

## HANWHA SOLUTIONS CORPORATION

76, Gajeong-ro  
Yuseong-gu, Daejeon  
Korea



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

**SGS File No.** : AYAA25-37777  
**Product Name** : HDPE  
**Item No./Part No.** : N/A  
**Received Date** : 2025. 09. 02  
**Test Period** : 2025. 09. 02 to 2025. 09. 09  
**Test Results** : For further details, please refer to following page(s)



Monet Jeong

Technical Manager / SGS Korea Co., Ltd

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# Test Report No. F690101/LF-CTSAYAA25-37777

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Sample No. : AYAA25-37777.001  
Sample Description : HDPE  
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, by ICP-OES	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321-5 : 2013, by ICP-OES	5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4 : 2013+AMD1:2017CSV, by ICP-OES	2	N.D.
Hexavalent Chromium (Cr VI)+	mg/kg	With reference to IEC 62321-7-2 : 2017, by UV-Vis and/or with reference to IEC 62321-5 : 2013, by ICP-OES	8	N.D.

## Total Metals

Test Items	Unit	Test Method	MDL	Results
Antimony (Sb)	mg/kg	With reference to EPA 3052 : 1996, EPA 6010D : 2018, by ICP-OES	10	N.D.

## Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Tribromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.

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Sample No. : AYAA25-37777.001

Sample Description : HDPE

Item No./Part No. : N/A

Materials : N/A

## Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321-6 : 2015, by GC-MS	5	N.D.

## Phthalates

Test Items	Unit	Test Method	MDL	Results
Di-(2-ethylhexyl) phthalate (DEHP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Di-butyl phthalate (DBP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Benzyl butyl phthalate (BBP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Di-isobutyl phthalate (DIBP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Di-isodecyl phthalate (DIDP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Di-isononyl phthalate (DINP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Di-n-octyl phthalate (DNOP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.
Di-n-hexyl phthalate (DNHP)	mg/kg	With reference to IEC 62321-8 : 2017, by GC-MS	50	N.D.

## Chlorinated Paraffin

Test Items	Unit	Test Method	MDL	Results
Alkanes, C10~13, Short Chain Chlorinated Paraffins(SCCP)	mg/kg	With reference to ISO 18219, by GC-MS(Cl)	50	N.D.

## Organotin Compounds

Test Items	Unit	Test Method	MDL	Results
Dibutyltin (DBT)	mg/kg	with reference to ISO 17353:2004, by GC/MS	1	N.D.
Tributyltin (TBT)	mg/kg	with reference to ISO 17353:2004, by GC/MS	1	N.D.
Triphenyltin (TPHT)	mg/kg	with reference to ISO 17353:2004, by GC/MS	1	N.D.
Diocetyl tin (DOT)	mg/kg	with reference to ISO 17353:2004, by GC/MS	1	N.D.

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Sample No. : AYAA25-37777.001  
Sample Description : HDPE  
Item No./Part No. : N/A  
Materials : N/A

## Flame Retardants

Test Items	Unit	Test Method	MDL	Results
Hexabromocyclododecane (HBCDD)	mg/kg	With reference to USEPA 3540 C, by LC/MS	5	N.D.

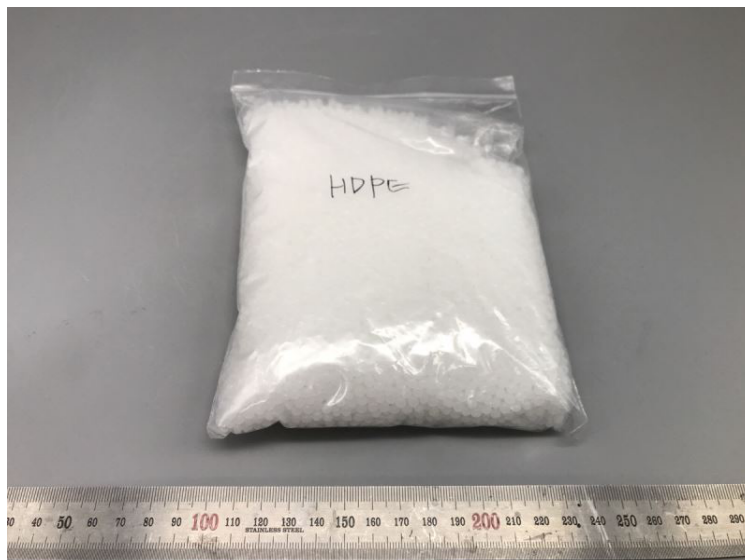
## Other(s)

Test Items	Unit	Test Method	MDL	Results
Bisphenol A	mg/kg	with reference to EPA 3550C, HPLC/MS or HPLC/MS/MS	10	N.D.

