Test Report No. F690101/LF-CTSAYGU19-12315

Issued Date : 2019. 12. 06

MAGNACHIP SEMICONDUCTOR LTD.
375,Suchul-daero
Gumi-si,Gyeongbuk
Korea

The following sample(s) was/were submitted and identified by/on behalf of the client as:-

SGS File No.	:	AYGU19-12315
Product Name	:	FAB-3 SMS WAFER PRODUCT
Item No./Part No.	:	N/A
Received Date	:	2019. 11. 15
Test Period	:	2019. 11. 15 to 2019. 12. 06
Test Comments	:	By the applicant's specific request, the sampling and testing was performed only for the part indicated in the photo without disassembly.
Test Results	:	For further details, please refer to following page(s)

SGS Korea Co., Ltd.
/ LTS Busan Laboratory

Thomas Hwang / Lab Manager

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Sample No. : AYGU19-12315.001
Sample Description : FAB-3 SMS WAFER PRODUCT
Item No./Part No. : N/A
Materials : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013(Determination of Cadmium by ICP-OES)	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321-5:2013(Determination of Lead by ICP-OES)	5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013(Determination of Mercury by ICP-OES)	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	With reference to IEC 62321-7-2:2017, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis and/or with reference to IEC 62321-5:2013, determination of Chromium by ICP-OES	8	N.D.
Antimony (Sb)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	10	N.D.
Beryllium (Be)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tribromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.

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Item No./Part No. : N/A
Materials : N/A

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.

Phthalates

Test Items	Unit	Test Method	MDL	Results
Di-butyl phthalate (DBP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-(2-ethylhexyl) phthalate (DEHP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Benzyl butyl phthalate (BBP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-isobutyl phthalate (DIBP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
[di(C7-C11 alkyl)phthalate] linear and branched (DHNUP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
[di(C6-C8 alkyl)phthalate] branched (DIHP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Bis(2-methoxyethyl) phthalate (BMP, BMEP, DMEP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.

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Item No./Part No. : N/A
Materials : N/A

Phthalates

Test Items	Unit	Test Method	MDL	Results
Hexahydromethylphathalic anhydride, Hexahydro-1-methylphathalic anhydride, Hexahydro-3-methylphathalic anhydride, Hexahydro-4-methylphathalic anhydride	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-iso-pentyl phthalate(DIPP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
n-Pentyl-isopentyl phthalate (iPnPP, nPIPP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-n-pentyl phthalate(DPP, DnPP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
1,2-benzenedicarboxylic acid, dihexyllester, branched and linear (DHP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-n-hexyl phthalate (DNHP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
1,2-benzenedicarboxylic acid, di-C6-10 alkyl esters; 1,2-benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters with ≥ 0.3% of dihexyl phthalate	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-cyclohexyl phthalate (DCHP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-isononyl phthalate (DINP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-isodecyl phthalate (DIDP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-n-octyl phthalate (DNOP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-ethyl phthalate(DEP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
Di-methyl phthalate (DMP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.
1,2-benzenedicarboxylic acid, dipentylester, branched and linear(TDPP, DPP)	mg/kg	With reference to IEC 62321-8:2017, GC/MS	50	N.D.

Halogen Contents

Test Items	Unit	Test Method	MDL	Results
Bromine(Br)	mg/kg	EN 14582:2016 , IC	30	N.D.
Chlorine(Cl)	mg/kg	EN 14582:2016 , IC	30	N.D.

PFCs

Test Items	Unit	Test Method	MDL	Results

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Item No./Part No. : N/A
Materials : N/A

PFCs

Test Items	Unit	Test Method	MDL	Results
Perfluorootanoic acid (PFOA)	mg/kg	CEN/TS 15968 : 2010, LC/MS/MS	1	N.D.
PFOS^	mg/kg	CEN/TS 15968 : 2010, LC/MS/MS	1	N.D.

