



Test Report

No. 4513508-CH08-R1

Date: October 3, 2019

Page 1 of 14

NeoGraf Solutions, LLC
11709 Madison Ave.
Lakewood, OH 44107
United States

"This report supersedes all previous documents bearing the test report number 4513508-CH08."

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

Sample Received Date: **8/19/2019**

Testing Period: **8/19/2019 – 10/2/2019**

Revision Summary : Sample description updated.

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 2011/65/EU Annex II	PASS
2. Directive (EU) 2015/863 of amending RoHS Directive 2011/65/EU	PASS
3. US California Proposition 65 – Phthalate Content	PASS
4. Halogen Content (Cl, Br, I, F) of the submitted sample(s) with reference to BS EN 14582:2016	See Test Results
5. Antimony Content	See Test Results
6. Beryllium Content	See Test Results
7. Annex XVII of REACH Regulation (EC) No. 1907/2006 and its amendments – Perfluorooctane Sulfonates (PFOS) Content (Formerly Directive 2006/122/EC)	PASS
8. Perfluorooctanoic Acid (PFOA) Content	See Test Results

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

Prepared By:

Jennifer Valal
Laboratory Manager, Chemistry Laboratory

Shaina Gibbons
Technical Report Writer, Chemistry Laboratory

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1. RoHS Directive 2011/65/EU Annex II

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 (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*	2	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	-	
Conclusion	/		PASS	/	/

Sample Description:

1. GRAFOIL® (GTC)

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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
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2. Directive (EU) 2015/863 of amending RoHS Directive 2011/65/EU

Test Item(s):	Unit	Test Method	Results	MDL	Limit
			1		
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. GRAFOIL® (GTC)

Note:

- (a) mg/kg = ppm ; 0.1wt% = 1000ppm
- (b) ND= not detected
- (c) MDL = Method Detection Limit
- (d) - = not regulated
- (e) IEC 62321 series is equivalent to EN 62321 series

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3. US California Proposition 65 – Phthalate Content

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

Phthalates	CAS No.	Result (ppm)	Detection Limit (ppm)	Reference Limit (ppm)
		1		
Dibutyl Phthalate (DBP)	84-74-2	ND	50	1000
Benzylbutyl Phthalate (BBP)	85-68-7	ND	50	1000
Bis-(2-ethylhexyl) Phthalate (DEHP)	117-81-7	ND	50	1000
Diisodecyl Phthalate (DIDP)	26761-40-0 / 68515-49-1	ND	50	1000
Di-n-hexyl Phthalate (DnHP)	84-75-3	ND	50	1000
Diisononyl Phthalate (DINP)	28553-12-0 / 68515-48-0	ND	50	1000
Conclusion	--	PASS	--	--

Sample Description:

1. GRAFOIL® (GTC)

- Note:
1. ppm = parts per million
 2. mg/kg = ppm
 3. 1% = 10000 ppm (mg/kg)
 4. ND = Not Detected

Remark: The reference limit applied in testing is based on particular prop 65 settlements that are most similar to the tested product in the opinion of the lab. The testing in this report does not reflect a user's actual exposure to the tested chemical.
A manufacturer or retailer that is not named in the referenced settlement is not bound by that settlement, and may choose to comply with Proposition 65 by clearly informing the consumer of potential exposure.

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4. Halogen Content (Cl, Br, I, F) of the submitted sample(s) with reference to BS EN 14582:2016

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 Items	Unit	Method Detection Limit	1
Halogen – Chlorine (Cl) CAS # 007782-50-5	mg/kg	50	ND
Halogen – Bromine (Br) CAS # 007726-95-6	mg/kg	50	ND
Halogen – Fluorine (F) CAS # 007782-41-4	mg/kg	50	ND
Halogen – Iodine (I) CAS # 007553-56-2	mg/kg	50	ND

Sample Description:

1. GRAFOIL® (GTC)

- 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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5. Antimony Content

Test Method: With reference to US EPA Method 3050B followed by analysis using ICP-OES and/or ICP-MS.

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

Sample Description:

1. GRAFOIL® (GTC)

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 3050B followed by analysis using ICP-OES and/or ICP-MS.

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

Sample Description:

1. GRAFOIL® (GTC)

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

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

Test Item	Result (%)	Detection Limit (%)	Permissible Limit (%)
	1		
Perfluorooctane sulfonates (PFOS)#	ND	0.001	0.005
Comment	PASS	--	--

Sample Description:

1. GRAFOIL® (GTC)

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)

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8. Perfluorooctanoic Acid (PFOA) Content

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

Test Item	Result (%)	Detection Limit (%)
	1	
Perfluorooctanoic Acid (PFOA)	ND	0.001

Sample Description:

1. GRAFOIL® (GTC)

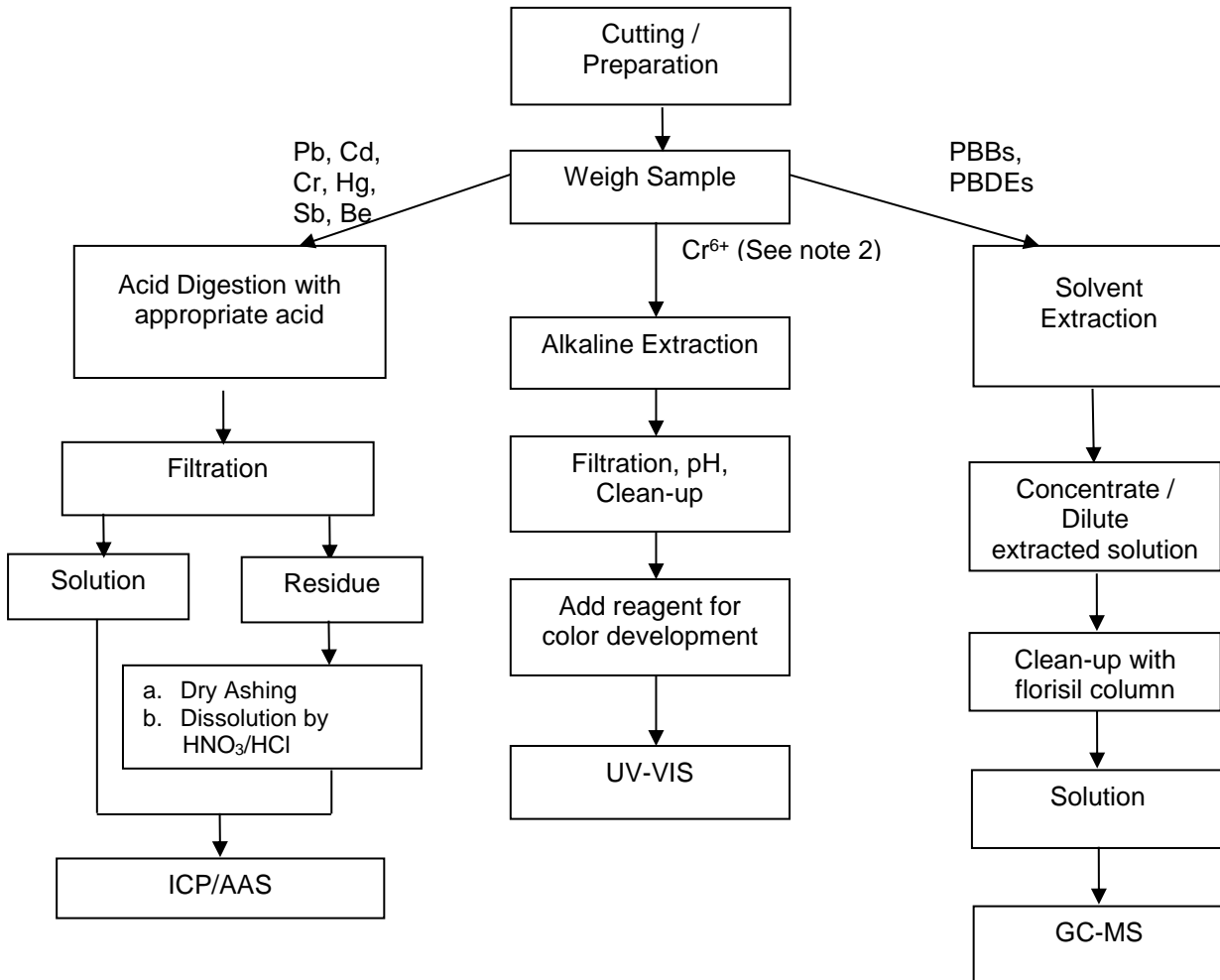
Note : 1. % = percentage by weight

2. ND = Not Detected

3. + PFOA related substances refer to the sum of Perfluoro-1-iodooctane (PFOI) and 1H,1H,2H, 2H-Perfluoro-1-decanol (8:2 FTOH).

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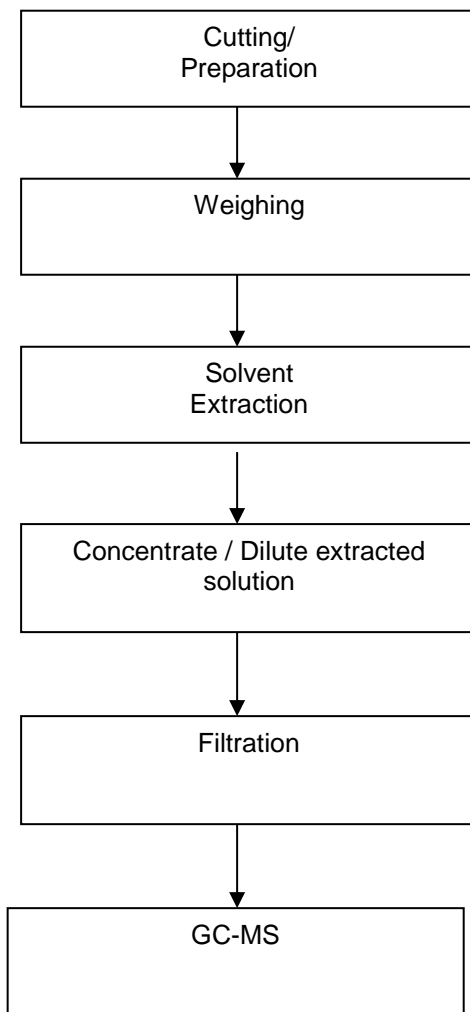
Flowchart for RoHS, Beryllium and Antimony Testing:



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

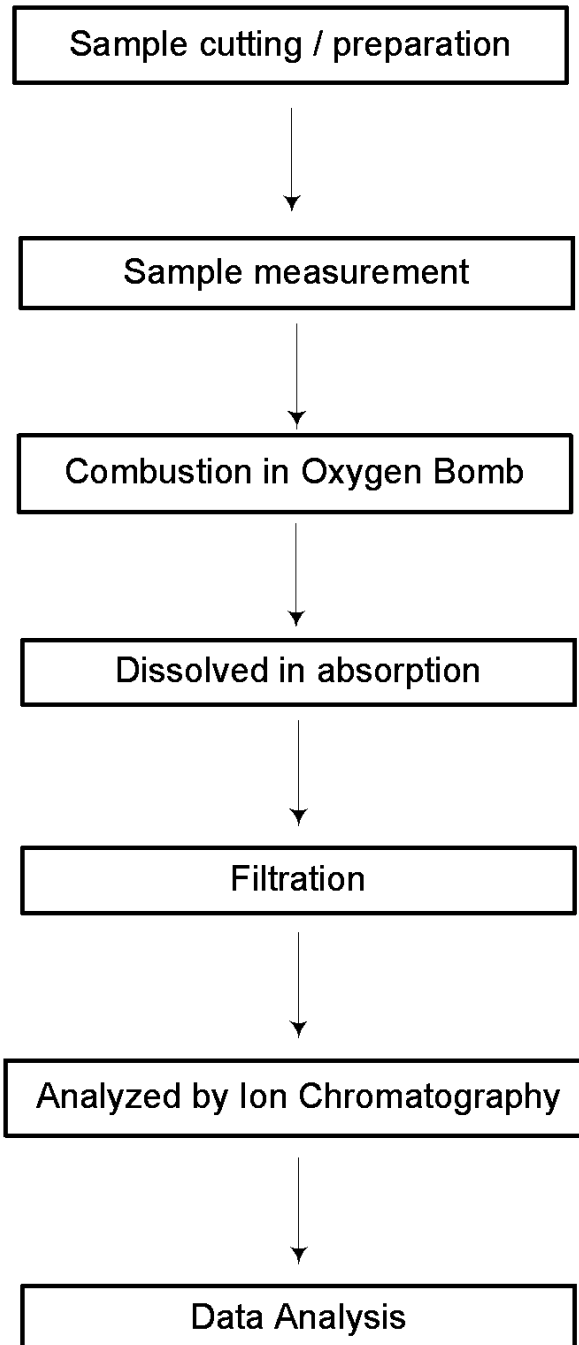
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Flowchart for Phthalates



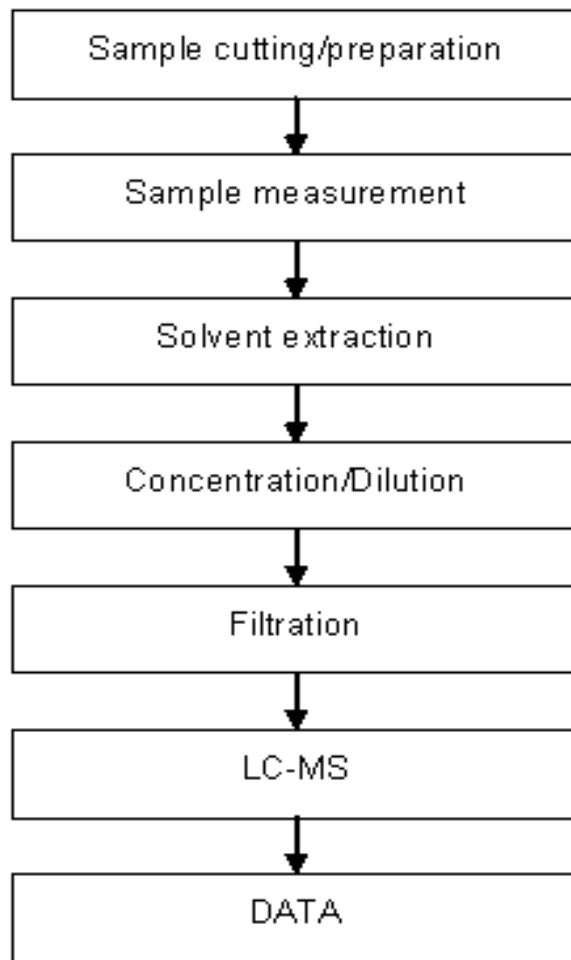
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Halogen Testing Flow Chart



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PFOS/PFOA Testing Flow Chart



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