

TEST REPORT

APPLICANT : Young Yiel Precision
ADDRESS : 1001-10, Doksan-dong, Geumcheon-gu,
Seoul, Korea

PAGE: 1 of 13

REPORT NO. RT18R-S1995-002-E-R

DATE: May 16, 2018

SAMPLE DESCRIPTION : The following submitted sample(s) said to be:-

NAME/TYPE OF PRODUCT : Anodizing Heat Spreader (Black)
NAME OF MATERIAL : Aluminum
SAMPLE ID NO. : RT18R-S1995-002
ITEM NO. : SLUG, SINK, STIFFENER, Hat Type
MANUFACTURER/VENDOR : Young Yiel Precision

SAMPLE RECEIVED : May 03, 2018
TESTING DATE : May 03, 2018 ~ May 10, 2018

TEST METHOD(S) : Please see the following page(s).
TEST RESULT(S) : Please see the following page(s).

- * Note 1 : The test results presented in this report relate only to the object tested.
- * Note 2 : This report shall not be reproduced except in full without the written approval of the testing laboratory.
- * Note 3 : The item no. is assigned by client and indicated according to their requirement and guarantee letter.

Approved by,



Jade Jang / Lab. Technical Manager

Authorized by,



Bo Park / Lab. General Manager



Authenticity check

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TEST REPORT

PAGE: 2 of 13
DATE: May 16, 2018

REPORT NO. RT18R-S1995-002-E-R

SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

TEST ITEM	UNIT	TEST METHOD	MDL	RESULT
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 Edition 1.0 : 2013, by acid digestion and determined by ICP-OES	0.5	N.D.
Lead (Pb)	mg/kg		5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4 Edition 1.0 : 2013, by acid digestion and determined by ICP-OES	2	N.D.
Hexavalent Chromium (Cr ⁶⁺) (For metal)	µg/cm ²	With reference to IEC 62321-7-1 Edition 1.0 : 2015, by boiling water extraction and determined by UV-VIS Spectrophotometer	0.10	Negative

Tested by : Jooyeon Lee, Seulgi Park

Notes : mg/kg = ppm = parts per million
µg/cm² = microgram per square centimeter
< = Less than
N.D. = Not detected (<MDL)
MDL = Method detection limit

Remarks : Interpretation of Cr⁶⁺ results

Qualitative result	Concentration of Cr ⁶⁺ (µg/cm ²)	Meaning
Negative	< 0.10	The sample coating is considered a non-Cr ⁶⁺ based coating.
Inconclusive	0.10 ≤ and ≤ 0.13	Unavoidable coating variation may influence the determination.
Positive	> 0.13	The sample coating is considered to contain Cr ⁶⁺ .

1. The qualitative results should be determination by the average result of three test results.
(If concentration of Cr⁶⁺ is over 0.10µg/cm²)
2. The above results will be carried out by visual comparison only with the standard.

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REPORT NO. RT18R-S1995-002-E-R

SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

TEST ITEM	UNIT	TEST METHOD	MDL	RESULT
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	mg/kg	With reference to IEC 62321-6 Edition 1.0 : 2015, by solvent extraction and determined by GC/MS	5	N.D.
Dibromobiphenyl	mg/kg		5	N.D.
Tribromobiphenyl	mg/kg		5	N.D.
Tetrabromobiphenyl	mg/kg		5	N.D.
Pentabromobiphenyl	mg/kg		5	N.D.
Hexabromobiphenyl	mg/kg		5	N.D.
Heptabromobiphenyl	mg/kg		5	N.D.
Octabromobiphenyl	mg/kg		5	N.D.
Nonabromobiphenyl	mg/kg		5	N.D.
Decabromobiphenyl	mg/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321-6 Edition 1.0 : 2015, by solvent extraction and determined by GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg		5	N.D.
Tribromodiphenyl ether	mg/kg		5	N.D.
Tetrabromodiphenyl ether	mg/kg		5	N.D.
Pentabromodiphenyl ether	mg/kg		5	N.D.
Hexabromodiphenyl ether	mg/kg		5	N.D.
Heptabromodiphenyl ether	mg/kg		5	N.D.
Octabromodiphenyl ether	mg/kg		5	N.D.
Nonabromodiphenyl ether	mg/kg		5	N.D.
Decabromodiphenyl ether	mg/kg		5	N.D.

