



Test Report

No. 4965595-CH01

Date: October 11, 2022

Page 1 of 20

So Clean Solutions
5804 Elain Dr., Ste #101
Rockford, IL 61108
United States

This report supersedes all previous documents bearing the test report number 4965595-CH01-PRE.

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

Surtec Nickel Sulfamate Concentrate
Surtec WA
Surtec AC

Sample Received Date: **09/27/2022**

Testing Period: **09/27/2022 – 10/11/2022**

Test Requested : Please refer to the result summary.

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

Result Summary :

Test Requested	Comment
1. RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU	PASS
2. Halogen Content (Cl, Br, I, F) of the submitted sample(s) with reference to BS EN 14582:2016	See Test Results
3. Annex XVII of REACH Regulation (EC) No. 1907/2006 and its amendments –Perfluorooctane Sulfonates (PFOS) Content (Formerly Directive 2006/122/EC)	PASS
4. Perfluorooctanoic Acid (PFOA) Content	See Test Results
5. Antimony Content	See Test Results
6. Beryllium Content	See Test Results
7. Iron Content	See Test Results
8. Copper Content	See Test Results
9. Manganese Content	See Test Results
10. Zinc Content	See Test Results
11. Arsenic Content	See Test Results
12. Boron Content	See Test Results
13. Total Phosphorus Content	See Test Results

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Signed for and on behalf of SGS North America, Inc.

Prepared By:



Sam Chien
Laboratory supervisor, Chemistry laboratory

Suzie Banik
Technical Report Writer, Chemistry Laboratory

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

Test Item(s):	Unit	Test Method	Results	MDL	Limit
			1		
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cd and Pb by ICP-OES and /or ICP-MS)	ND	2	100
Lead (Pb)	mg/kg		ND	2	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+A1:2017 (Determination of Hg by ICP-OES and/ or ICP-MS)	ND	2	1000
Hexavalent Chromium (CrVI)	mg/kg	With reference to IEC 62321-7-2:2017 (Determination of CrVI by UV-Vis)	ND*	8	1000
Sum of PBBs	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBB and PBDE by GC-MS)	ND	-	1000
Monobromobiphenyl	mg/kg		ND	5	-
Dibromobiphenyl	mg/kg		ND	5	-
Tribromobiphenyl	mg/kg		ND	5	-
Tetrabromobiphenyl	mg/kg		ND	5	-
Pentabromobiphenyl	mg/kg		ND	5	-
Hexabromobiphenyl	mg/kg		ND	5	-
Heptabromobiphenyl	mg/kg		ND	5	-
Octabromobiphenyl	mg/kg		ND	5	-
Nonabromobiphenyl	mg/kg		ND	5	-
Decabromobiphenyl	mg/kg		ND	5	-
Sum of PBDEs	mg/kg		ND	-	1000
Monobromodiphenyl ether	mg/kg		ND	5	-
Dibromodiphenyl ether	mg/kg		ND	5	-
Tribromodiphenyl ether	mg/kg	ND	5	-	
Tetrabromodiphenyl ether	mg/kg	ND	5	-	
Pentabromodiphenyl ether	mg/kg	ND	5	-	
Hexabromodiphenyl ether	mg/kg	ND	5	-	
Heptabromodiphenyl ether	mg/kg	ND	5	-	
Octabromodiphenyl ether	mg/kg	ND	5	-	
Nonabromodiphenyl ether	mg/kg	ND	5	-	
Decabromodiphenyl ether	mg/kg	ND	5	-	
Bis (2-ethylhexyl) Phthalate (DEHP)	mg/kg	IEC 62321-8:2017 (Determination of DEHP, BBP, DBP and DIBP by GC-MS)	ND	50	1000
Butyl Benzyl Phthalate (BBP)	mg/kg		ND	50	1000
Dibutyl Phthalate (DBP)	mg/kg		ND	50	1000
Diisobutyl Phthalate (DIBP)	mg/kg		ND	50	1000
Conclusion	/	/	PASS	/	/