- NOTE:
- (1) N.D. = Not detected. (<MDL)
  - (2) mg/kg = ppm, ug/kg = ppb, mg/L = ppm
  - (3) MDL = Method Detection Limit
  - (4) - = No regulation
  - (5) \*\* = Qualitative analysis (No Unit)
  - (6) Negative = Undetectable / Positive = Detectable
  - (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 content of Total Chromium (Cr) is greater than the MDL of Hexavalent Chromium (Cr(VI)), it is the result of hexavalent Chromium by UV-VIS.
  - (8) ++ = a. The sample is positive for Cr VI if the Cr VI concentration is greater than 0.13 ug/cm2.  
The sample coating is considered to contain Cr VI.  
b. The sample is negative for Cr VI if Cr VI is ND(concentration less than 0.10 ug/cm2).  
The coating is considered a non-Cr VI based coating.  
c. The result between 0.10 ug/cm2 and 0.13 ug/cm2 is considered to be inconclusive – unavoidable coating variations may influence the determination.

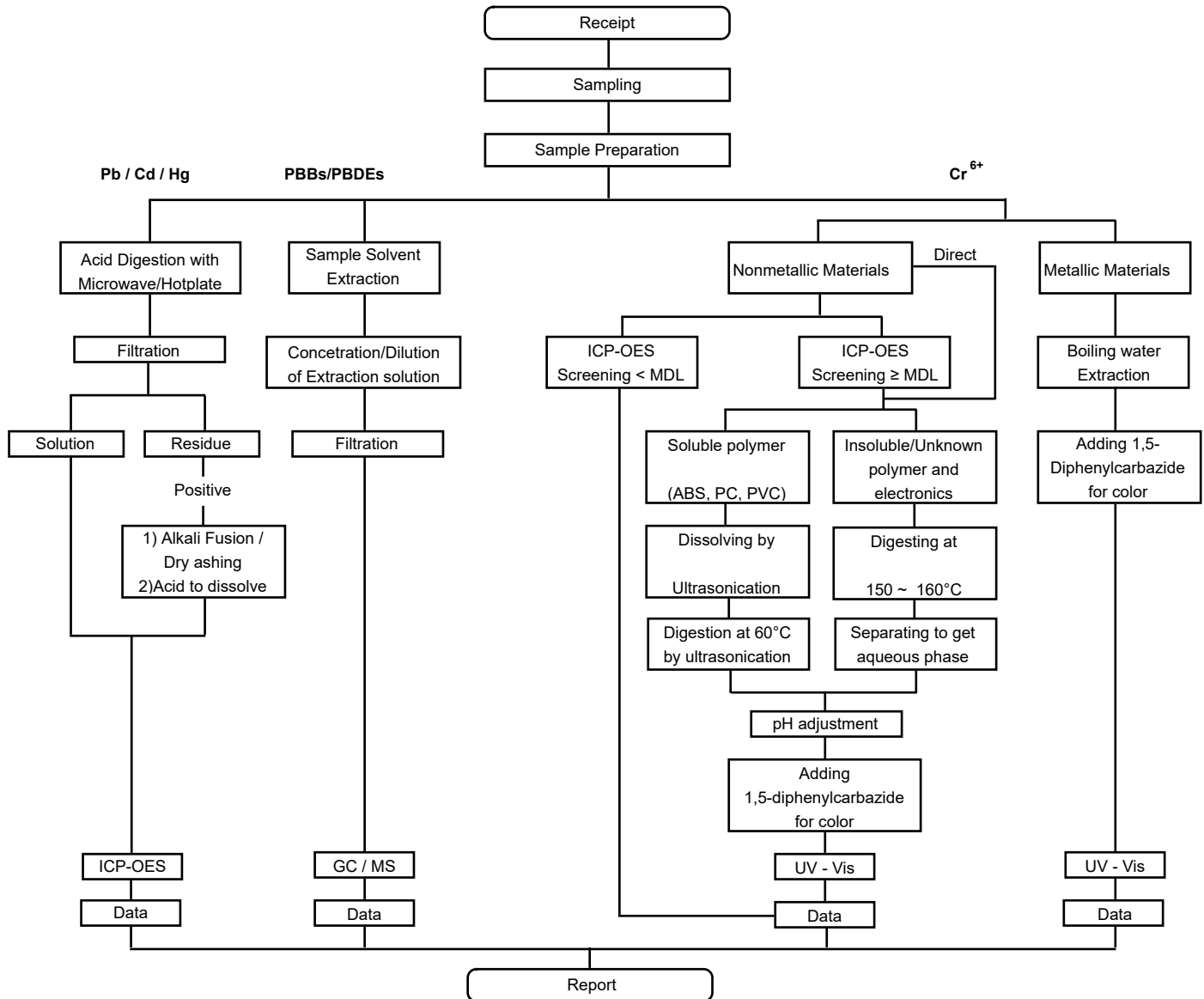
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**Picture of Sample as Received:**