Tested by : Sujung Lee

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DATE: May 16, 2018

REPORT NO. RT18R-S1995-002-E-R

SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

TEST ITEM	UNIT	TEST METHOD	MDL	RESULT
Bromine (Br)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D.
Chlorine (Cl)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D.
Fluorine (F)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D.
Iodine (I)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D.
Arsenic (As)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Beryllium (Be)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Antimony (Sb)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Hexabromocyclododecane (HBCDD)	mg/kg	With reference to IEC 62321-9(111/409/CD), by solvent extraction and determined by LC/MS and GC/MS	10	N.D.
Tetrabromobisphenol-A (TBBP-A)	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by LC/MS/MS	5	N.D.
Perfluorooctanoic acid (PFOA)	mg/kg	With reference to US EPA 3550C/8321B, by ultrasonic extraction and determined by LC/MS or LC/MS/MS	0.1	N.D.
Perfluorooctane sulfonate (PFOS)	mg/kg	With reference to US EPA 3550C/8321B, by ultrasonic extraction and determined by LC/MS or LC/MS/MS	0.1	N.D.

Tested by : Hyojoo kim, Jooyeon Lee, Sujung Lee

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REPORT NO. RT18R-S1995-002-E-R

SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

TEST ITEM	CAS NO.	UNIT	TEST METHOD	MDL	RESULT
Phthalates					
Dibutyl phthalate (DBP)	84-74-2	mg/kg	With reference to IEC 62321-8 Edition 1.0 : 2017, by solvent extraction and determined by GC/MS	50	N.D.
Di(2-ethylhexyl) phthalate (DEHP)	117-81-7	mg/kg		50	N.D.
Di-n-octyl phthalate (DNOP)	117-84-0	mg/kg		50	N.D.
Diisononyl phthalate (DINP)	28553-12-0 68515-48-0	mg/kg		100	N.D.
Diisodecyl phthalate (DIDP)	26761-40-0 68515-49-1	mg/kg		100	N.D.
Benzyl butyl phthalate (BBP)	85-68-7	mg/kg		50	N.D.
Diisobutyl phthalate (DIBP)	84-69-5	mg/kg		50	N.D.

Tested by : Sujung Lee

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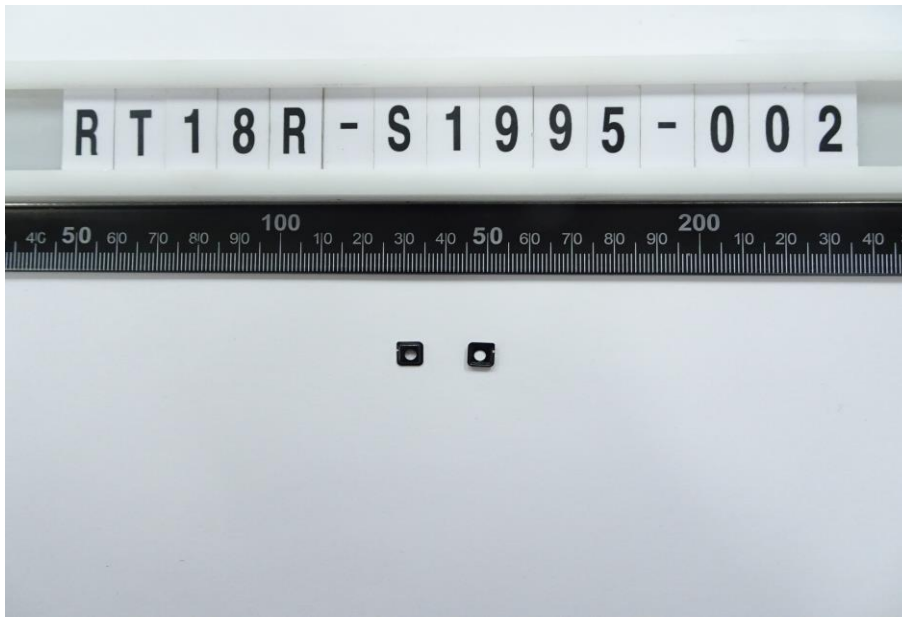
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SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

