

Test Report

No.: CANEC25010703721

Date: May 22, 2025

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Client Name: KINGBOARD LAMINATES HOLDINGS LIMITED

Client Address: 23/F., DELTA HOUSE, NO.3 ON YIU STREET, SHATIN, N.T. HONG KONG.

Sample Name: FR-4

Model No.: KB-6160LC

The above sample(s) and information were provided by the client.

SGS Job No.: GZP25-012452

Sample Receiving Date: May 12, 2025

Testing Period: May 12, 2025 ~ May 20, 2025

Test Requested: Select test(s) as requested by the client.

Test Method(s): Please refer to next page(s).

Test Result(s): Please refer to next page(s).

Test Requirement	Conclusion
EU RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU - Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP)	Pass
AfPS GS 2019:01 PAK-Polycyclic Aromatic Hydrocarbons (PAHs)	See Results
Tetrabromobisphenol A (TBBP-A)	See Results
Alkanes C14-C17, chloro (medium- chain chlorinated paraffins) (MCCPs)	See Results
Benzotriazole UV Absorbent	See Results
Bisphenol-A	See Results
Chlorinated Paraffins	See Results
Dimethyl fumarate (DMFu)	See Results

Signed for and on behalf of
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

Arsene Ye

Arsene Ye
Approved Signatory

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Test Requirement	Conclusion
Formaldehyde	See Results
Hexabromocyclododecane (HBCDD)	See Results
Phthalates	See Results
Polyvinyl chloride (PVC)	See Results
Persistent, Bioaccumulative, and Toxic (PBT) Chemicals under US EPA Toxic Substances Control Act (TSCA) Section 6(h)	Pass
Red Phosphorus	See Results
Element(s)	See Results

Test Result(s):

Test Part Description:

SN ID	Sample No.	SGS Sample ID	Description
SN1	A8	CAN25-0107037-0001.C008	Double-side copper-clad laminate

Remarks:

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected (< MDL)
- (4) “-” = Not Regulated

EU RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU - Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP)

Test Method: With reference to IEC 62321-4:2013+AMD1:2017, IEC 62321-5:2013, IEC 62321-7-2:2017 and IEC 62321-12:2023, analysis was performed by ICP-OES/AAS, UV-Vis and GC-MS.

Test Item(s)	Limit	Unit(s)	MDL	A8
Lead (Pb)	1000	mg/kg	2	13
Mercury (Hg)	1000	mg/kg	2	ND
Cadmium (Cd)	100	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	8	ND
Polybrominated biphenyls (PBB)	1000	mg/kg	-	ND
Monobrominated biphenyl (MonoBB)	-	mg/kg	25	ND
Dibrominated biphenyl (DiBB)	-	mg/kg	25	ND
Tribrominated biphenyl (TriBB)	-	mg/kg	25	ND
Tetrabrominated biphenyl (TetraBB)	-	mg/kg	25	ND
Pentabrominated biphenyl (PentaBB)	-	mg/kg	25	ND
Hexabrominated biphenyl (HexaBB)	-	mg/kg	25	ND
Heptabrominated biphenyl (HeptaBB)	-	mg/kg	25	ND
Octabrominated biphenyl (OctaBB)	-	mg/kg	25	ND
Nonabrominated biphenyl (NonaBB)	-	mg/kg	25	ND
Decabrominated biphenyl (DecaBB)	-	mg/kg	25	ND



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Test Item(s)	Limit	Unit(s)	MDL	A8
Polybrominated diphenyl ethers (PBDE)	1000	mg/kg	-	ND
Monobrominated diphenyl ether (MonoBDE)	-	mg/kg	25	ND
Dibrominated diphenyl ether (DiBDE)	-	mg/kg	25	ND
Tribrominated diphenyl ether (TriBDE)	-	mg/kg	25	ND
Tetrabrominated diphenyl ether (TetraBDE)	-	mg/kg	25	ND
Pentabrominated diphenyl ether (PentaBDE)	-	mg/kg	25	ND
Hexabrominated diphenyl ether (HexaBDE)	-	mg/kg	25	ND
Heptabrominated diphenyl ether (HeptaBDE)	-	mg/kg	25	ND
Octabrominated diphenyl ether (OctaBDE)	-	mg/kg	25	ND
Nonabrominated diphenyl ether (NonaBDE)	-	mg/kg	25	ND
Decabrominated diphenyl ether (DecaBDE)	-	mg/kg	25	ND
Bis(2-ethylhexyl) phthalate (DEHP)	1000	mg/kg	50	ND
Butyl benzyl phthalate (BBP)	1000	mg/kg	50	ND
Dibutyl Phthalate (DBP)	1000	mg/kg	50	ND
Diisobutyl Phthalate (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.
- (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.