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Test Item(s):	Unit	Test Method	Results	MDL	Limit
			2		
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cd and Pb by ICP-OES and /or ICP-MS)	ND	2	100
Lead (Pb)	mg/kg		ND	2	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+A1:2017 (Determination of Hg by ICP-OES and/ or ICP-MS)	ND	2	1000
Hexavalent Chromium (CrVI)	mg/kg	With reference to IEC 62321-7-2:2017 (Determination of CrVI by UV-Vis)	ND*	8	1000
Sum of PBBs	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBB and PBDE by GC-MS)	ND	-	1000
Monobromobiphenyl	mg/kg		ND	5	-
Dibromobiphenyl	mg/kg		ND	5	-
Tribromobiphenyl	mg/kg		ND	5	-
Tetrabromobiphenyl	mg/kg		ND	5	-
Pentabromobiphenyl	mg/kg		ND	5	-
Hexabromobiphenyl	mg/kg		ND	5	-
Heptabromobiphenyl	mg/kg		ND	5	-
Octabromobiphenyl	mg/kg		ND	5	-
Nonabromobiphenyl	mg/kg		ND	5	-
Decabromobiphenyl	mg/kg		ND	5	-
Sum of PBDEs	mg/kg		ND	-	1000
Monobromodiphenyl ether	mg/kg		ND	5	-
Dibromodiphenyl ether	mg/kg		ND	5	-
Tribromodiphenyl ether	mg/kg	ND	5	-	
Tetrabromodiphenyl ether	mg/kg	ND	5	-	
Pentabromodiphenyl ether	mg/kg	ND	5	-	
Hexabromodiphenyl ether	mg/kg	ND	5	-	
Heptabromodiphenyl ether	mg/kg	ND	5	-	
Octabromodiphenyl ether	mg/kg	ND	5	-	
Nonabromodiphenyl ether	mg/kg	ND	5	-	
Decabromodiphenyl ether	mg/kg	ND	5	-	
Bis (2-ethylhexyl) Phthalate (DEHP)	mg/kg	IEC 62321-8:2017 (Determination of DEHP, BBP, DBP and DIBP by GC-MS)	ND	50	1000
Butyl Benzyl Phthalate (BBP)	mg/kg		ND	50	1000
Dibutyl Phthalate (DBP)	mg/kg		ND	50	1000
Diisobutyl Phthalate (DIBP)	mg/kg		ND	50	1000
Conclusion	/	/	PASS	/	/

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Test Item(s):	Unit	Test Method	Results	MDL	Limit
			3		
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cd and Pb by ICP-OES and /or ICP-MS)	ND	2	100
Lead (Pb)	mg/kg		ND	2	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+A1:2017 (Determination of Hg by ICP-OES and/ or ICP-MS)	ND	2	1000
Hexavalent Chromium (CrVI)	mg/kg	With reference to IEC 62321-7-2:2017 (Determination of CrVI by UV-Vis)	ND*	8	1000
Sum of PBBs	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBB and PBDE by GC-MS)	ND	-	1000
Monobromobiphenyl	mg/kg		ND	5	-
Dibromobiphenyl	mg/kg		ND	5	-
Tribromobiphenyl	mg/kg		ND	5	-
Tetrabromobiphenyl	mg/kg		ND	5	-
Pentabromobiphenyl	mg/kg		ND	5	-
Hexabromobiphenyl	mg/kg		ND	5	-
Heptabromobiphenyl	mg/kg		ND	5	-
Octabromobiphenyl	mg/kg		ND	5	-
Nonabromobiphenyl	mg/kg		ND	5	-
Decabromobiphenyl	mg/kg		ND	5	-
Sum of PBDEs	mg/kg		ND	-	1000
Monobromodiphenyl ether	mg/kg		ND	5	-
Dibromodiphenyl ether	mg/kg	ND	5	-	
Tribromodiphenyl ether	mg/kg	ND	5	-	
Tetrabromodiphenyl ether	mg/kg	ND	5	-	
Pentabromodiphenyl ether	mg/kg	ND	5	-	
Hexabromodiphenyl ether	mg/kg	ND	5	-	
Heptabromodiphenyl ether	mg/kg	ND	5	-	
Octabromodiphenyl ether	mg/kg	ND	5	-	
Nonabromodiphenyl ether	mg/kg	ND	5	-	
Decabromodiphenyl ether	mg/kg	ND	5	-	
Bis (2-ethylhexyl) Phthalate (DEHP)	mg/kg	IEC 62321-8:2017 (Determination of DEHP, BBP, DBP and DIBP by GC-MS)	ND	50	1000
Butyl Benzyl Phthalate (BBP)	mg/kg		ND	50	1000
Dibutyl Phthalate (DBP)	mg/kg		ND	50	1000
Diisobutyl Phthalate (DIBP)	mg/kg		ND	50	1000
Conclusion	/	/	PASS	/	/

