

Test Report

No. TAOEC2100797311

Date: 16 Mar 2021

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SHANDONG JINGDAO MICROELECTRONICS CO.,LTD
NO.166 CHUNQIU EAST ROAD, QUFU, JINING, SHANDONG

The following sample(s) was/were submitted and identified on behalf of the clients as : MEDIUM AND HIGH POWDER SEMICONDUCTOR DEVICES

SGS Job No. : QP21-000476 - QD
Model No. : GBU
Client Ref. Information : Other Model No.:
KBP(GBP),KBJ(GBJ),TO-251,TO-252,TO-220,ITO-220,TO-263,JDBFC,4032,322
5
Supplier : SHANDONG JINGDAO MICROELECTRONICS CO.,LTD
Manufacturer : SHANDONG JINGDAO MICROELECTRONICS CO.,LTD
Date of Sample Received : 26 Feb 2021
Testing Period : 26 Feb 2021 - 12 Mar 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 ID 004, 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 (Qingdao) Co., Ltd.



Wang Bo, Claire
Approved Signatory



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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	TAO21-007973.003	black solid(mix all)
SN2	TAO21-007973.004	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 : With reference to IEC 62321-5:2013, IEC 62321-4:2013+AMD1:2017, IEC 62321-7-2:2017, 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>003</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	-	mg/kg	2	5646▲
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	8	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



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>003</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
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.
- (2) 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
- (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) ▲According to the declaration from the client, Lead (Pb) in No.003 is exempted by EU RoHS directive 2011/65/EU based on [ANNEX III 7(c)-I]: Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound.
- (5) ▲According to the declaration from the client, Lead (Pb) in No.003 is exempted by EU RoHS directive 2011/65/EU based on [ANNEX III 7(a)]: Lead in high melting temperature type solders (i.e. lead-based alloys containing 85 % by weight or more lead).
- (6) The sample(s) was/were analyzed on behalf of the applicant as mixing sample in one testing. The above result(s) was/were only given as the informality value and only for reference.

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

Test Method : With reference to IEC 62321-5:2013, IEC 62321-4:2013+AMD1:2017, IEC 62321-7-1:2015, analyzed by ICP-OES,AAS and UV-Vis.

<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)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm ²	0.10	ND

Notes :

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



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(2) 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

(3) ▼= 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 Ion Chromatograph (IC).

Test Item(s)	Unit	MDL	003
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

Notes :

- The test was subcontracted to SGS Tianjin chemical lab.

Element(s)

Test Method : With reference to US EPA 3052:1996 、 US EPA 3051A:2007 、 US EPA 6010C:2007, analyzed by ICP-OES.

Test Item(s)	Unit	MDL	003
Arsenic (As)	mg/kg	10	ND
Antimony (Sb)	mg/kg	10	ND
Sb ₂ O ₃ ♦	mg/kg	12	ND
Beryllium (Be)	mg/kg	5	ND
Phosphorus (P)	mg/kg	20	73
Tin (Sn)	mg/kg	5	398

Notes :

- ♦Calculated concentration of Sb₂O₃ is based on the identified Sb



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Polyvinyl chloride (PVC) component

Test Method : SGS In house method(SHTC-CHEM-SOP-347-T), analysis was performed by Pyrolysis-GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>
Polyvinyl chloride component	%	0.05	ND

Notes :

- (1) Polyvinyl chloride component includes its present in copolymer.
- (2) The test was subcontracted to SGS Shanghai chemical lab.

Alkanes C10-C13, chloro (short-chain chlorinated paraffins) (SCCP), Alkanes C14-C17, chloro (Medium-chain Chlorinated Paraffins) (MCCP)

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

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>
Alkanes C10-C13, chloro (short-chain chlorinated paraffins) (SCCP)	mg/kg	50	ND
Alkanes C14-C17, chloro (Medium-chain Chlorinated Paraffins) (MCCP)	mg/kg	50	ND

Tetrabromobisphenol A (TBBP-A)

Test Method : SGS in house method-TJChemLab-TOP-036-2 (With reference to US EPA 3550C:2007 、 US EPA 3540C:1996 、 US EPA 8270D:2014), analyzed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND

Notes :

- The test was subcontracted to SGS Tianjin chemical lab.

Hexabromocyclododecane (HBCDD)



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Test Method : SGS in house method-TJChemLab-TOP-059 (With reference to US EPA 3550C:2007 、 US EPA 8270D:2014), analyzed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

Notes :

- The test was subcontracted to SGS Tianjin chemical lab.