AfPS GS 2019:01 PAK-Polycyclic Aromatic Hydrocarbons (PAHs)

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

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Benzo(a)pyrene(BaP)	50-32-8	mg/kg	0.1	ND
Benzo(e)pyrene(BeP)	192-97-2	mg/kg	0.1	ND
Benzo(a)anthracene(BaA)	56-55-3	mg/kg	0.1	ND
Benzo(b)Fluoranthene(BbF)	205-99-2	mg/kg	0.1	ND
Benzo(j)fluoranthene(BjF)	205-82-3	mg/kg	0.1	ND
Benzo(k)Fluoranthene(BkF)	207-08-9	mg/kg	0.1	ND
Chrysene(CHR)	218-01-9	mg/kg	0.1	ND
Dibenzo(a,h)Anthracene(DBA)	53-70-3	mg/kg	0.1	ND
Benzo(g,h,i)perylene(BPE)	191-24-2	mg/kg	0.1	ND
Indeno(1,2,3-c,d)pyrene(IPY)	193-39-5	mg/kg	0.1	ND
Phenanthrene(PHE)	85-01-8	mg/kg	0.1	ND
Pyrene(PYR)	129-00-0	mg/kg	0.1	ND
Anthracene(ANT)	120-12-7	mg/kg	0.1	ND



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Test Item(s)	CAS No.	Unit(s)	MDL	A8
Fluoranthene(FLT)	206-44-0	mg/kg	0.1	ND
Sum of Phenanthrene(PHE), Pyrene(PYR), Anthracene(ANT), Fluoranthene(FLT)	-	mg/kg	-	ND
Naphthalene(NAP)	91-20-3	mg/kg	0.1	ND
Sum of 15 PAHs	-	mg/kg	-	ND
Material Category	-	-	-	-

Notes:

AfPS (German commission for Product Safety) : PAHs requirements

Parameter	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) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(e)pyrene (BeP) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(a)anthracene (BaA) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(b)fluoranthene (BbF) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(j)fluoranthene (BjF) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(k)fluoranthene (BkF) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Chrysene (CHR) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1



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Dibenzo(a,h)anthracene (DBA) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Benzo(g,h,i)perylene (BPE) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Indeno(1,2,3-cd)pyrene (IPY) mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
Phenanthrene (PHE), pyrene (PYR), anthracene (ANT), fluoranthene (FLT), mg/kg	< 1 Sum	< 5 Sum	< 10 Sum	< 20 Sum	< 50 Sum
Naphthalene (NAP) mg/kg	< 1	< 2		< 10	
Sum of 15 PAHs	<1	< 5	< 10	< 20	< 50

Notes:

^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 German committee on Product Safety (AfPS) published a new PAHs document (AfPS GS 2019:01 PAK) on April 10, 2020, which will be binding for the issue of GS mark certificate from July 1, 2020.

Tetrabromobisphenol A (TBBP-A)

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

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Tetrabromobisphenol A(TBBP-A)	79-94-7	mg/kg	5	ND

Alkanes C14-C17, chloro (medium- chain chlorinated paraffins) (MCCPs)

Test Method: With reference to ISO 22818:2021, analysis was performed by GC-NCI-MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Alkanes C ₁₄ -C ₁₇ , chloro (medium- chain chlorinated paraffins) (MCCPs)	85535-85-9 and others	mg/kg	50	ND

Benzotriazole UV Absorbent



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Test Method: SGS In-house method(GZTC CHEM-TOP-102, with reference to EPA 3550C:2007), analysis was performed by GC-MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A8
2-Benzotriazol-2-yl-4,6-di-tert-butylphenol(UV 320)	3846-71-7	mg/kg	5	ND
2-(2H-Benzotriazol-2-yl)-4(tert-butyl)-6-(sec-butyl)phenol (UV 350)	36437-37-3	mg/kg	5	ND
2-(2H-Benzotriazol-2-yl)-4,6-di-tert-pentylphenol(UV 328)	25973-55-1	mg/kg	5	ND
2,4-Di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV 327)	3864-99-1	mg/kg	5	ND