**AYAA25-37777.001**

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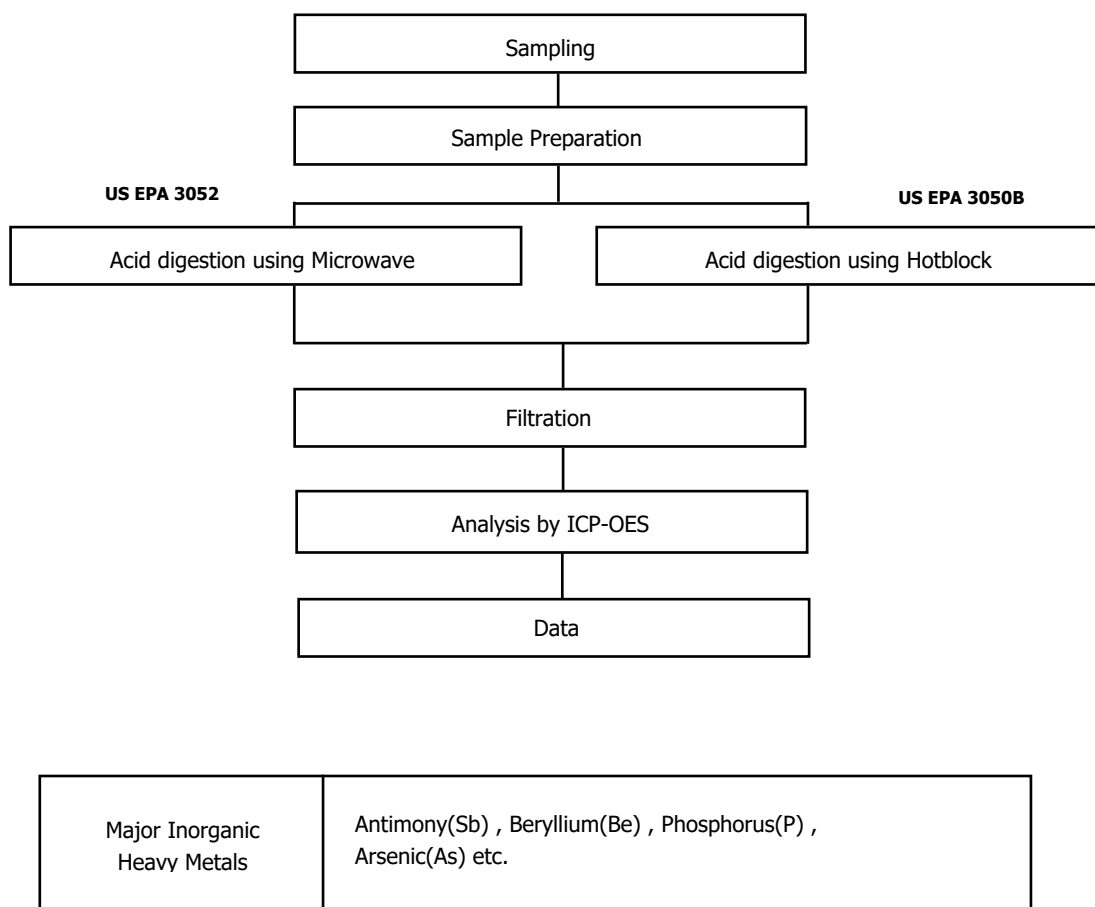
**Flow Chart for RoHS Pb / Cd / Hg / Cr<sup>6+</sup> / PBBs&PBDEs Test**


The samples were dissolved totally at the acid digestion step of the above flow chart for Cd, Pb, Hg.

