

TEST REPORT

APPLICANT : SAMSUNG ELECTRONICS Co., Ltd
ADDRESS : 1, Samsungjeonja-ro,
Hwaseong-si, Gyeonggi-do, Korea

PAGE: 1 of 10

REPORT NO. RT20R-S0761-005-E1

DATE: Feb. 24, 2020

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

NAME/TYPE OF PRODUCT : 12inch-Bump (Cu)
NAME OF MATERIAL : Wafer (Patterned)
SAMPLE ID NO. : RT20R-S0761-005
MANUFACTURER/VENDOR : SAMSUNG ELECTRONICS Co., Ltd

SAMPLE RECEIVED : Feb. 19, 2020
TESTING DATE : Feb. 19, 2020 ~ Feb. 24, 2020

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 refer only to the object tested.

* Note 2 : This report shall not be reproduced except in full without the written approval of the testing laboratory.

Approved by,



Jade Jang / Lab. Technical Manager

Authorized by,



Bo Park / Lab. General Manager



Authenticity check

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REPORT NO. RT20R-S0761-005-E1

PAGE: 2 of 10
DATE: Feb. 24, 2020

SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)

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⁺)	mg/kg	With reference to IEC 62321-7-2 Edition 1.0 : 2017, by alkaline/toluene digestion and determined by UV-VIS Spectrophotometer	8	N.D.
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 : Jooyeon Lee, Seulgi Park, Miseon Lee

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

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PAGE: 3 of 10
DATE: Feb. 24, 2020

SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)

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.
Beryllium (Be)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Cobalt (Co)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Indium (In)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Nickel (Ni)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Phosphorus (P)	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.

Tested by : Hyojoo Kim, Jooyeon Lee

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DATE: Feb. 24, 2020

SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)

TEST ITEM	UNIT	TEST METHOD	MDL	RESULT
Tetrabromobisphenol-A (TBBP-A)	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by LC/MS/MS	5	N.D.
Medium-chain chlorinated paraffin (MCCP)	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by LC/MS/MS and/or GC/ECD	100	N.D.

Tested by : Miseon Lee

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REPORT NO. RT20R-S0761-005-E1

PAGE: 5 of 10
DATE: Feb. 24, 2020

SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)

TEST ITEM	CAS NO.	UNIT	TEST METHOD	MDL	RESULT
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.
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 : Miseon Lee

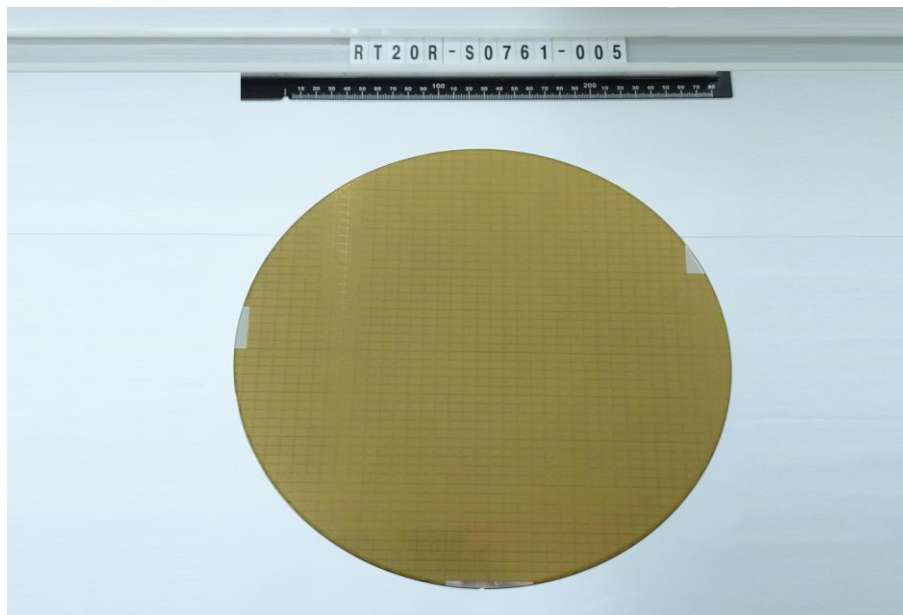
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* View of sample as received;-