Bisphenol-A

Test Method: SGS In-house method (GZTC CHEM-TOP-075-02, With reference to EPA 3550C:2007 & EPA 8321B:2007), analysis was performed by HPLC-DAD/MS / LC-MS/MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Bisphenol-A	80-05-7	mg/kg	1.0	ND

Chlorinated Paraffins

Test Method: With reference to ISO 22818:2021,analysis was performed by GC-NCI-MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Short Chain Chlorinate Paraffins(SCCP)(C ₁₀ -C ₁₃)	85535-84-8	mg/kg	50	ND

Dimethyl fumarate (DMFu)

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

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Dimethyl Fumarate (DMFu)	624-49-7	mg/kg	0.1	ND

Formaldehyde

Test Method: With reference to ISO 14184-1:2011, analysis was performed by UV-Vis.

Test Item(s)	Unit(s)	MDL	A8
Formaldehyde	mg/kg	16	ND

Hexabromocyclododecane (HBCDD)

Test Method: With reference to IEC 62321-9:2021, analysis was performed by GC-MS.



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Test Item(s)	CAS No.	Unit(s)	MDL	A8
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α -HBCDD, β -HBCDD, γ -HBCDD)	134237-50-6 /134237-51-7 /134237-52-8 /25637-99-4 /3194-55-6	mg/kg	20	ND

Phthalates

Test Method: With reference to IEC 62321-8:2017, analysis was performed by GC-MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Dibutyl Phthalate(DBP)	84-74-2	mg/kg	50	ND
Bis-(2-ethylhexyl) Phthalate(DEHP)	117-81-7	mg/kg	50	ND
Benzyl Butyl Phthalate(BBP)	85-68-7	mg/kg	50	ND
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
Diisobutyl Phthalate(DIBP)	84-69-5	mg/kg	50	ND
Bis(2-methoxyethyl)phthalate(DMEP)	117-82-8	mg/kg	50	ND
Di-n-Hexyl Phthalate(DnHP)	84-75-3	mg/kg	50	ND
Dipentyl Phthalate (DPENP/DnPP)	131-18-0	mg/kg	50	ND
Diphenyl Phthalate(DPhP)	84-62-8	mg/kg	50	ND
Diundecyl Phthalate(DUDP)	3648-20-2	mg/kg	50	ND
Dimethyl Phthalate(DMP)	131-11-3	mg/kg	50	ND
Diethyl Phthalate(DEP)	84-66-2	mg/kg	50	ND
Dipropyl Phthalate(DPrP)	131-16-8	mg/kg	50	ND
Dicyclohexyl Phthalate(DCHP)	84-61-7	mg/kg	50	ND
Dibenzyl Phthalate(DBzP)	523-31-9	mg/kg	50	ND
Dinonyl Phthalate(DNP)	84-76-4	mg/kg	50	ND
Diisooctyl Phthalate(DIOP)	27554-26-3	mg/kg	50	ND
Diallyl Phthalate(DAP)	131-17-9	mg/kg	50	ND
n-Decyl-n-Octyl Phthalate(nDnOP)	119-07-3	mg/kg	50	ND
Di-n-Decyl Phthalate(DnDP)	84-77-5	mg/kg	50	ND
Diisopentyl Phthalate(DIPP)	605-50-5	mg/kg	50	ND
n-pentyl Isopentyl Phthalate(nPIPP)	776297-69-9	mg/kg	50	ND
Bis(2-n-butoxyethyl)Phthalate(DBEP)	117-83-9	mg/kg	50	ND
Bis(4-methyl-2-pentyl)Phthalate(BMPP)	146-50-9	mg/kg	50	ND
Bis(2-ethoxyethyl)Phthalate(DEEP)	605-54-9	mg/kg	50	ND
1,2-Benzenedicarboxylic Acid, di-C6-8-branched alkyl esters, C7-rich(DIHP)	71888-89-6	mg/kg	50	ND
Di-n-Heptyl Phthalate(DnHpP)	3648-21-3	mg/kg	50	ND
1,2-Benzenedicarboxylic Acid, Di-C7-11-Branched and Linear Alkyl Esters(DHNUP)	68515-42-4	mg/kg	50	ND
1,2-Benzenedicarboxylic Acid, Dipentyl Ester, Branched and Linear(DPP)	84777-06-0	mg/kg	50	ND
Ditridecyl Phthalate(DTDP)	119-06-2	mg/kg	50	ND