^ PFOS refer to Perfluorooctanesulfonic acid and its derivatives including Perfluoroctanesulfonic acid, Perfluoroctane sulfonamide, N-Methylperfluoroctane sulfonamide, N-Ethylperfluoroctane sulfonamide, N-Methylperfluoroctane sulfonamidoethanol and N-Ethylperfluoroctane sulfonamidoethanol

Flame Retardants

Test Items	Unit	Test Method	MDL	Results
Hexabromocyclododecane (HBCDD, HBCD)	mg/kg	With reference to US EPA 3540C, GC/MS	5	N.D.
Tetrabromobisphenol A	mg/kg	With reference to US EPA 3540C, GC/MS	5	N.D.

NOTE:
(1) N.D. = Not detected.(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) Negative = Undetectable / Positive = Detectable
(6) ** = Qualitative analysis (No Unit)
(7) * = a. The result of Hexavalent Chromium (Cr(VI)) is "ND" as the result of Chromium (Cr) is "ND", and confirmation test of Hexavalent Chromium (Cr(VI)) is not required.
b. If the Chromium (Cr) content is greater than the MDL of Hexavalent Chromium (Cr(VI)), confirmation test of Hexavalent Chromium (Cr(VI)) is required.
(8) The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report is not related to Korea Laboratory Accreditation Scheme.

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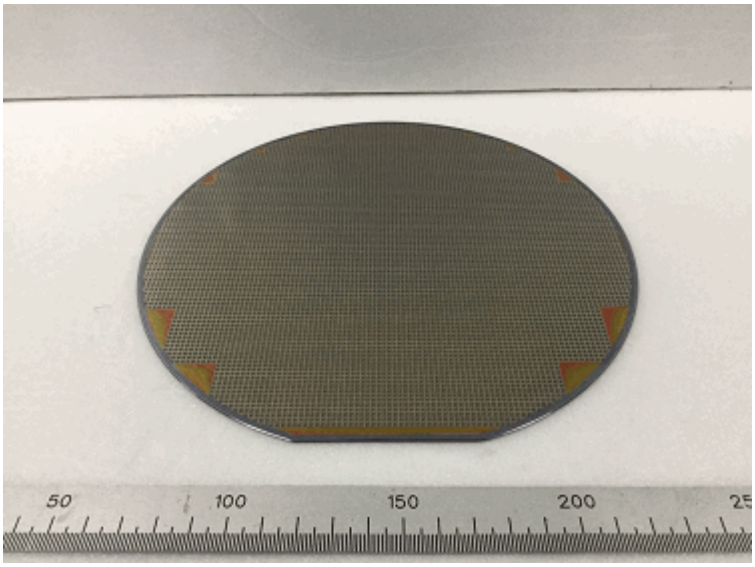
Picture of Sample as Received:



AYGU19-12315.001

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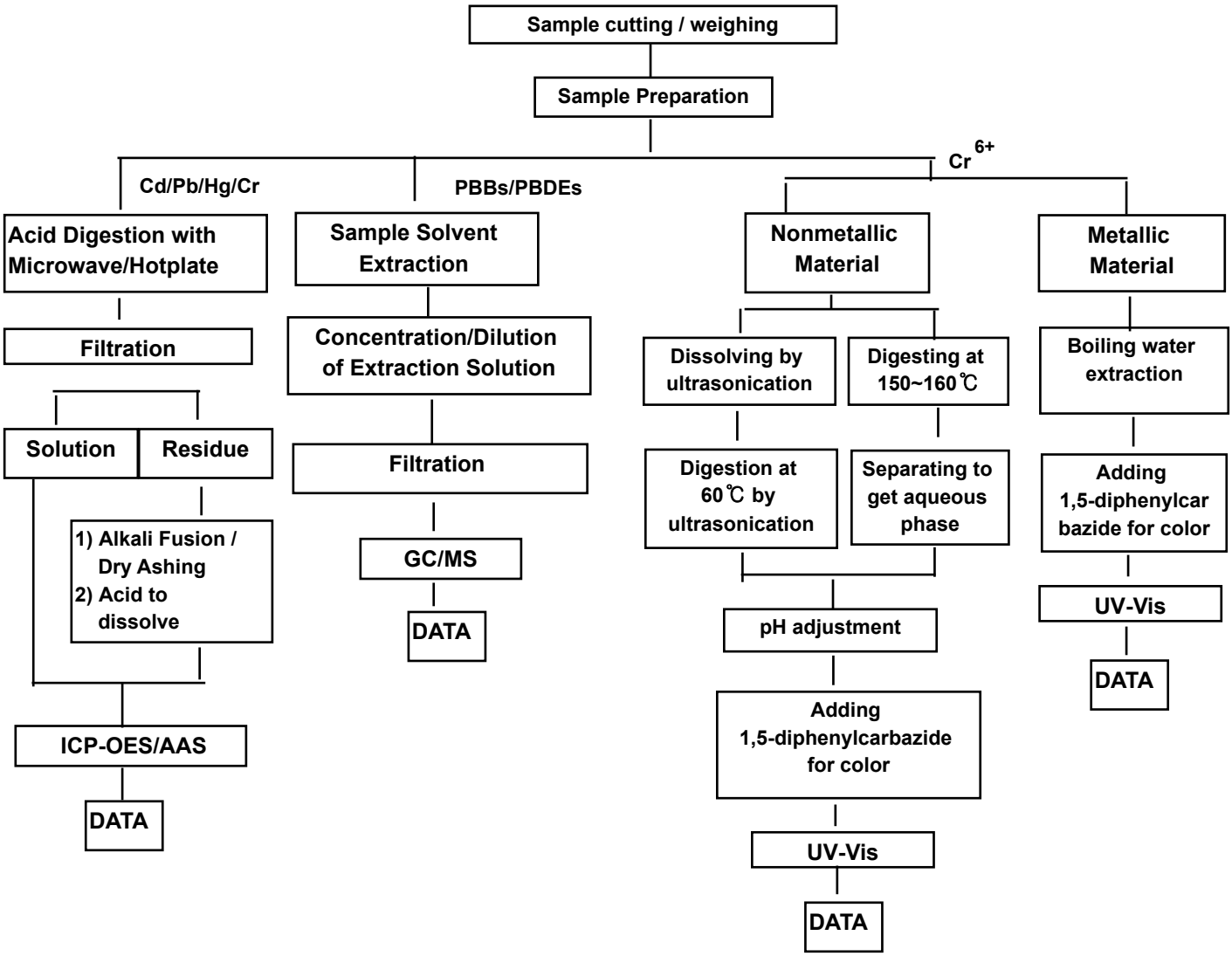
Testing Flow Chart for RoHS:Cd/Pb/Hg/Cr^{6+} /PBBs&PBDEs Testing



The samples were dissolved totally at the acid digestion step of the above flow chart for Cd,Pb,Hg
Section Chief : Sharpless Park

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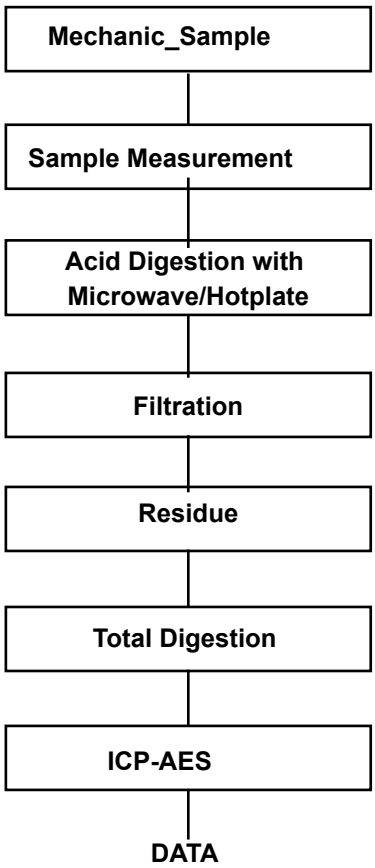
Flow Chart for Inorganic Elements Testing

Inorganic Elements



Major Inorganic Heavy Metals	Antimony(Sb) , Beryllium(Be) , Phosphorus(P) , Arsenic(As) etc.