Phthalates

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

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>
Dibutyl Phthalate (DBP)	84-74-2	%	0.003	ND
Benzylbutyl Phthalate (BBP)	85-68-7	%	0.003	ND
Bis-(2-ethylhexyl) Phthalate (DEHP)	117-81-7	%	0.003	ND
Diisononyl Phthalate (DINP)	28553-12-0/ 68515-48-0	%	0.01	ND
Di-n-octyl Phthalate (DNOP)	117-84-0	%	0.003	ND
Diisodecyl Phthalate (DIDP)	26761-40-0/ 68515-49-1	%	0.01	ND
Dimethyl Phthalate (DMP)	131-11-3	%	0.003	ND
Diethyl Phthalate (DEP)	84-66-2	%	0.003	ND
Dipropyl Phthalate (DPrP)	131-16-8	%	0.003	ND
Diisobutyl Phthalate (DIBP)	84-69-5	%	0.003	ND
Diundecyl Phthalate (DUP,DUDP)	3648-20-2	%	0.003	ND
Di-n-pentyl Phthalate (DnPP)	131-18-0	%	0.003	ND
1,2-Benzenedicarboxylic, dihexylester, branched and linear (DHP)	68515-50-4	%	0.01	ND
Dicyclohexyl Phthalate (DCHP)	84-61-7	%	0.003	ND
Diphenyl Phthalate (DPhP)	84-62-8	%	0.003	ND
Dibenzyl Phthalate (DBzP)	523-31-9	%	0.003	ND
Dinonyl Phthalate (DNP)	84-76-4	%	0.003	ND
Diisooctyl Phthalate (DiOP)	27554-26-3	%	0.01	ND
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	%	0.003	ND
Diallyl Phthalate (DAP)	131-17-9	%	0.003	ND
n-decyl, n-octyl Phthalate (nDnOP)	119-07-3	%	0.003	ND
Di-n-decyl Phthalate (DnDP)	84-77-5	%	0.003	ND
Diisopentyl Phthalate (DIPP)	605-50-5	%	0.003	ND



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Test Item(s)	CAS NO.	Unit	MDL	003
n-pentyl Isopentyl phthalate(nPiPP)	776297-69-9	%	0.003	ND
Di-n-hexyl Phthalate (DnHP)	84-75-3	%	0.003	ND
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4	%	0.01	ND
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6	%	0.01	ND
1,2-Benzenedicarboxylic acid,dipentylester, branched and linear (DPP)	84777-06-0	%	0.003	ND
Di-iso-nonyl adipate (DINA)	33703-08-1	%	0.003	ND
Bis (4-methyl-2-pentyl) Phthalate(BMPP)	146-50-9	%	0.003	ND
Bis (2-ethoxyethyl) Phthalate(DEEP)	605-54-9	%	0.003	ND
Bis (2-n-butoxyethyl) Phthalate(DBEP)	117-83-9	%	0.003	ND
Di(2-propylheptyl)Phthalate (DPHP)	53306-54-0	%	0.003	ND
Di(2-ethylhexyl)adipate (DEHA)	103-23-1	%	0.003	ND
Di-n-octyl adipate (DNOA)	123-79-5	%	0.003	ND
Bis(2-ethylhexyl) terephthalate (DOTP)	6422-86-2	%	0.003	ND

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

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

Test Item(s)	CAS NO.	Unit	MDL	003
Perfluorooctanesulfonate (PFOS) and its derivatives	-	mg/kg	-	ND
Perfluorooctane Sulfonates (PFOS)^	1763-23-1	mg/kg	10	ND
2-(N-methylperfluoro- 1-octanesulfonamido) -ethanol (MeFOSE)	24448-09-7	mg/kg	10	ND
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol (EtFOSE)	1691-99-2	mg/kg	10	ND
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	mg/kg	10	ND
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	mg/kg	10	ND
Perfluorooctane sulfonamide (PFOSA)	754-91-6	mg/kg	10	ND
Perfluorooctanoic Acid (PFOA) and its salts+		mg/kg	10	ND

Notes :

(1)^ PFOS refer to its acid, salts/derivatives including PFOS (CAS No.: 1763-23-1) , 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) and PFOS-N(C₂H₅)₄ (CAS No.: 56773-42-3), PFOS-N(CH₃)₂(C₁₀H₂₁)₂ (CAS No.:251099-16-8) and POSF (CAS No.: 307-35-7).