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Test Item(s)	CAS No.	Unit(s)	MDL	A8
1,2-benzenedicarboxylic Acid, dihexyl ester branched and linear (DHxP)	68515-50-4	mg/kg	50	ND
Di-(2-Ethylhexyl)Adipate (DEHA)	103-23-1	mg/kg	50	ND
Dioctyl Terephthalate (DOTP)	6422-86-2	mg/kg	50	ND
Diisononyl Adipate (DINA)	33703-08-1	mg/kg	50	ND
Di(2-propylheptyl)Phthalate (DPHP)	53306-54-0	mg/kg	50	ND
Acetyl Tributyl Citrate (ATBC)	77-90-7	mg/kg	50	ND
Trioctyl trimellitate (TOTM)	3319-31-1	mg/kg	50	ND

Polyvinyl chloride (PVC)

Test Method: SGS In-house method (SGS-CCL-TOP-066-01), analysis was performed by FTIR/HATR.

Test Item(s)	A8
Polyvinyl chloride (PVC)	Negative

Notes:

(1) Negative=Undetectable, Positive=Detectable

Persistent, Bioaccumulative, and Toxic (PBT) Chemicals under US EPA Toxic Substances Control Act (TSCA) Section 6(h)

Test Method: SGS In-house method (SGS-CCL-TOP-149-07, With reference to US EPA Method 3550C:2007), analysis was performed by GC-MS.

Test Item(s)	CAS No.	Limit	Unit(s)	MDL	A8
Decabromodiphenyl ether (DecaBDE)	1163-19-5	1000	mg/kg	5	ND
Phenol, isopropylated phosphate (3:1) (PIP 3:1)	68937-41-7	1000	mg/kg	5	ND
2,4,6-Tris(tert-butyl)phenol (2,4,6-TTBP)	732-26-3	3000	mg/kg	5	ND
Hexachlorobutadiene (HCBd)	87-68-3	Prohibited	mg/kg	5	ND
Pentachlorothiophenol (PCTP)	133-49-3	10000	mg/kg	5	ND
Conclusion					Pass

Notes:

(1) The regulation is available at the following link.

<https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/persistent-bioaccumulative-and-toxic-pbt-chemicals-under>.

(2) The rule for Decabromodiphenyl ether (DecaBDE) and Phenol, isopropylated phosphate (3:1) (PIP 3:1) is effective on January 21, 2025.

Red Phosphorus

Test Method: SGS In-house method (SGS-CCL-TOP-215-01), analysis was performed by PY-GC/MS/ICP-OES / GC-MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A8
Red Phosphorus	7723-14-0	mg/kg	500	ND



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Element(s)**Test Method:** With reference to US EPA 3052:1996, analysis was performed by ICP-OES/AAS.

Test Item(s)	Unit(s)	MDL	A8
Arsenic(As)	mg/kg	10	ND
Beryllium(Be)	mg/kg	5	ND
Nickel (Ni)	mg/kg	5	ND
Antimony(Sb)	mg/kg	10	ND

Unless otherwise stated, the decision rule for conformity reporting is based on Binary Statement for Simple Acceptance Rule ($w=0$) stated in ILAC-G8:09/2019.