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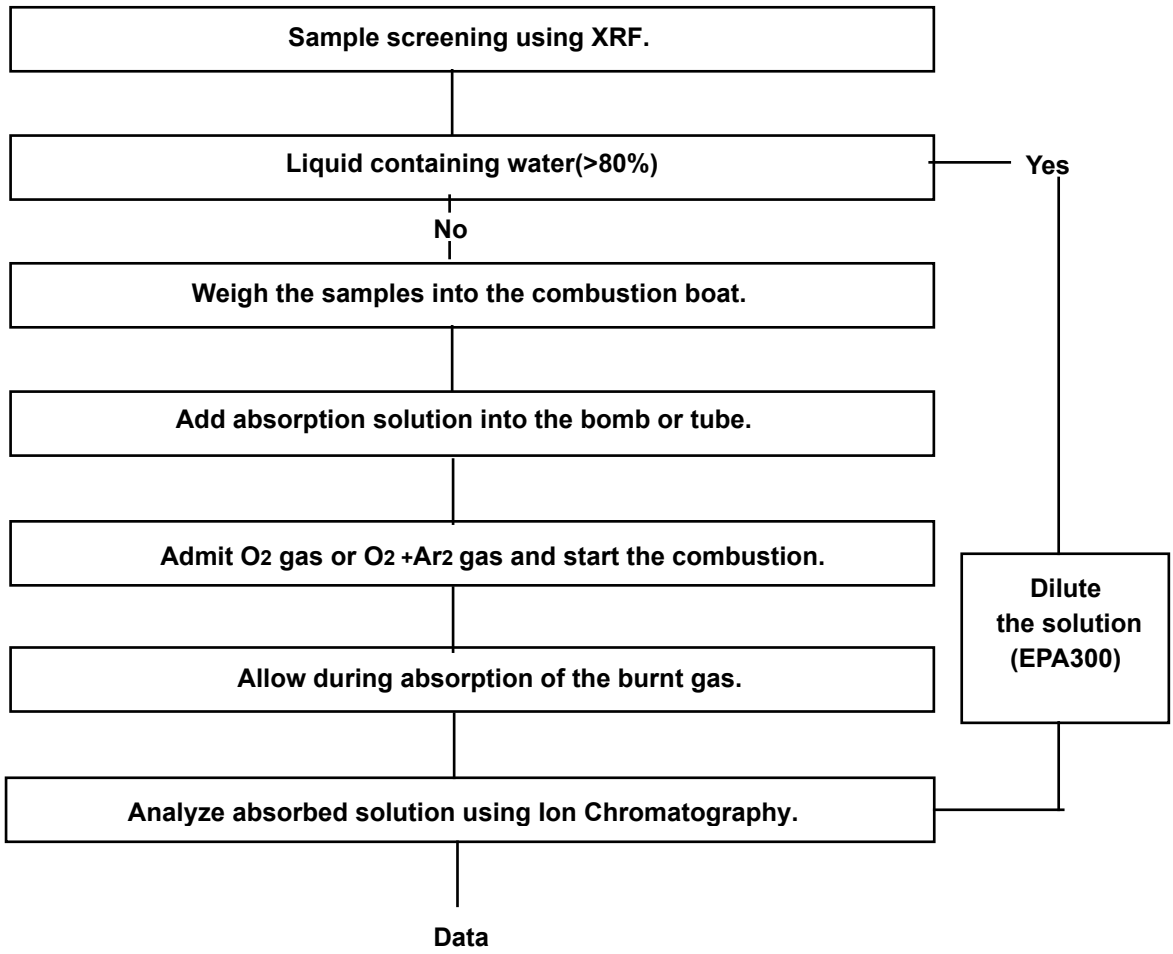
Flow Chart for Halogen Test