(2) PFOA and its salts+ refer to its acid / salts including PFOA (CAS No.: 335-67-1), 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)



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Polycyclic Aromatic Hydrocarbons (PAHs)

Test Method : With reference to AfPS GS 2019:01 PAK, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</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(b)fluoranthene(BbF)	mg/kg	0.1	ND
Benzo(j)fluoranthene(BjF)	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
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

Notes :

As per client information, the tested sample is not children product which is with reference to the directive of German ProdSG.



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Client requirements

Parameter (mg/kg)	Category 1	Category 2		Category 3	
	Materials intended to be placed in the mouth, or materials coming into long-term contact with skin (more than 30s) during the intended use -in toys according to Directive 2009/48/EC or -for the use by children ^{a,b} up to 3 years of age.	Materials not covered by category 1, coming into long-term contact (more than 30s) or short-term repetitive contact ^c with skin during the intended or foreseeable use ^d .		Materials covered neither by category 1 nor by category 2, coming into short-term contact (up to 30s) with skin during the intended or foreseeable use.	
		a. use by children	b. other consumer products	a. use by children	b. other consumer products
Benzo(a)pyrene (BaP)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(e)pyrene (BeP)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(a)anthracene (BaA)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(b)fluoranthene (BbF)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(j)fluoranthene (BjF)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(k)fluoranthene (BkF)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Chrysene (CHR)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Dibenzo(a,h)anthracene (DBA)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(g,h,i)perylene (BPE)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Indeno(1,2,3-cd)pyrene (IPY)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Sum of 7 PAHs (Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Pyrene, Anthracene, Fluoranthene)	< 1 Sum	< 5 Sum	< 10 Sum	< 20 Sum	< 50 Sum
Naphthalene (NAP)	< 1	< 2		< 10	
Sum of 18 PAHs	<1	< 5	< 10	< 20	< 50

Note:

^a A "Child" is legally defined as a person before reaching the age of 14 years.

^b Use by children includes both active and passive contact by children.

^c Definition "short-term repetitive contact" taken from REACH Annex XVII entry 50 amendment (Regulation (EC) No. 1272/2013)

^d According to the definition of the German Product Safety Act (ProdSG) (chapter 1 Article 2 No. 28) "foreseeable use" shall mean the use of a product in a manner that the person placing it on the market, has not intended, but which could be reasonably foreseeable.

Remark:

The classification of material categories is refer to AfPS GS 2019:01 PAK issued on 10 April, 2020. The Acenaphthylene (ANY), Acenaphthene (ANA) and Fluorene (FLU) are not in the scope of AfPS 2019:1 PAK which is additionally in scope of AfPS GS 2014:01 PAK and recommended in connection with §30 LFGB product safety requirements.



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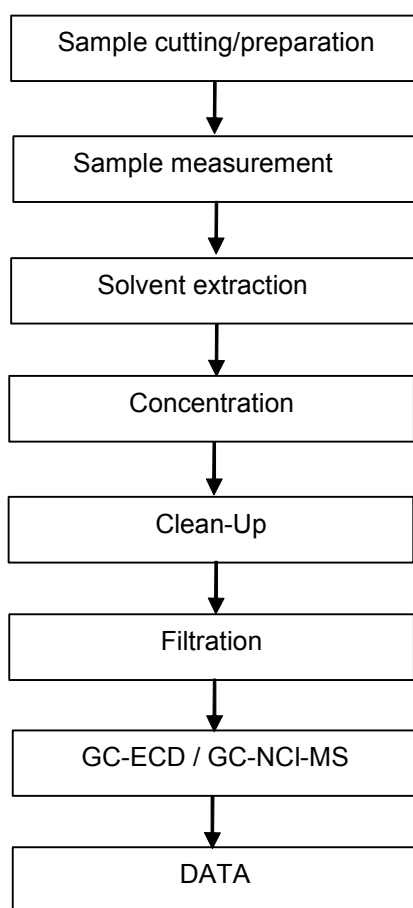
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SCCP/MCCP Testing Flow Chart