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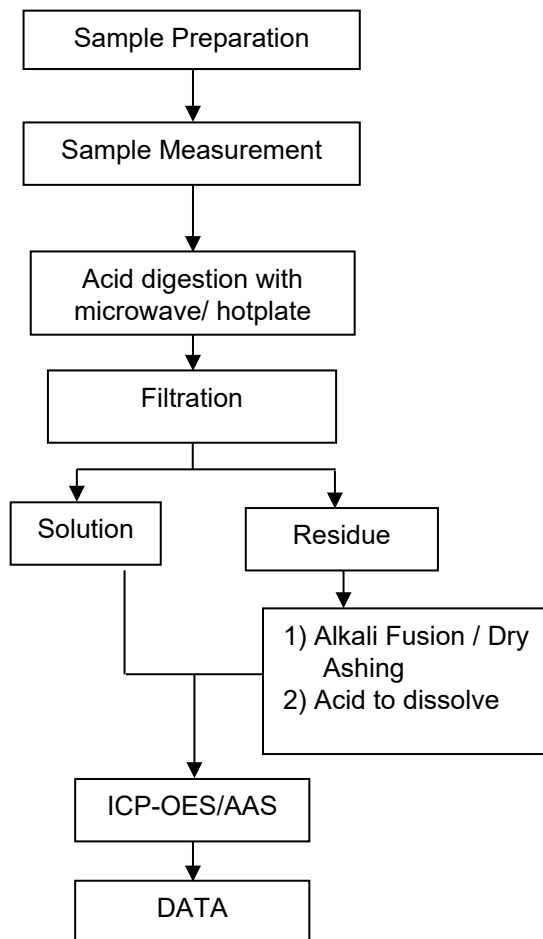
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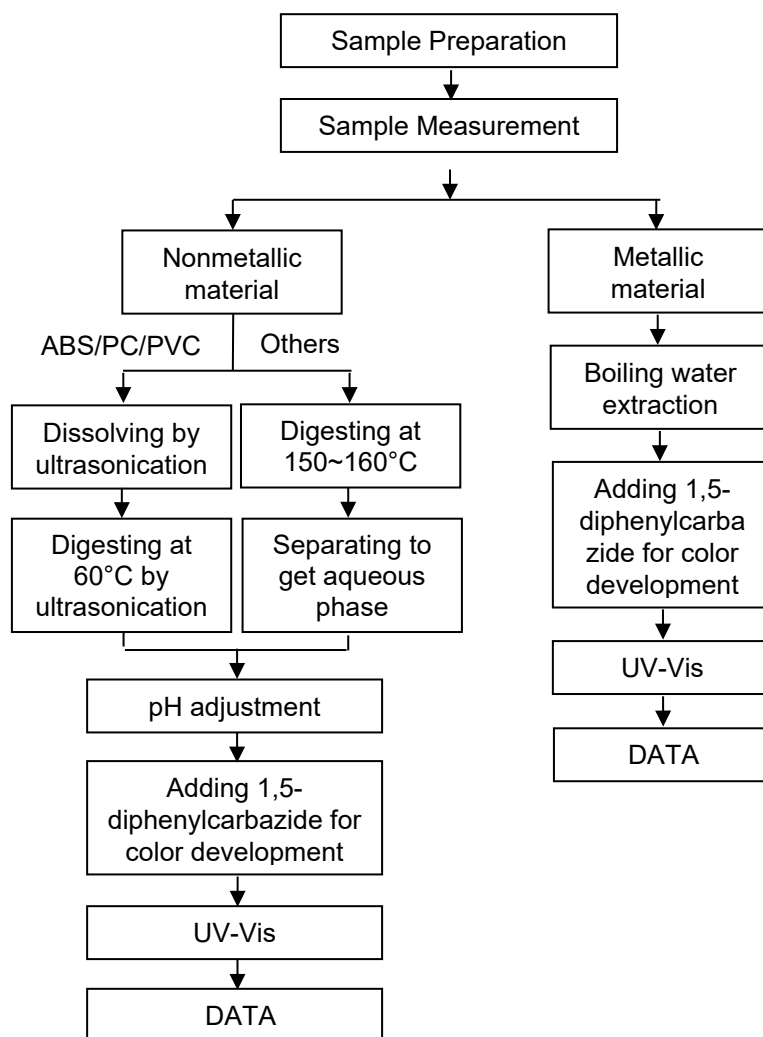
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Elements Testing Flow Chart

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



Hexavalent Chromium (Cr(VI)) Testing Flow Chart



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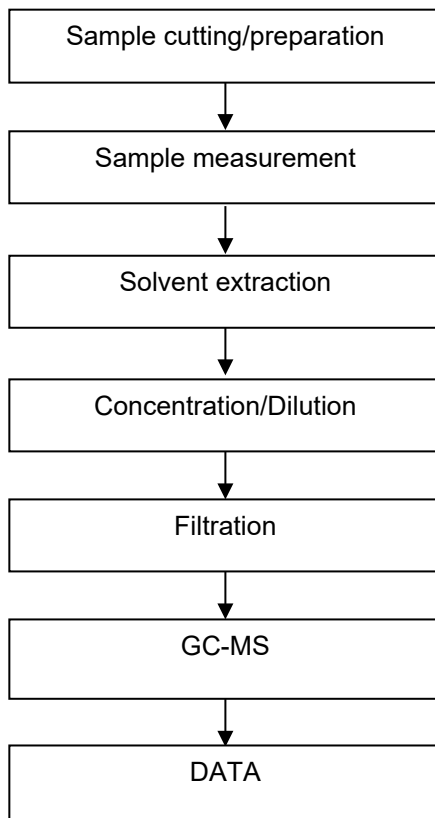
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PBB/PBDE/Phthalates Testing Flow Chart