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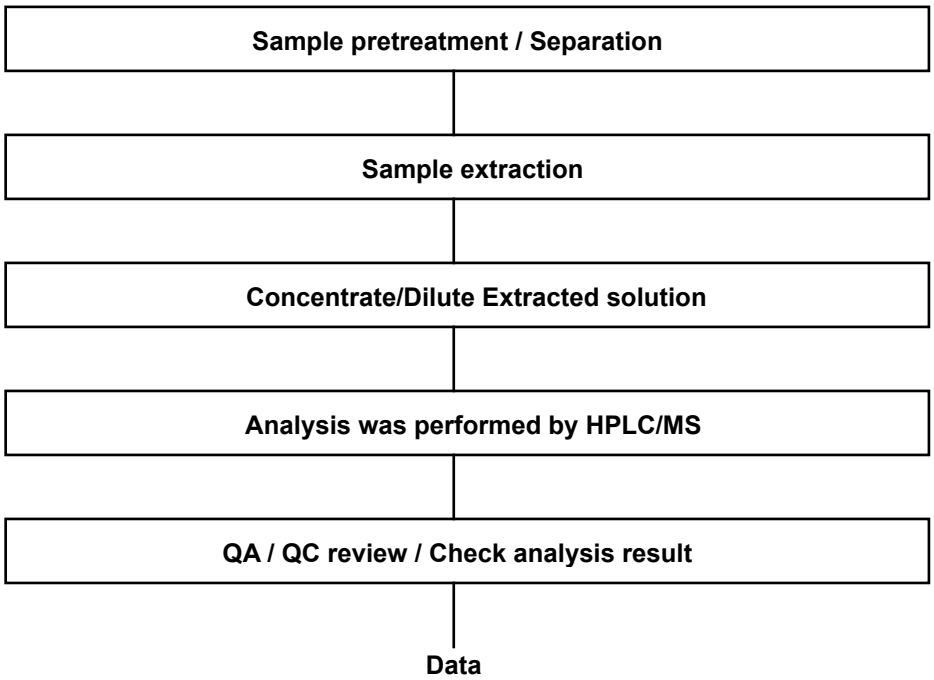
Flow Chart for PFOS/PFOA Test



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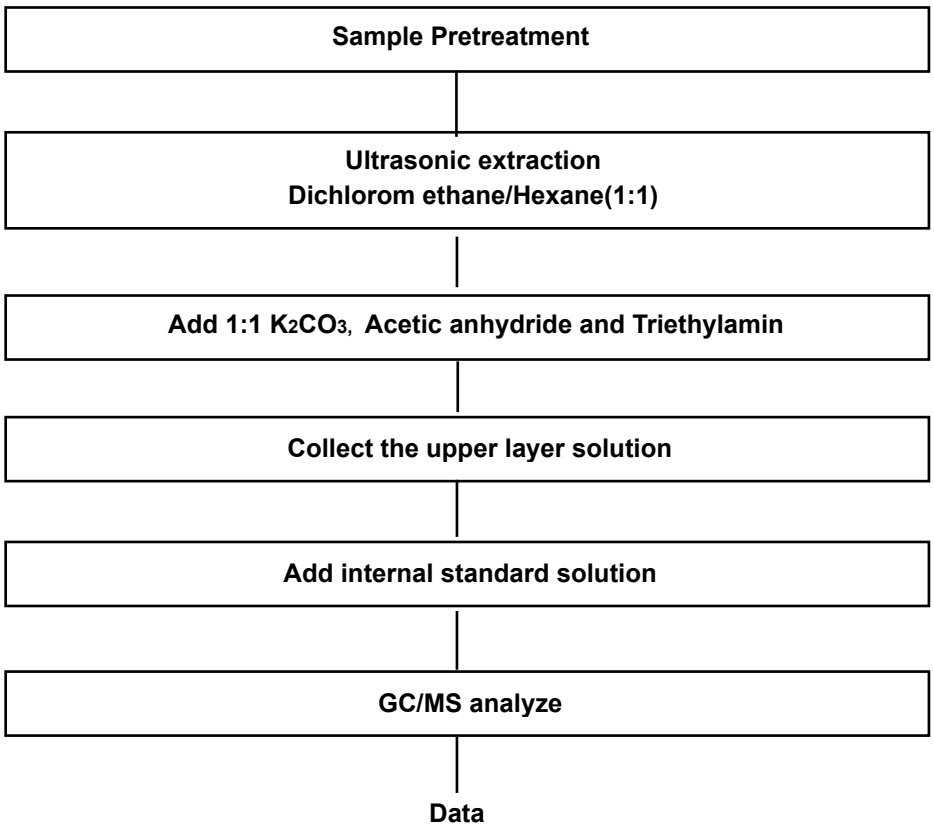
Flow Chart for TBBPA Test