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

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Note:

- (a) mg/kg = ppm ; 0.1wt% = 1000ppm
- (b) ND= not detected
- (c) MDL = Method Detection Limit
- (d) - = not regulated
- (e) * = Total Chromium analysis by ICP-MS and/or ICP-OES was not detected in submitted sample. Therefore, Hexavalent Chromium determination using UV-Visible Spectroscopy was not performed.
- (f) IEC 62321 series is equivalent to EN 62321 series
http://www.cenelec.eu/dyn/wwwf?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25

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2. Halogen Content

Test Method: With reference to **BS EN 14582:2016** "Characterization of waste – Halogen and sulfur content – Oxygen Combustion in closed systems and determination methods". Analysis was performed by Ion Chromatography.

Test Item(s):	Unit	Results			MDL
		1	2	3	
Fluorine (F)	mg/kg	ND	ND	ND	50
Chlorine (Cl)	mg/kg	ND	67	245,000	50
Bromine (Br)	mg/kg	ND	ND	1130	50
Iodine (I)	mg/kg	ND	ND	ND	50

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. ppm = parts per million
 2. mg/kg = ppm
 3. 1% = 10000 ppm (mg/kg)
 4. ND = Not Detected, reported when the reading is less than the reporting limit value.

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3. Annex XVII of REACH Regulation (EC) No. 1907/2006 and its amendments – Perfluorooctane sulfonates (PFOS) content (Formerly Directive 2006/122/EC)

Test Method: Solvent extraction followed by analysis with High Performance Liquid Chromatography – Mass Selective Detector (HPLC-MSD).

Test Item	Result (%)			Detection Limit (%)	Permissible Limit (%)
	1	2	3		
Perfluorooctane Sulfonates (PFOS)#	ND	ND	ND	0.0001	0.005
Comment	PASS	PASS	PASS	--	--

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note : 1. % = percentage by weight
 2. ND = Not Detected
 3. # = Perfluorooctane sulfonates (PFOS) are represented by sum of PFOS – Acid, PFOS – Metal Salt and PFOS – Amide.

Remark: Recommended requirement with reference to commission regulation (EU) No. 757/2010 amending Regulation (EC) No 850/2004 (previously restricted under entry 53 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006)

4. Perfluorooctanoic Acid (PFOA) Content

Test Method: Solvent extraction followed by analysis with High Performance Liquid Chromatography – Mass Selective Detector (HPLC-MSD).

Test Item	Result (%)			Detection Limit (%)
	1	2	3	
Perfluorooctanoic Acid (PFOA)	ND	ND	ND	0.0001

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note : 1. % = percentage by weight
 2. ND = Not Detected

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5. Antimony Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Antimony (Sb)	ND	ND	ND	10

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

6. Beryllium Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Beryllium (Be)	ND	ND	ND	5

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

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7. Iron Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Iron (Fe)	81.4	ND	32.5	10

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

8. Copper Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Copper (Cu)	ND	ND	ND	5

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

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9. Manganese Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Manganese (Mn)	ND	ND	ND	5

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

10. Zinc Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Zinc (Zn)	239	1670	37.5	5

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

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11. Arsenic Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Arsenic (As)	ND	ND	ND	10

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

12. Boron Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Boron (B)	ND	ND	590	5

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

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13. Total Phosphorus Content

Test Method: With reference to US EPA Method 3051 followed by analysis using ICP-OES and/or ICP-MS.