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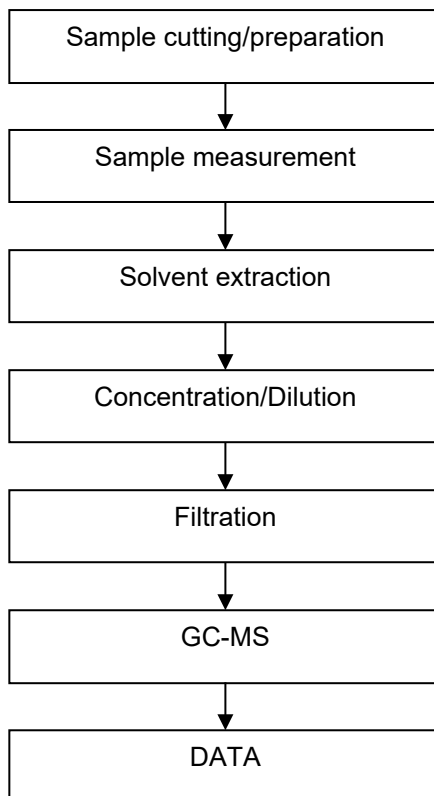
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PAHs Testing Flow Chart



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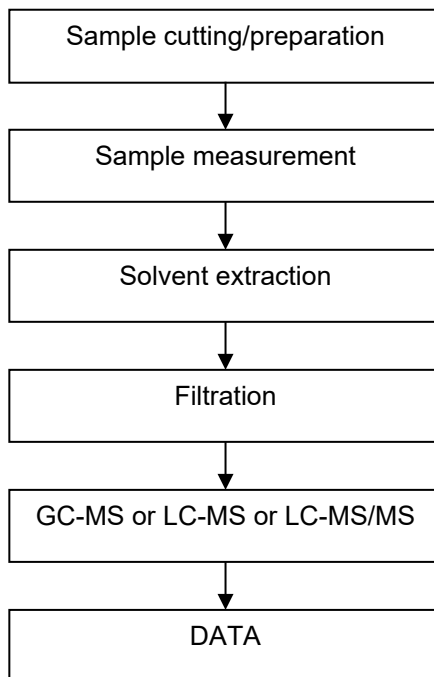
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TBBP-A Testing Flow Chart



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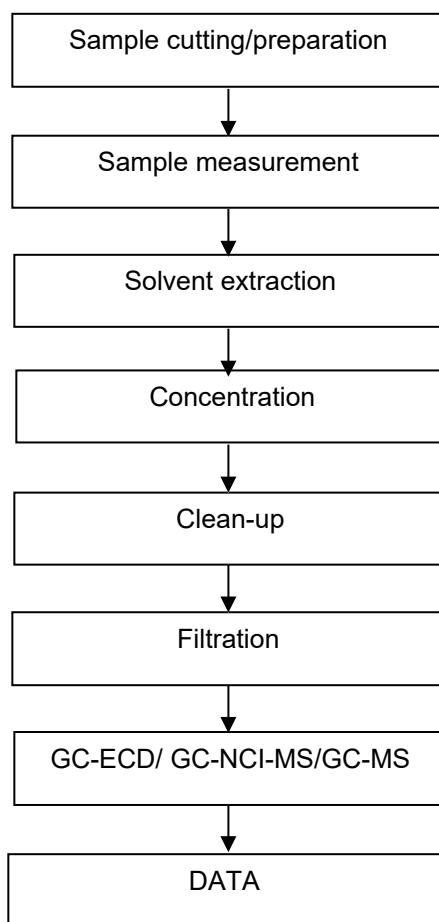
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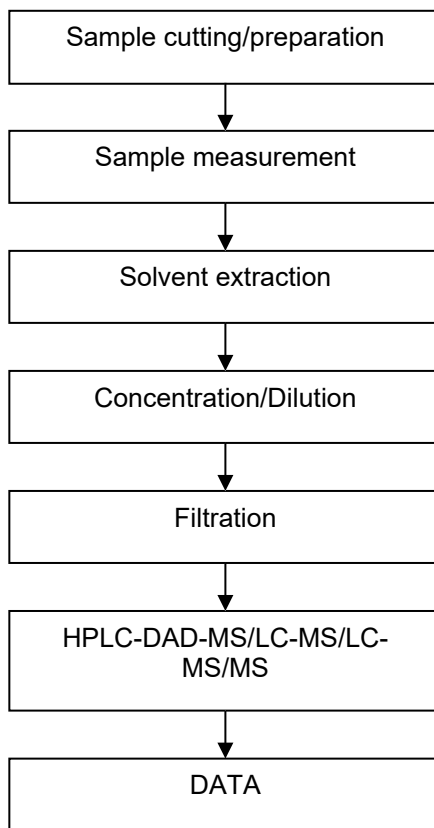
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Chlorinated Paraffin Testing Flow Chart