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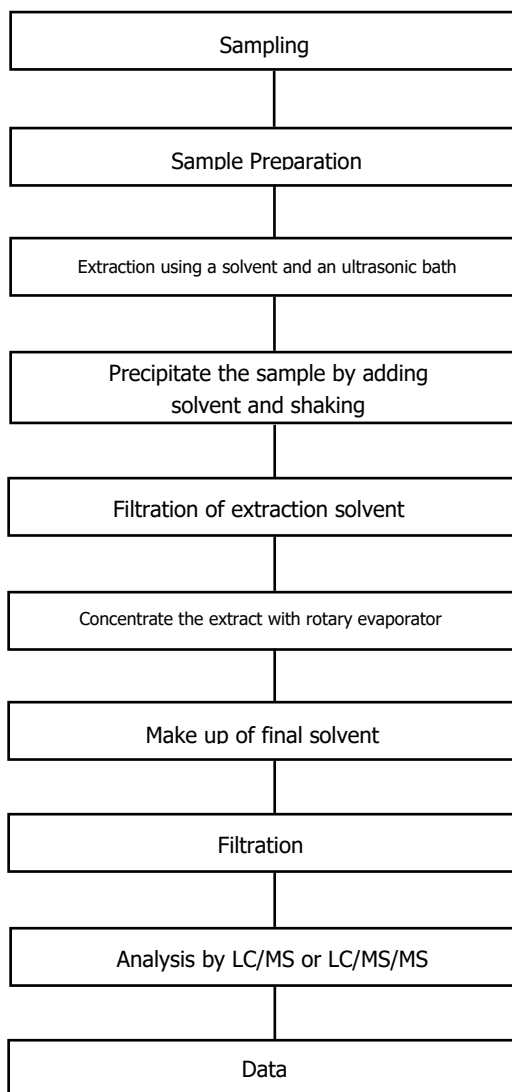
### Flow Chart for Heavy metal



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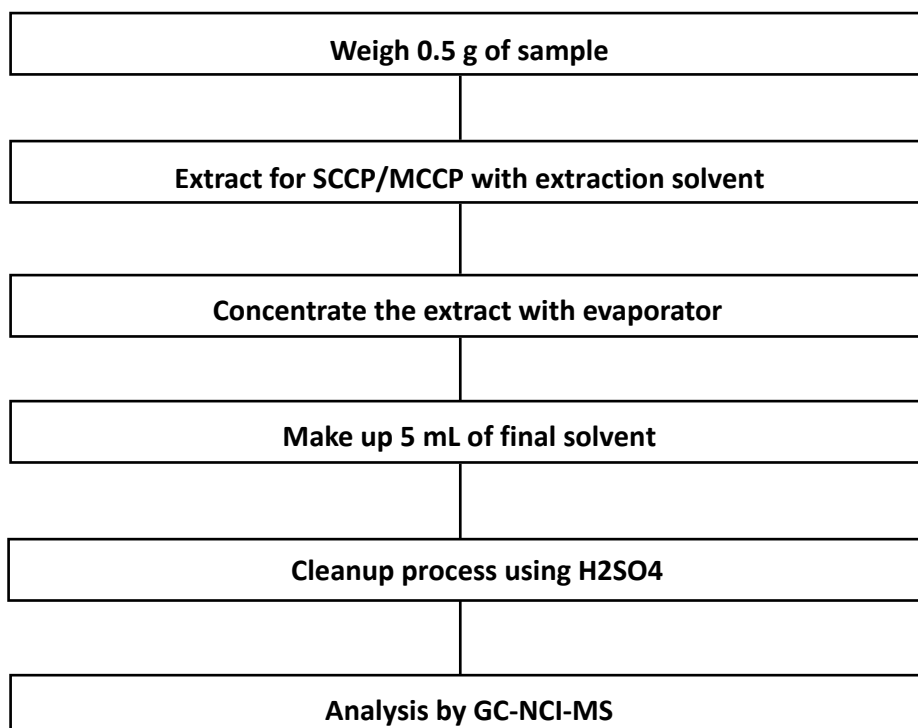
### Flow Chart for Bisphenols