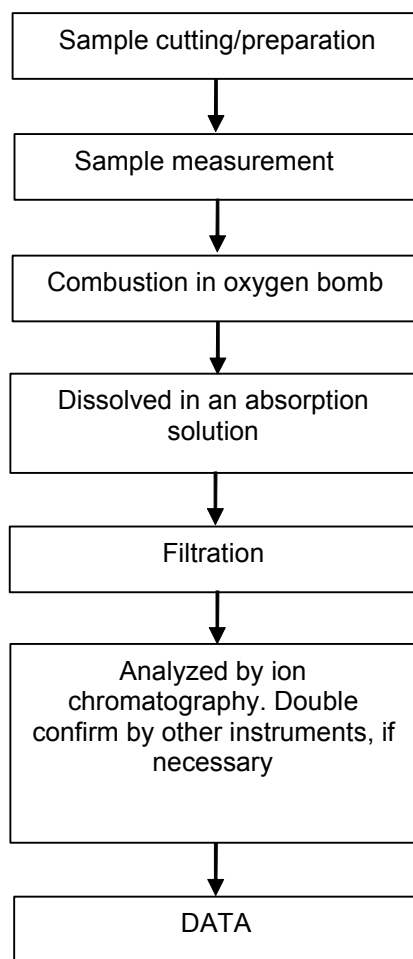


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Halogen Testing Flow Chart

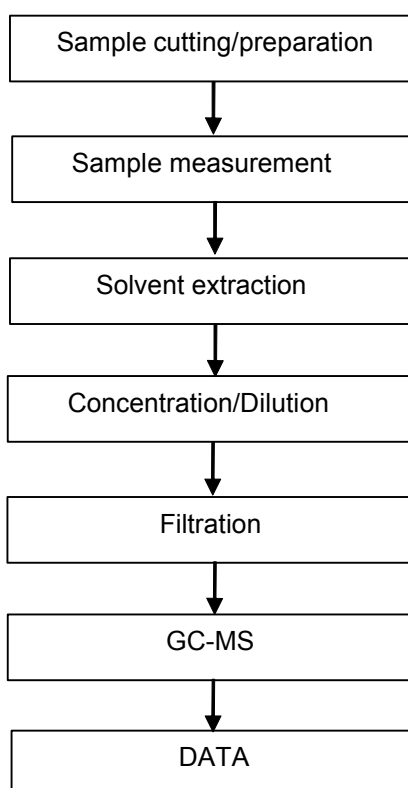


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HBCDD Testing Flow Chart

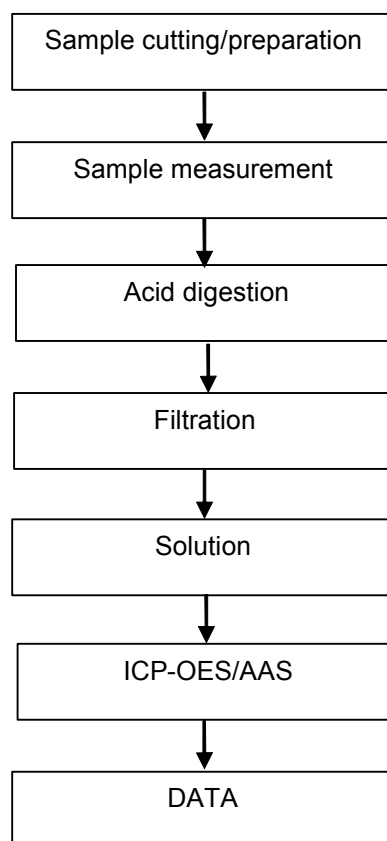


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Elementary Testing Flow Chart