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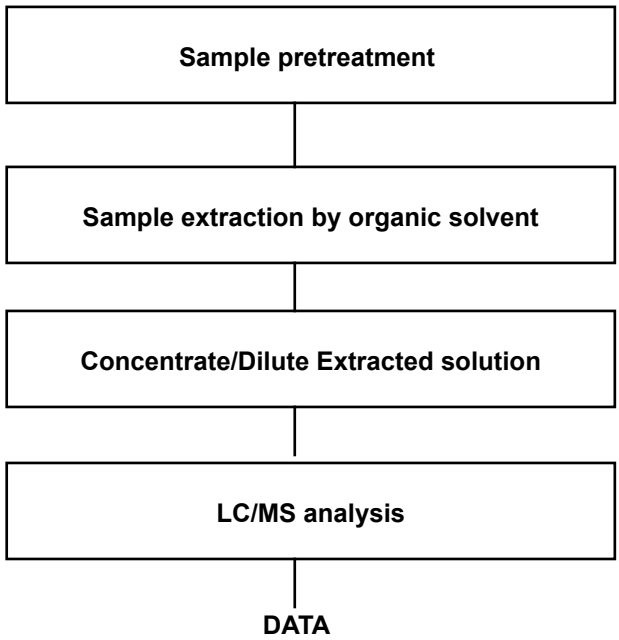
Testing Flow Chart for HBCD



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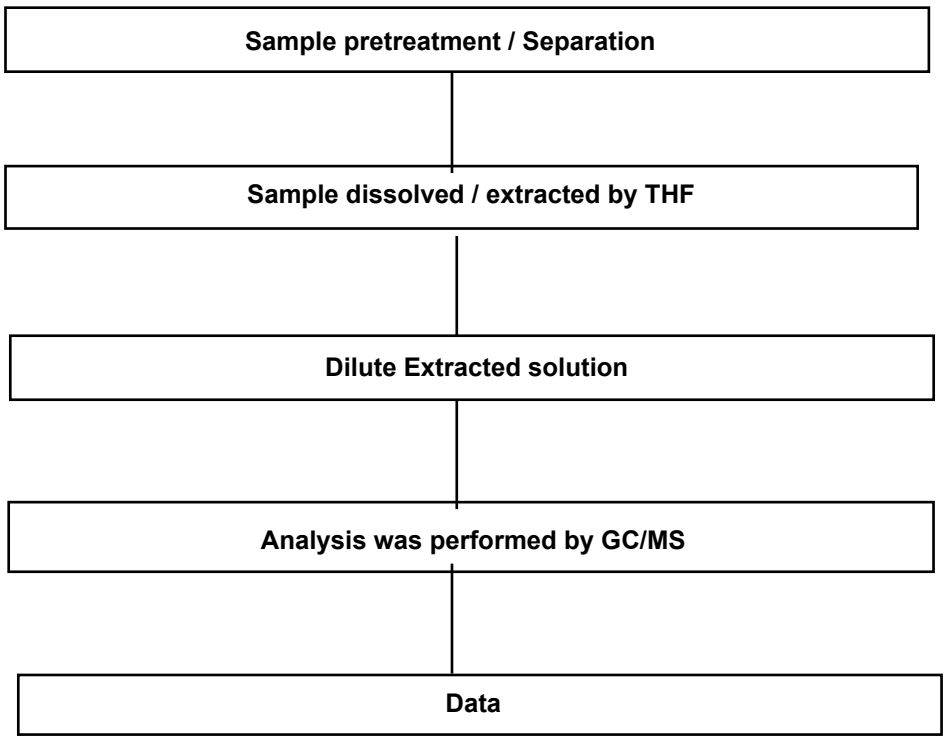
Flow Chart for Phthalate Test



*** End of Report ***

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