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TEST REPORT

KOTITI NO. : **1414001983 R3**
APPLICANT : **Samsung Electro-mechanics Co., Ltd.**
ADDRESS : **314, Metan3-Dong, Yeongtong-Gu, Suwon-Si, Gyunggi-Do 443-743**

DATE IN : **December 08, 2014**
DATE OUT : **January 27, 2015**

Sample Description	**MLCC B(X7R) TYPE, Y(X7S) TYPE, Z(X7T) TYPE**
Style Number	**CLxxBxxxxxxxxx, CLxxYxxxxxxxxx, CLxxZxxxxxxxxx**
Buyer	**N/S**
Test Result	**For further details, please refer to the following page(s).**
Test Method	**For further details, please refer to the following page(s).**

*** N/S : Not Submitted**

PREPARED and CHECKED by :

Sang Rag Lee

Dr. SANG RAG LEE
VICE PRESIDENT – KOTITI

AUTHORIZED by :

Young R. Kim

Dr. YOUNG RYUL KIM
PRESIDENT – KOTITI

REMARK: SEE ENCLOSED WORKSHEET(S) RESULT

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KOTITI No. : 1414001983 R3
Sample Description : MLCC B(X7R) TYPE, Y(X7S) TYPE, Z(X7T) TYPE /
CLxxBxxxxxxxxx, CLxxYxxxxxxxxx, CLxxZxxxxxxxxx

Test Item	Unit	Test Method	Reporting Limit	Result
Pb (Lead)	mg/kg	IEC 62321-5:2013 (Acid digestion and determined by ICP-OES)	5	N.D.
Cd (Cadmium)	mg/kg		0.5	N.D.
Hg (Mercury)	mg/kg	IEC 62321-4:2013 (Acid digestion and determined by ICP-OES)	2	N.D.
Cr^{6+} (Hexavalent Chromium)	mg/kg	IEC 62321:2008 Annex C (Alkaline digestion and determined by UV-VIS)	1	N.D.
Sum of PBBs/PBDEs	mg/kg	IEC 62321:2008 Annex A (Solvent extraction and determined by GC-MS)	-	N.D.
Bromobiphenyls	mg/kg		5	N.D.
Dibromobiphenyls			5	N.D.
Tribromobiphenyls			5	N.D.
Tetrabromobiphenyls			5	N.D.
Pentabromobiphenyls			5	N.D.
Hexabromobiphenyls			5	N.D.
Heptabromobiphenyls			5	N.D.
Octabromobiphenyls			5	N.D.
Nonabromobiphenyls			5	N.D.
Decabromobiphenyl			5	N.D.
Bromodiphenyl ethers			5	N.D.
Dibromodiphenyl ethers			5	N.D.
Tribromodiphenyl ethers			5	N.D.
Tetrabromodiphenyl ethers			5	N.D.
Pentabromodiphenyl ethers			5	N.D.
Hexabromodiphenyl ethers			5	N.D.
Heptabromodiphenyl ethers			5	N.D.
Octabromodiphenyl ethers			5	N.D.
Nonabromodiphenyl ethers			5	N.D.
Decabromodiphenyl ether			5	N.D.

Remark
- N.D. = not detected (concentration of analyte lower than the laboratory reporting limit)
- N.A. = not applicable

KOTITI No. : 1414001983 R3
Sample Description : MLCC B(X7R) TYPE, Y(X7S) TYPE, Z(X7T) TYPE /
CLxxBxxxxxxxxx, CLxxYxxxxxxxxx, CLxxZxxxxxxxxx

Test Item	Unit	Test Method	Reporting Limit	Result
Heavy metal				
Sb (Antimony)	mg/kg	Reference to EPA 3052 (Determined by ICP-OES)	5	N.D.
Be (Beryllium)	mg/kg		5	N.D.
Halogen				
Br (Bromine)	mg/kg	Reference to EN 14582:2007, IEC 62321-3-2 Annex A (Determined by IC)	50	N.D.
Cl (Chlorine)	mg/kg		50	N.D.
Phthalates				
DBP(Dibutyl phthalate)	mg/kg	Reference to CPSC-CH-C1001-09.3 (Determined by GC-MS)	50	N.D.
BBP(Butyl benzyl phthalate)	mg/kg		50	N.D.
DEHP (Di-2-ethylhexyl phthalate)	mg/kg		50	N.D.
DNOP(Di-n-octyl phthalate)	mg/kg		50	N.D.
DINP(Di-iso-nonyl phthalate)	mg/kg		50	N.D.
DIDP (Diisodecyl phthalate)	mg/kg		50	N.D.
DIBP (Diisobutyl phthalate)	mg/kg		50	N.D.
DEP (Diethyl phthalate)	mg/kg		50	N.D.
DMP (Dimethyl phthalate)	mg/kg		50	N.D.
Perfluorooctanoic acid (PFOA)	mg/kg	Reference to ISO 25101 (Determined by LC-MS-MS)	0.05	N.D.
Perfluorooctane sulfonate (PFOS)	mg/kg		0.05	N.D.
Short-chain chlorinated paraffins (SCCP)	mg/kg	Reference to US EPA 8082A (Determined by GC-MS)	30	N.D.
Polyvinyl chloride (PVC)	-	Infrared spectroscopy (IR) with or without chemical separation	-	Negative
Hexabromocyclododecane (HBCDD)	mg/kg	Reference to KS M 1072:2008 (Determined by LC-MS)	5	N.D.