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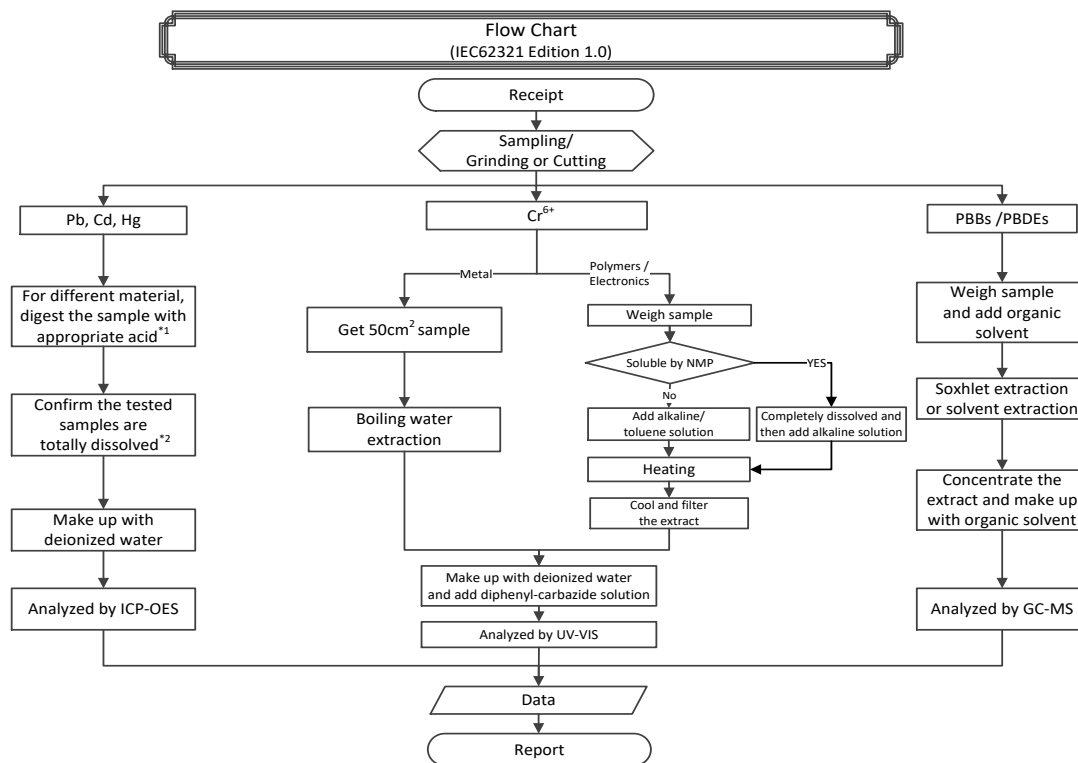
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SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)



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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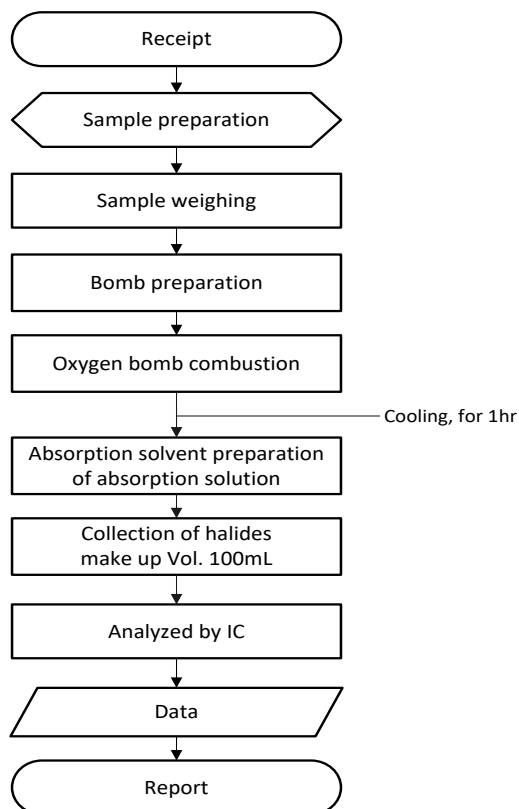
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SAMPLE DESCRIPTION : 12inch-Bump (Cu)