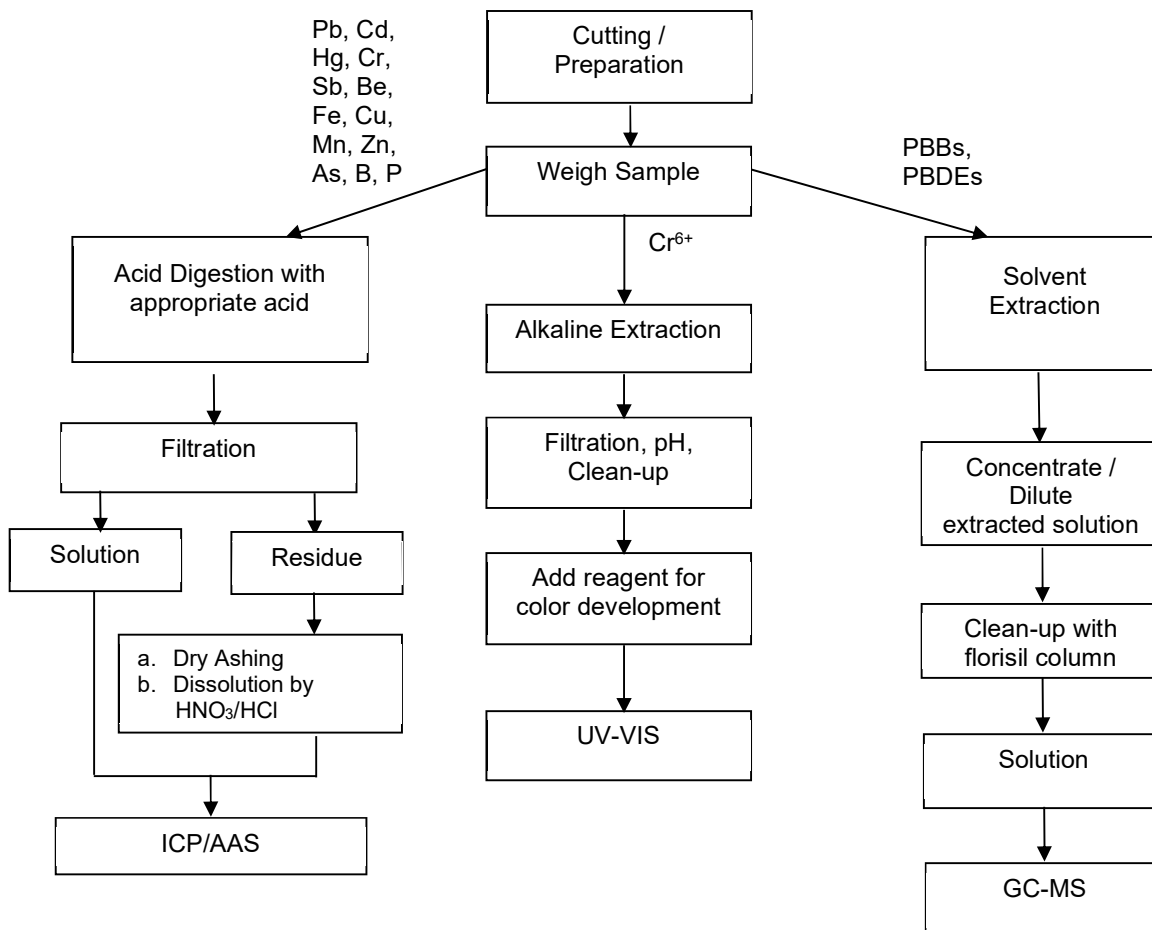
Test Item	Result (mg/kg)			Detection Limit (mg/kg)
	1	2	3	
Phosphorus (P)	ND	27.3	ND	20

Sample Description:

1. Surtec Nickel Sulfamate Concentrate
2. Surtec WA
3. Surtec AC

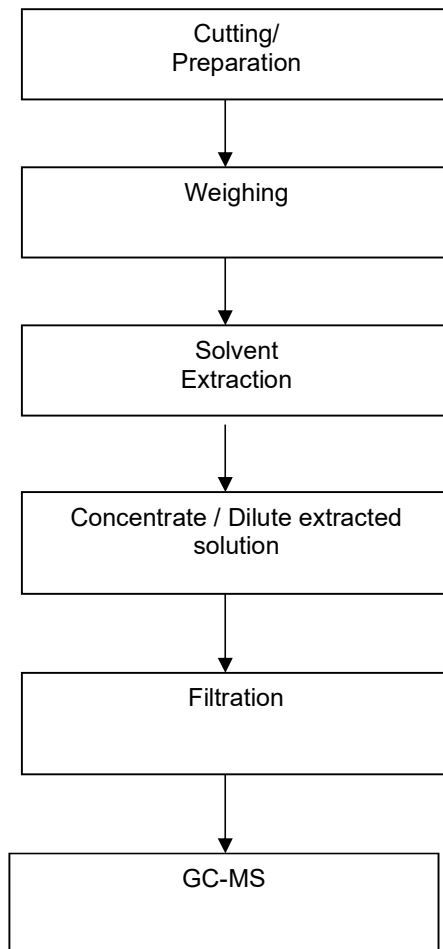
Note: 1. mg/kg = milligram per kilogram
 2. ND = Not Detected, reported when the reading is less than the detection limit value.
 3. mg/kg = ppm

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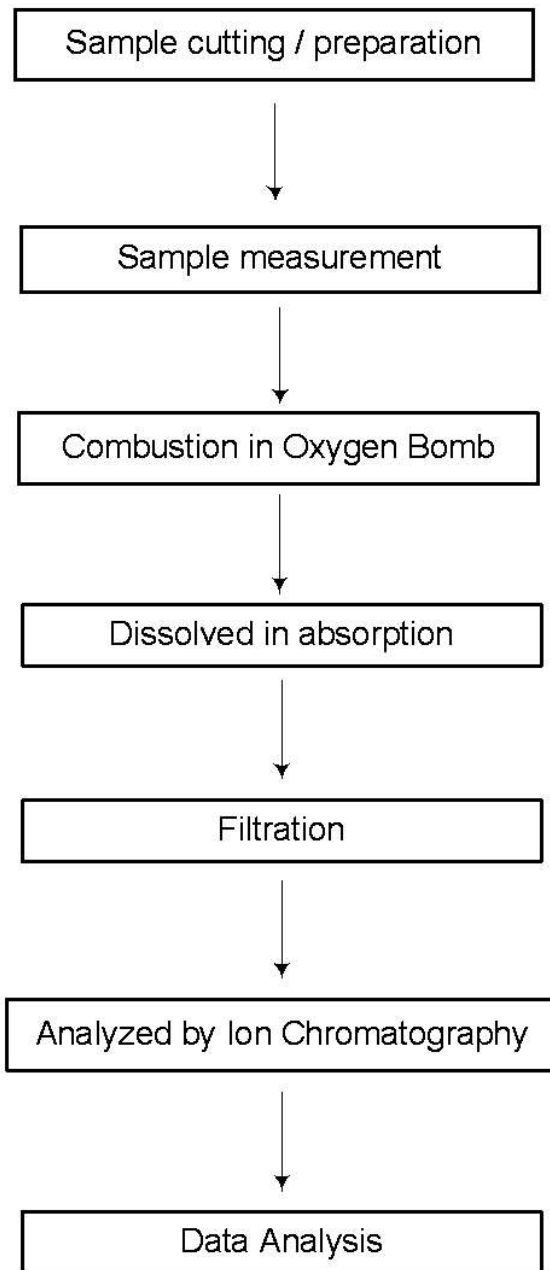
Flowchart for RoHS Testing:


- Note : 1. Cr⁶⁺ is performed only when total Cr is detected
 2. The Be, Sb, Cr, Cd, Pb and Hg contents test on polymeric samples were dissolved totally by pre-conditioning method according to above flow chart.

