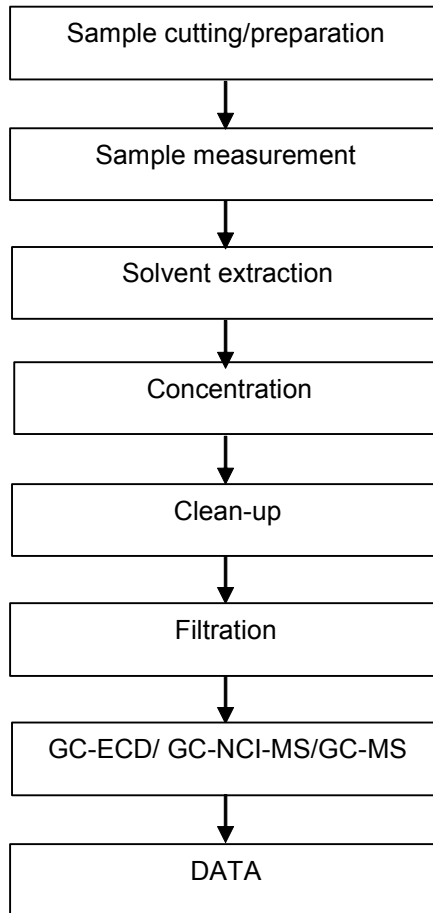


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Chlorinated Paraffin Testing Flow Chart

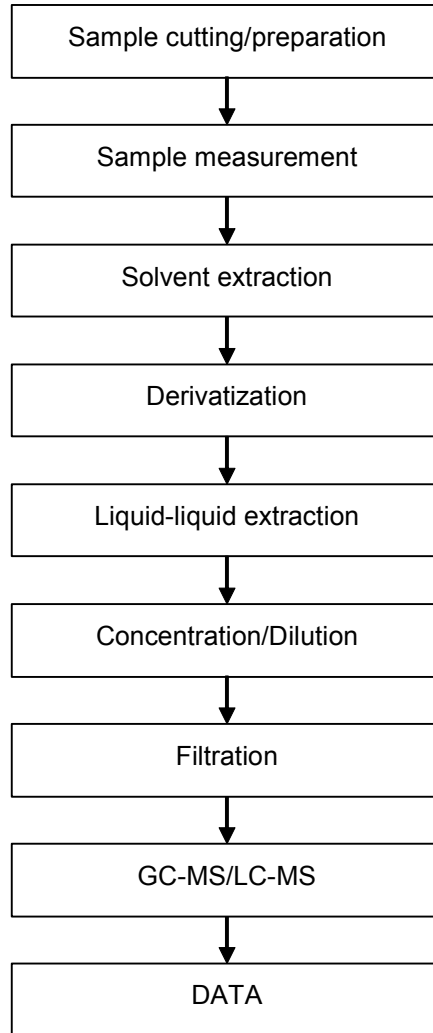


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TBBP-A Testing Flow Chart

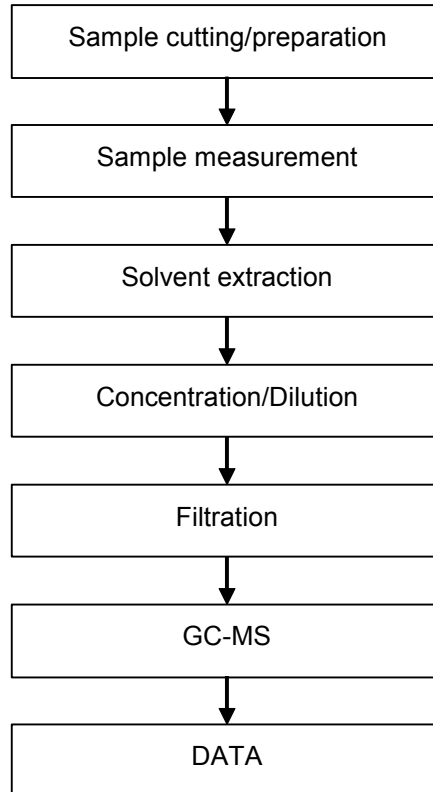


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DMF (Dimethyl fumarate) Testing Flow Chart

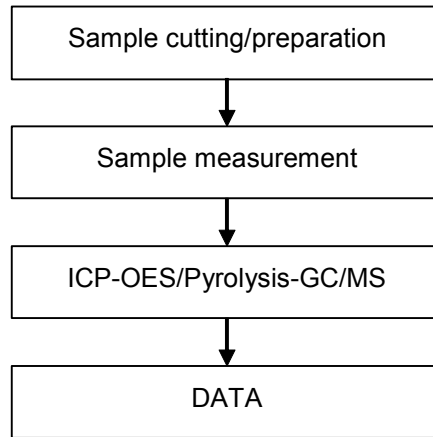


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Red Phosphorus Testing Flow Chart



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