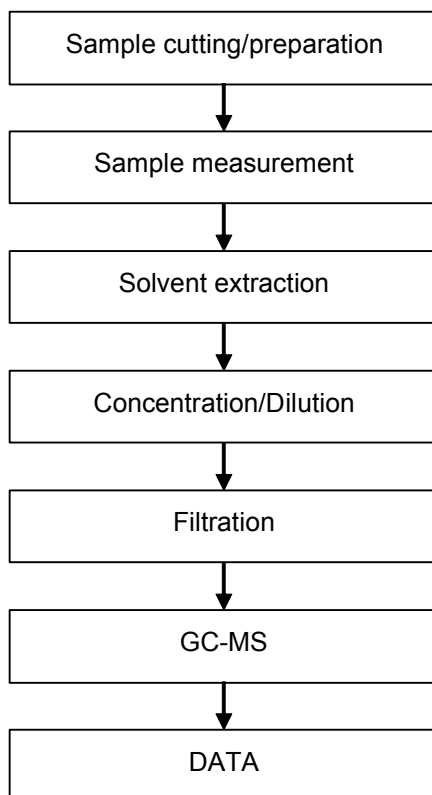


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PAHs Testing Flow Chart

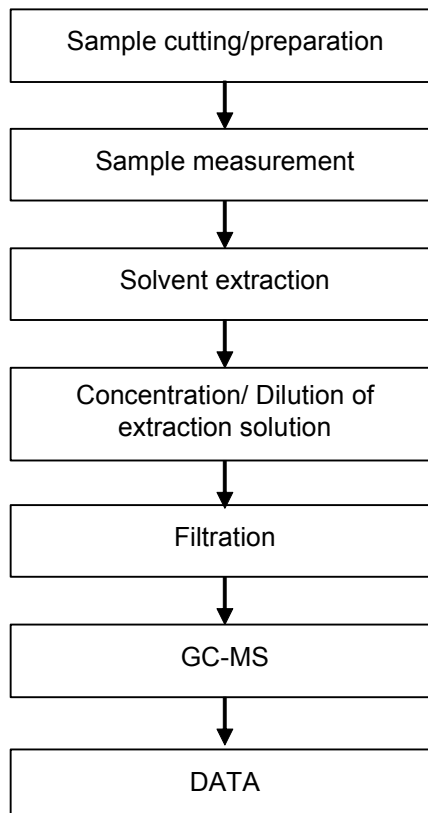


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PBBs/PBDEs Testing Flow Chart

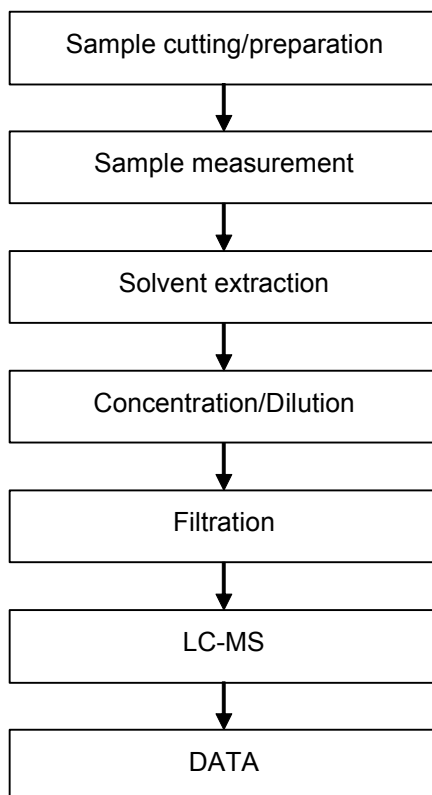


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PFOS/PFOA Testing Flow Chart

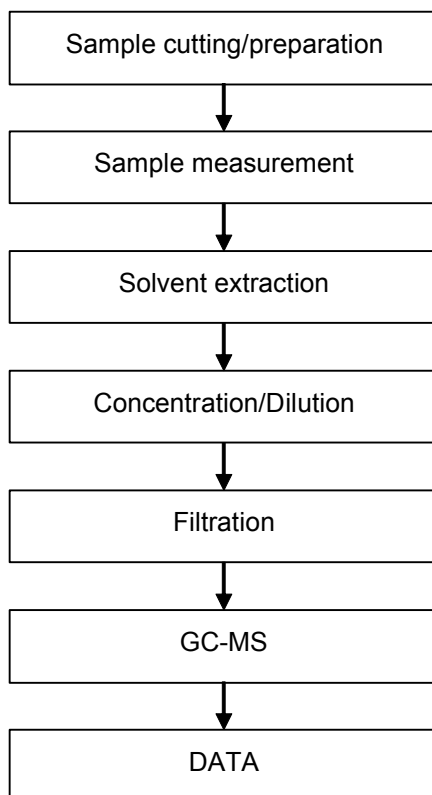


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Phthalates Testing Flow Chart