Bisphenols Testing Flow Chart



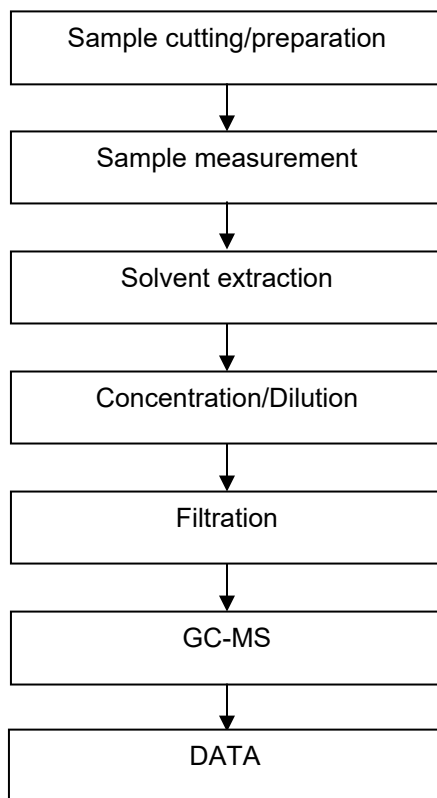
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DMF (Dimethyl fumarate) Testing Flow Chart



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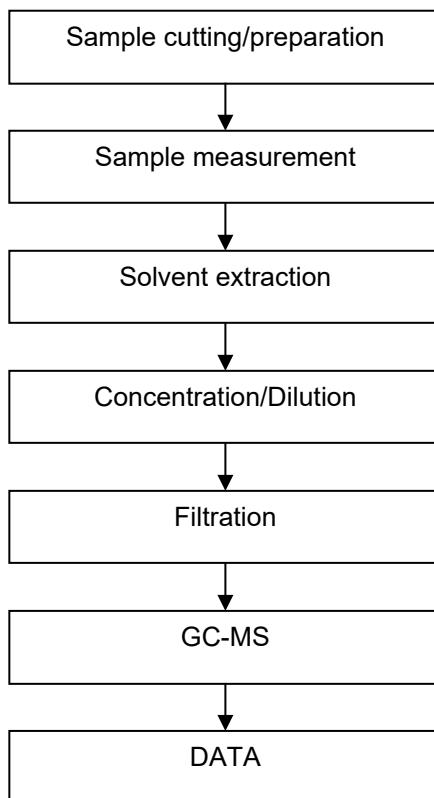
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HBCDD Testing Flow Chart



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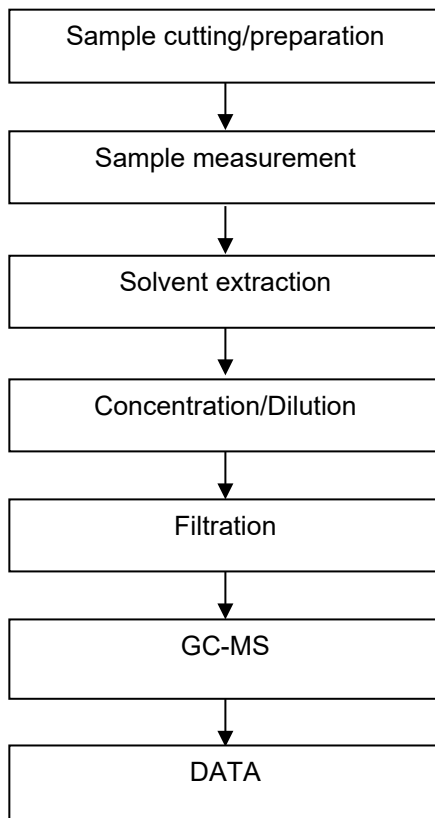
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Phthalates Testing Flow Chart