Flow Chart (EN14582)



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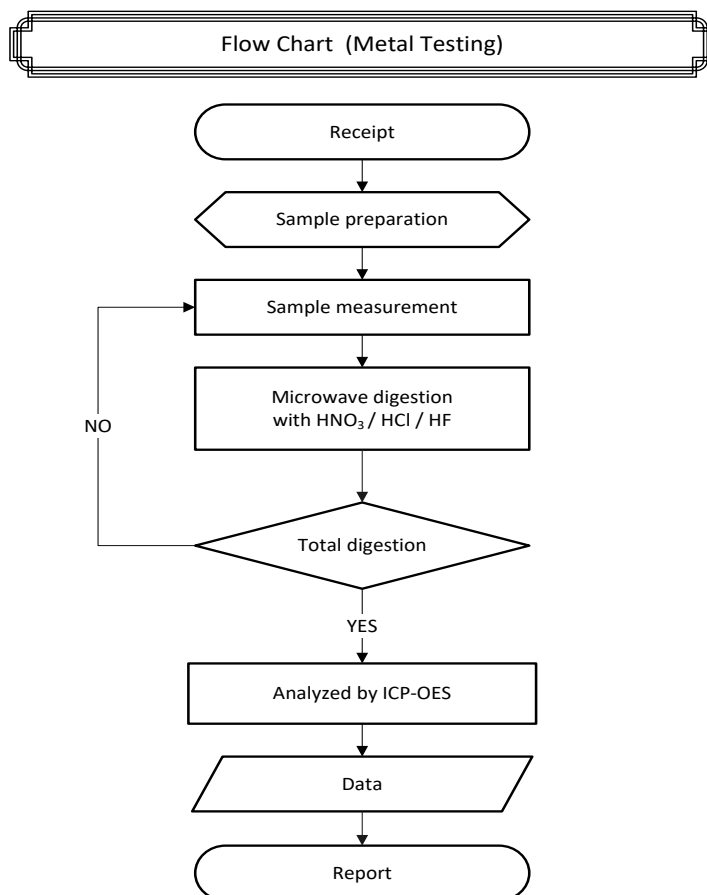
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SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)



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

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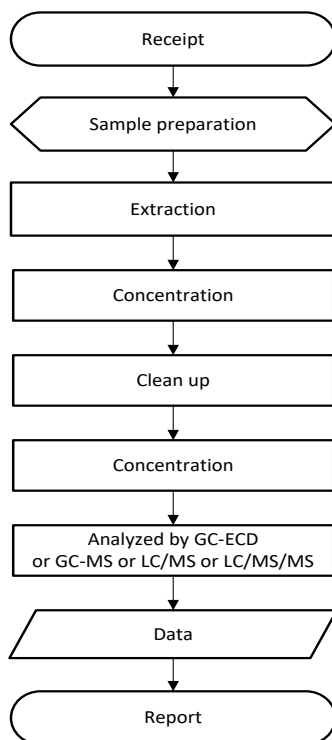
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SAMPLE DESCRIPTION : 12inch-Bump (Cu)

Flow Chart (EPA 3540C)



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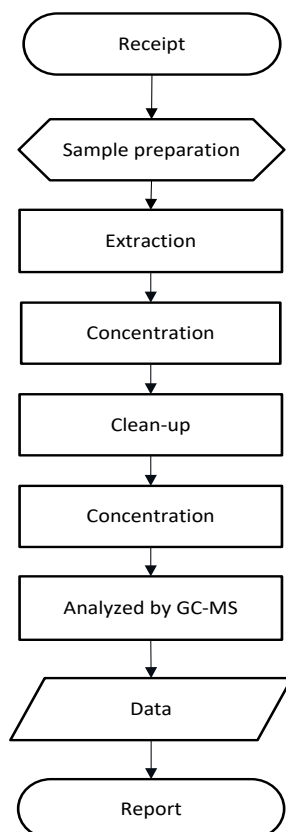
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SAMPLE ID NO. : RT20R-S0761-005

SAMPLE DESCRIPTION : 12inch-Bump (Cu)

Flow Chart (Phthalates)



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

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