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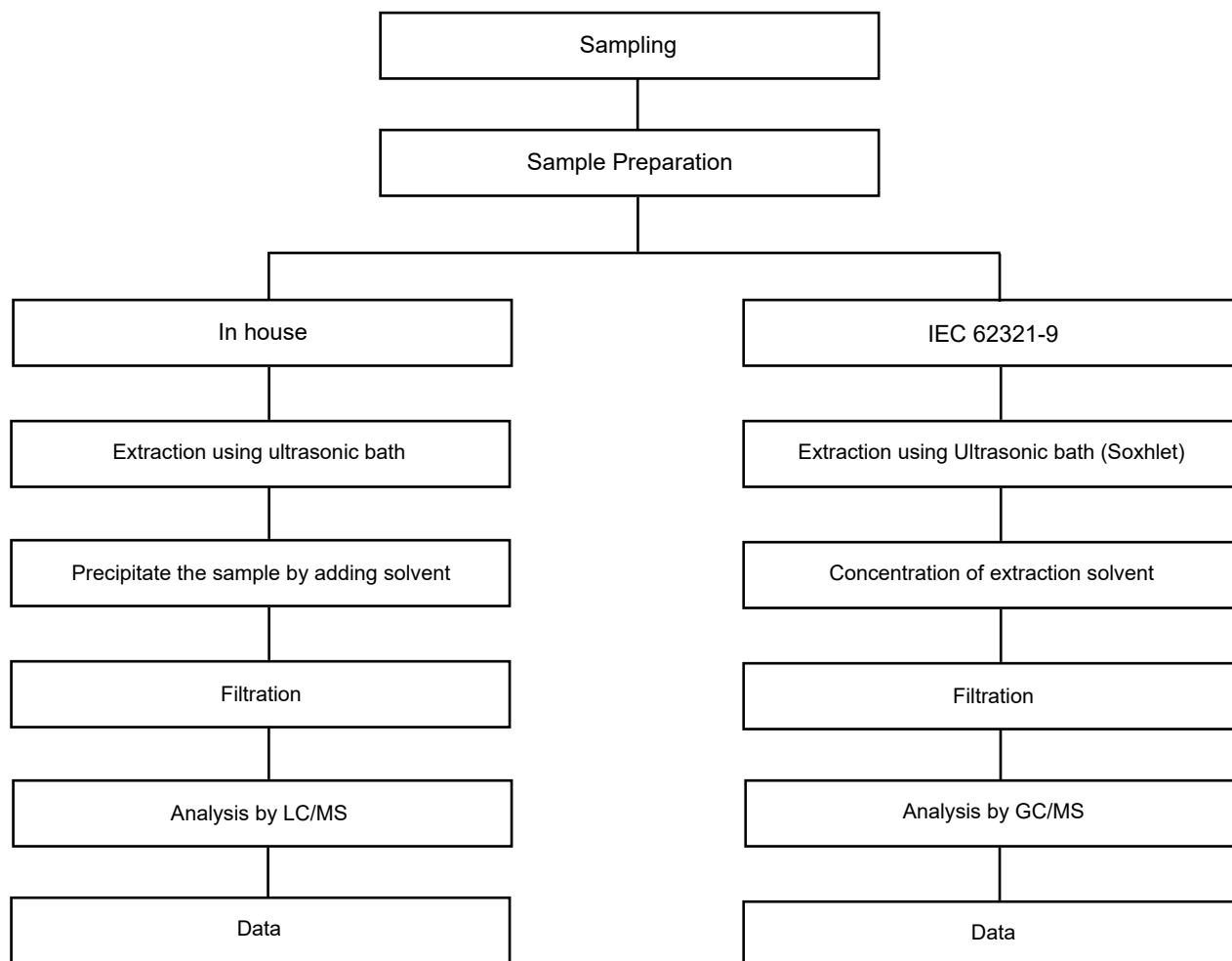


### Flow Chart for SCCP/MCCP



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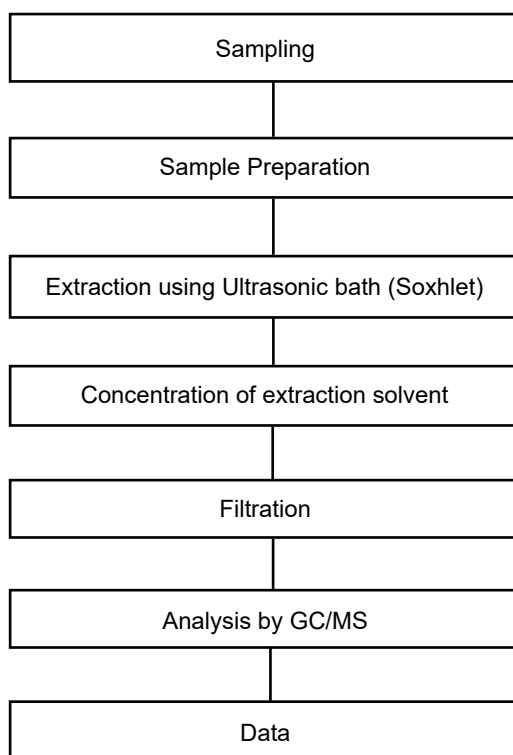
### Flow Chart for HBCDD



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Flow Chart for IEC Phthalates



\*\*\* End of Report \*\*\*

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