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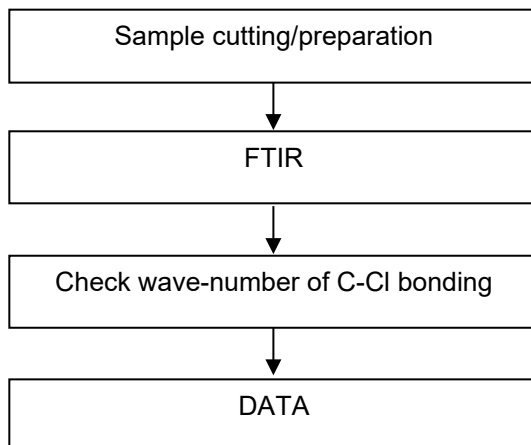
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PVC Testing Flow Chart



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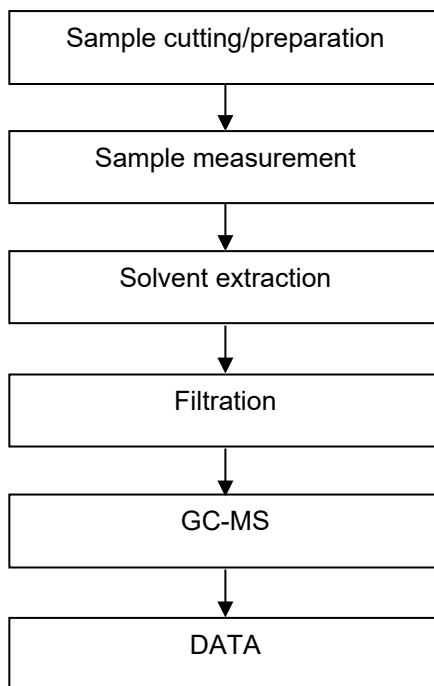
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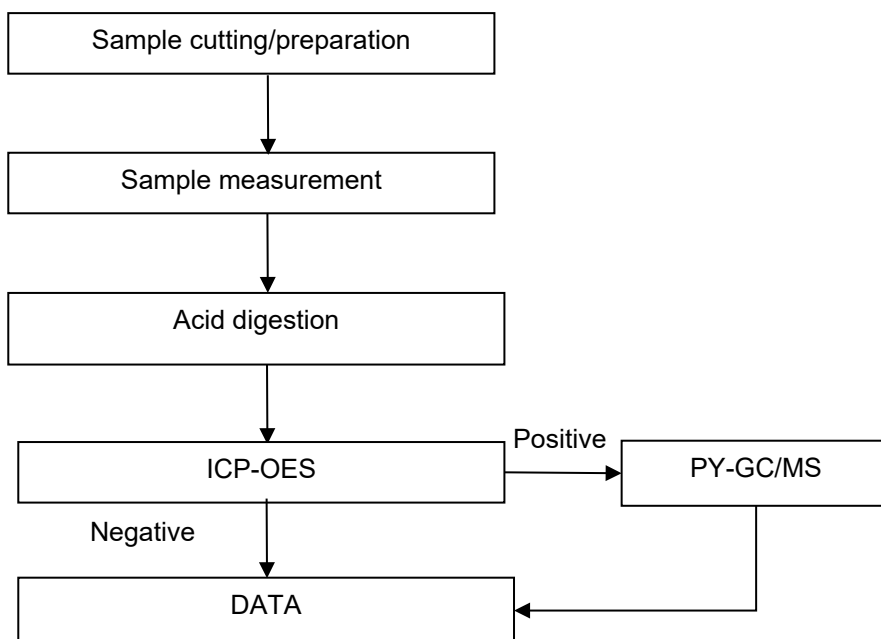
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Persistent, Bioaccumulative, and Toxic (PBT) Chemicals Testing Flow Chart



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Red phosphorus Testing Flow Chart



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Elements Testing Flow Chart



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Sample Photo:



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