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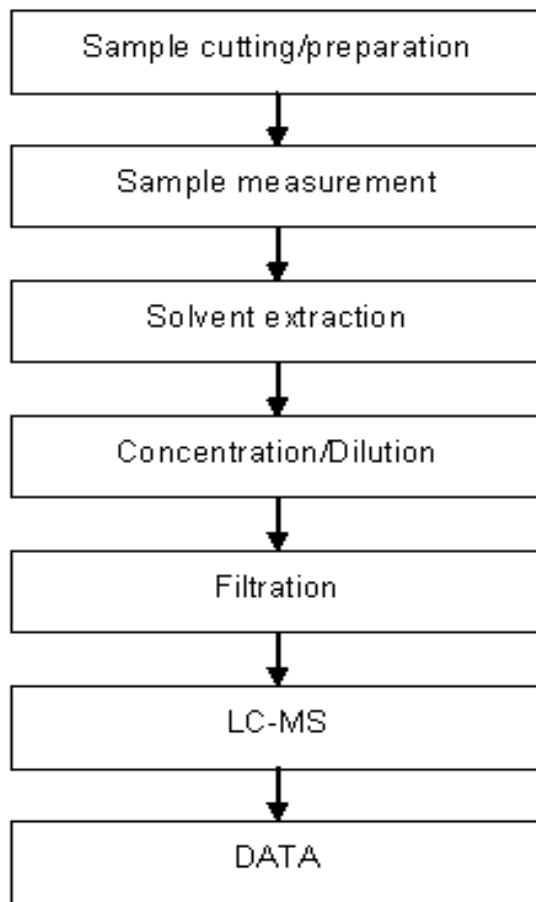
Flowchart for Phthalates


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Halogen Testing Flow Chart


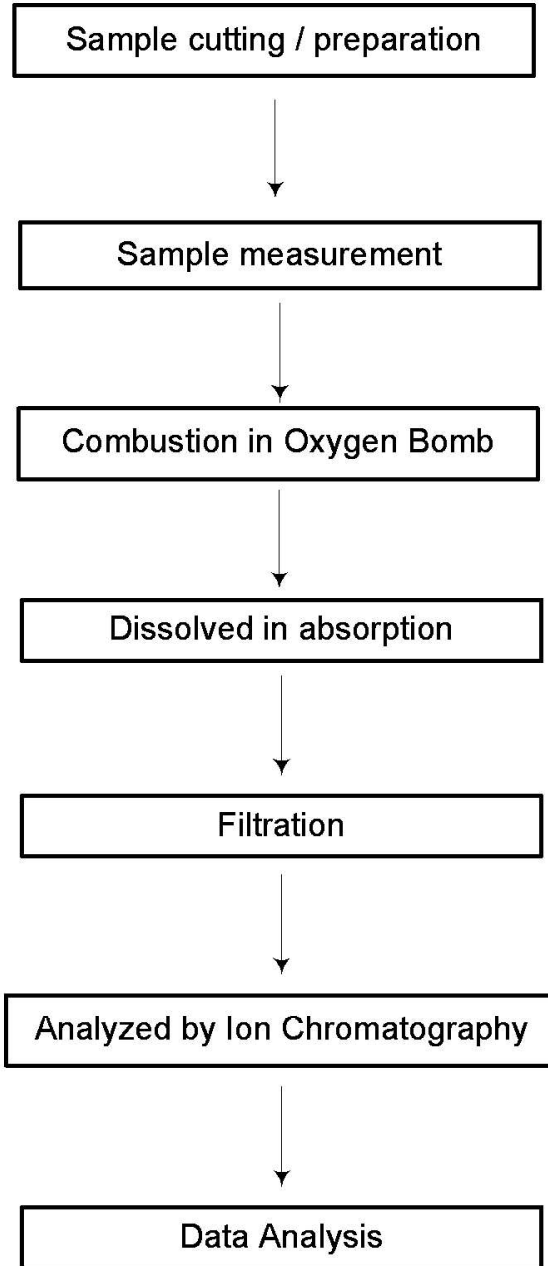
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PFOS/PFOA Testing Flow Chart



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Halogen Testing Flow Chart



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