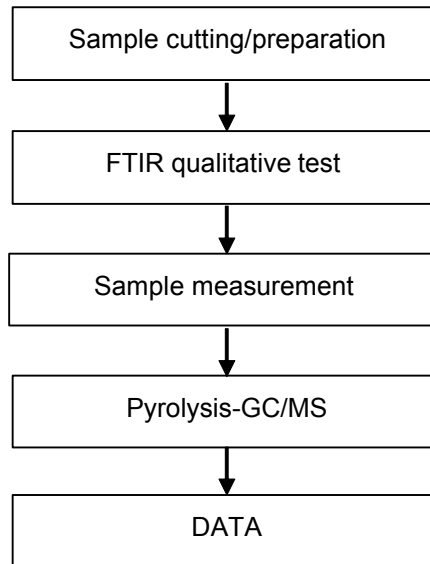


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PVC Testing Flow Chart

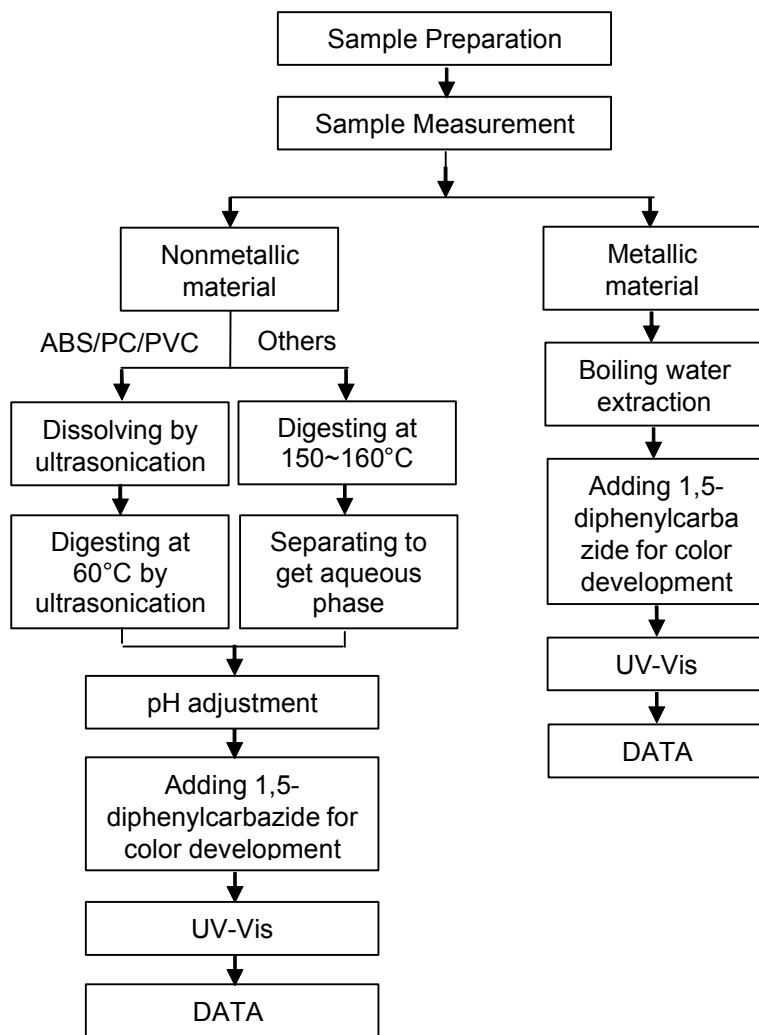


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Hexavalent Chromium (Cr(VI)) Testing Flow Chart



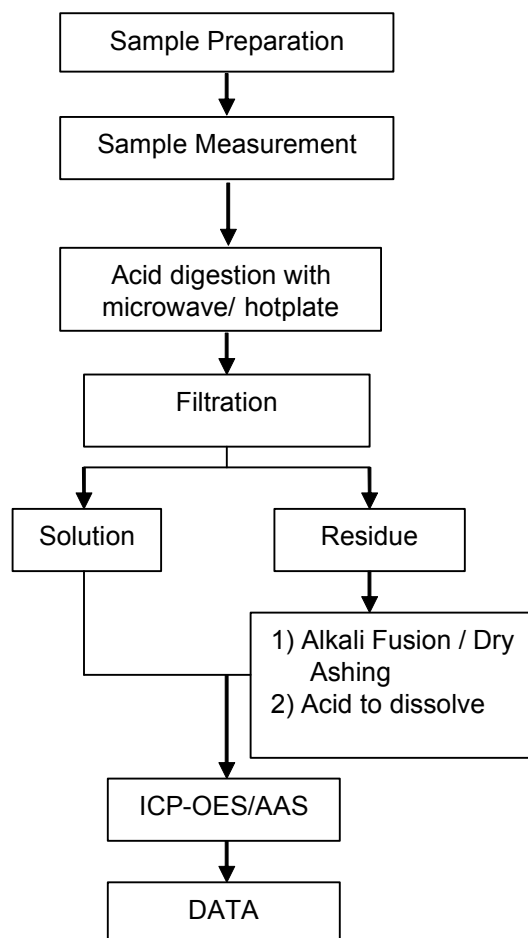
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Elements (IEC62321) Testing Flow Chart