* View of sample as received;-



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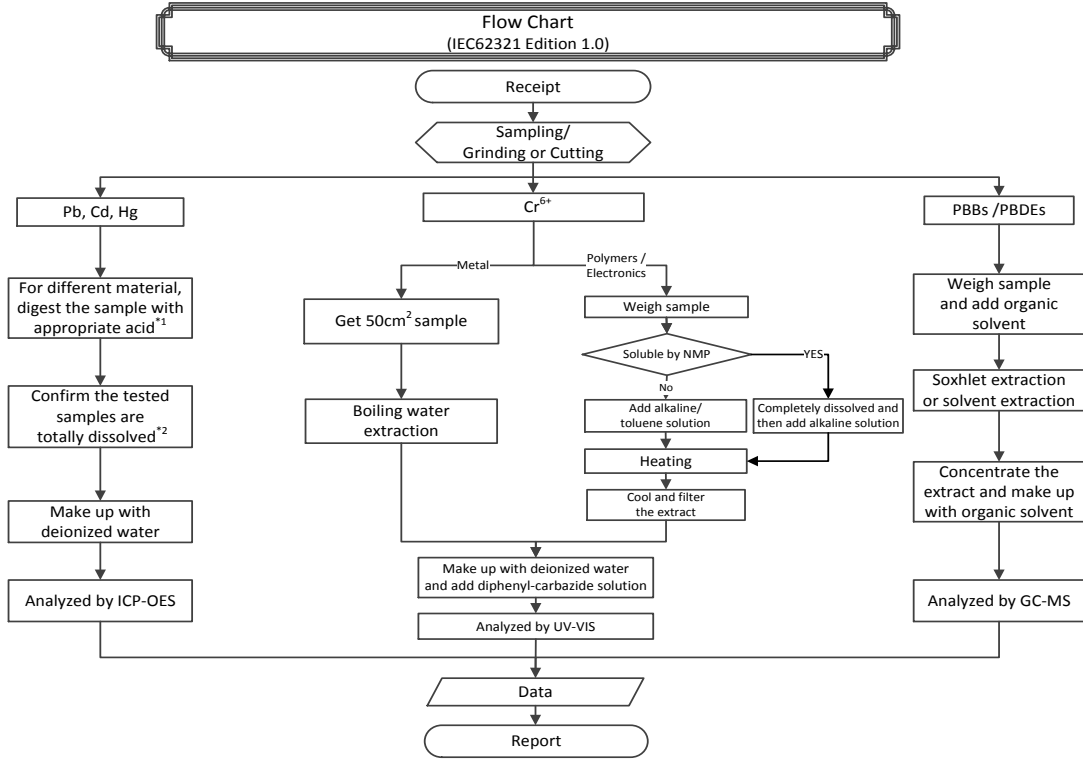
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DATE: May 16, 2018

SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)



Remarks :

*1 : List of appropriate acid :

Material	Acid added for digestion
Polymers	HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃
Metals	HNO ₃ , HCl, HF
Electronics	HNO ₃ , HCl, H ₂ O ₂ , HBF ₄

*2 : The samples were dissolved totally by pre-conditioning method according to above flow chart.

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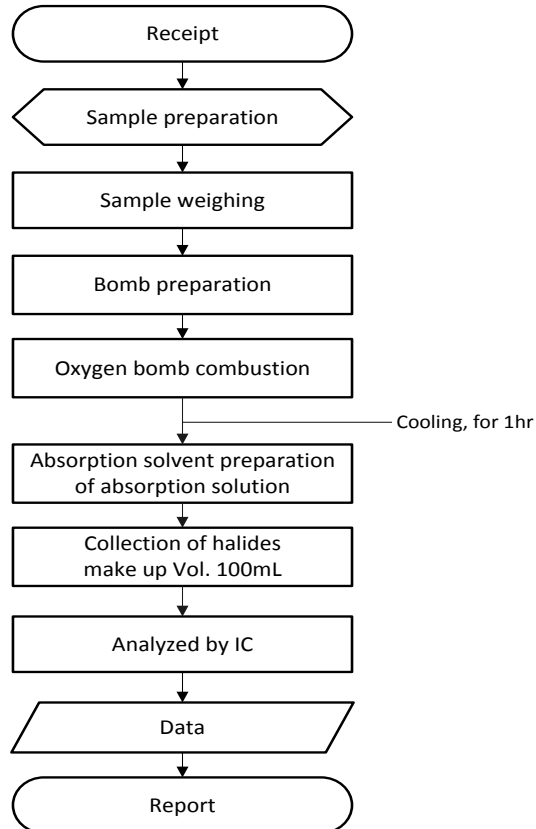
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SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

Flow Chart (EN14582)



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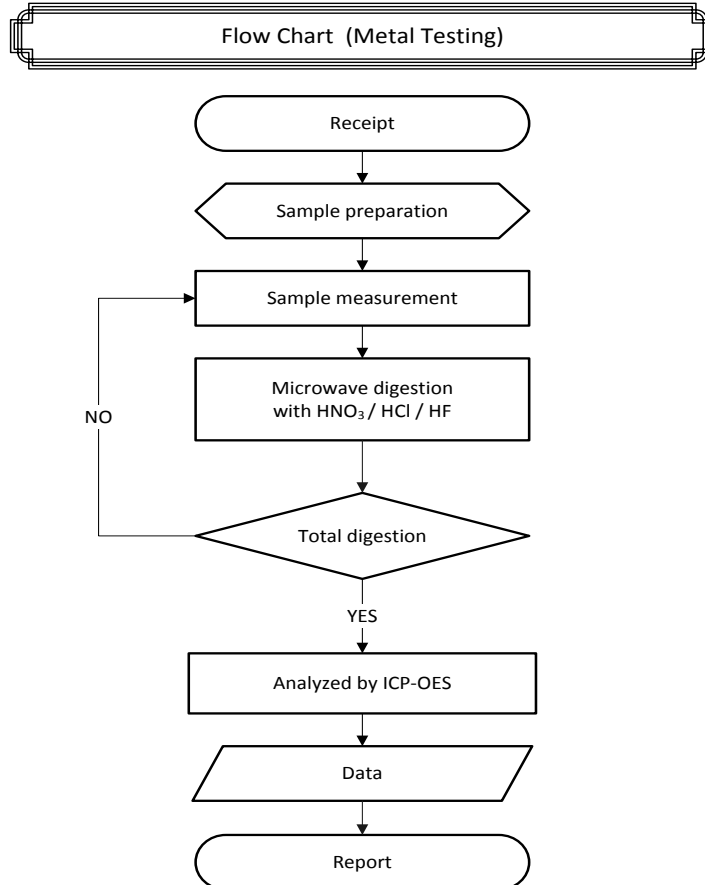
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SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)



** Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart.



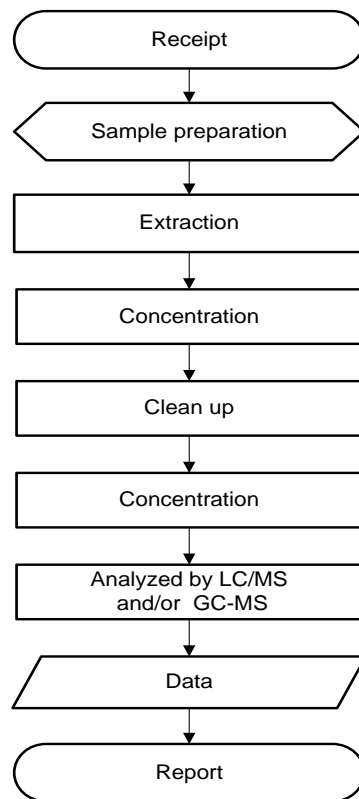
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SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

Flow Chart (HBCDD)



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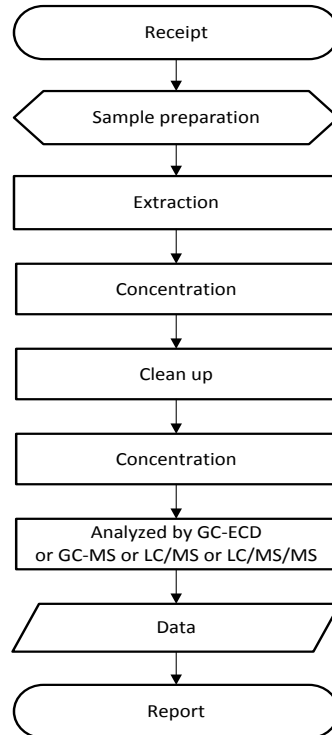
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SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

Flow Chart (EPA 3540C)



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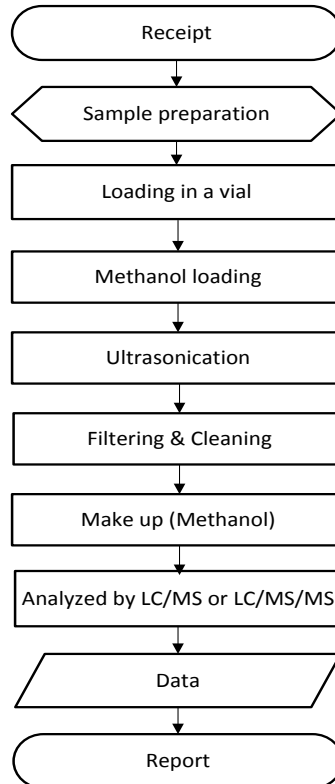
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SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

Flow Chart (PFOS, PFOA)



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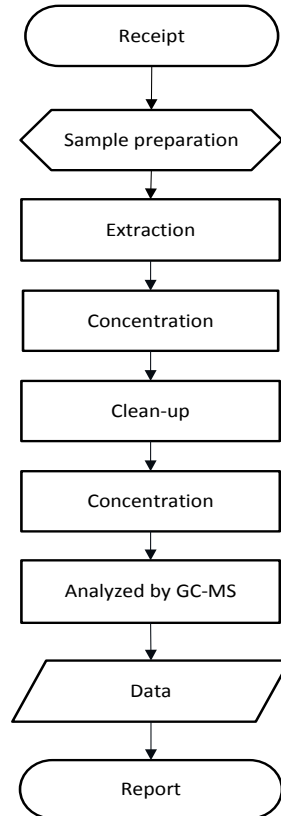
TEST REPORT

REPORT NO. RT18R-S1995-002-E-R

SAMPLE ID NO. : RT18R-S1995-002

SAMPLE DESCRIPTION : Anodizing Heat Spreader (Black)

Flow Chart (Phthalates)



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

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