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



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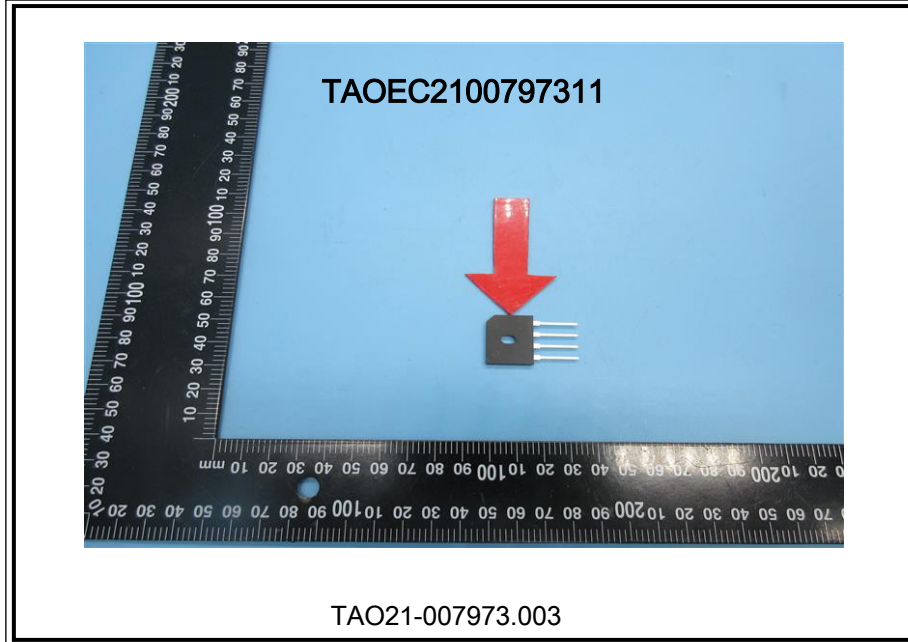
Test Report

No. TAOEC2100797311

Date: 16 Mar 2021

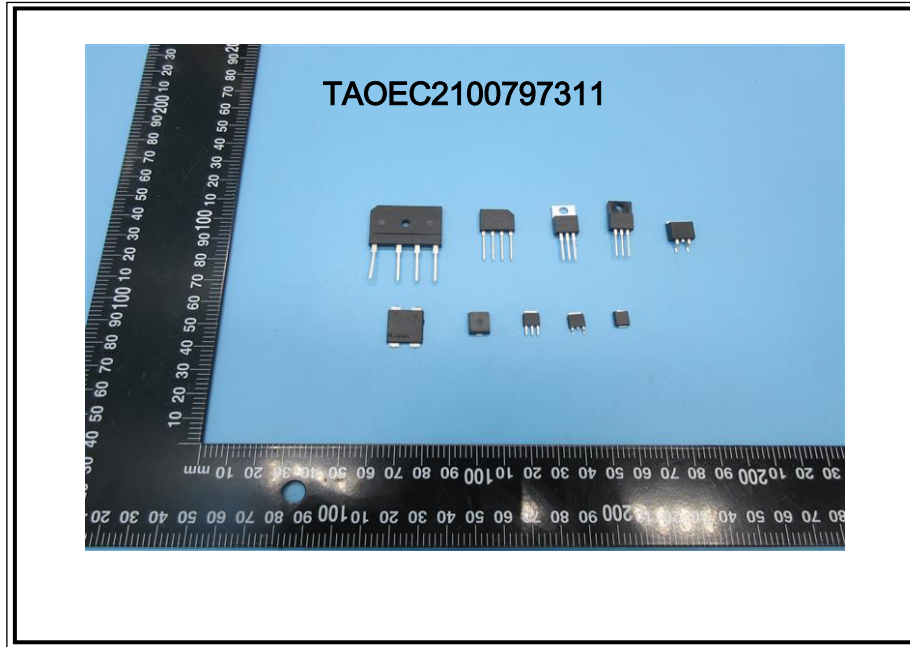
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