Remark
- N.D. = not detected (concentration of analyte lower than the laboratory reporting limit)
- N.A. = not applicable

KOTITI No. : 1414001983 R3
Sample Description : MLCC B(X7R) TYPE, Y(X7S) TYPE, Z(X7T) TYPE /
CLxxBxxxxxxxxxx, CLxxYxxxxxxxxxx, CLxxZxxxxxxxxxx

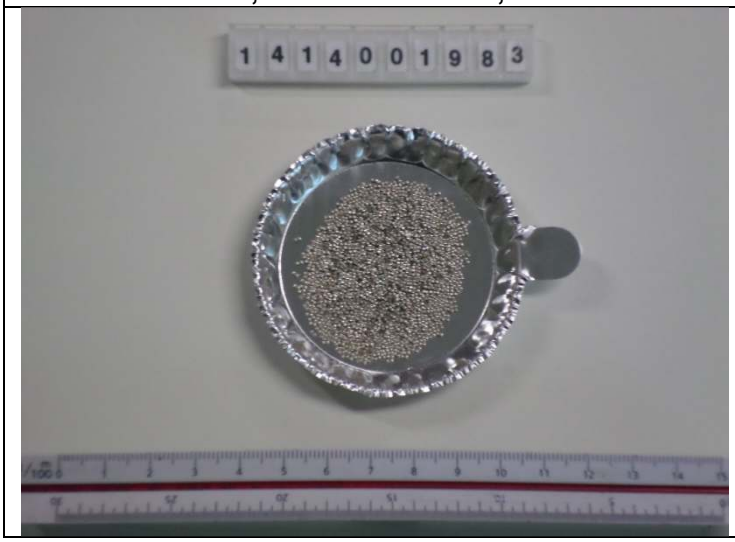
Test Item	Unit	Test Method	Reporting Limit	Result
Polychlorinated terphenyls (PCTs)	mg/kg	Reference to EPA 3540C, EPA 8082 (Solvent extraction and determined by GC-MS and/or GC-ECD)	5	N.D.
Polychlorinated naphthalenes (PCNs)	mg/kg		5	N.D.
Polychlorinated biphenyls (PCBs)	mg/kg		5	N.D.

Remark

- N.D. = not detected (concentration of analyte lower than the laboratory reporting limit)
- N.A. = not applicable

SAMPLE PICTURE

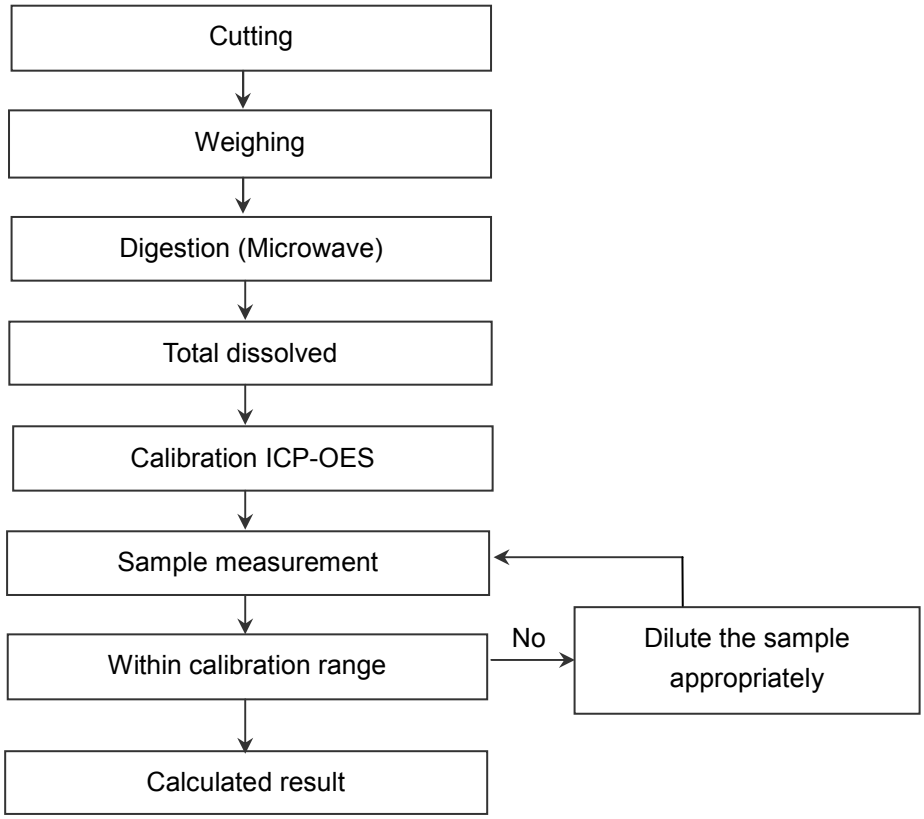
MLCC B(X7R) TYPE, Y(X7S) TYPE, Z(X7T) TYPE /
CLxxBxxxxxxxxxx, CLxxYxxxxxxxxxx,CLxxZxxxxxxxxxx



※ Due to the client's request, the sample which was mixed has been analyzed.

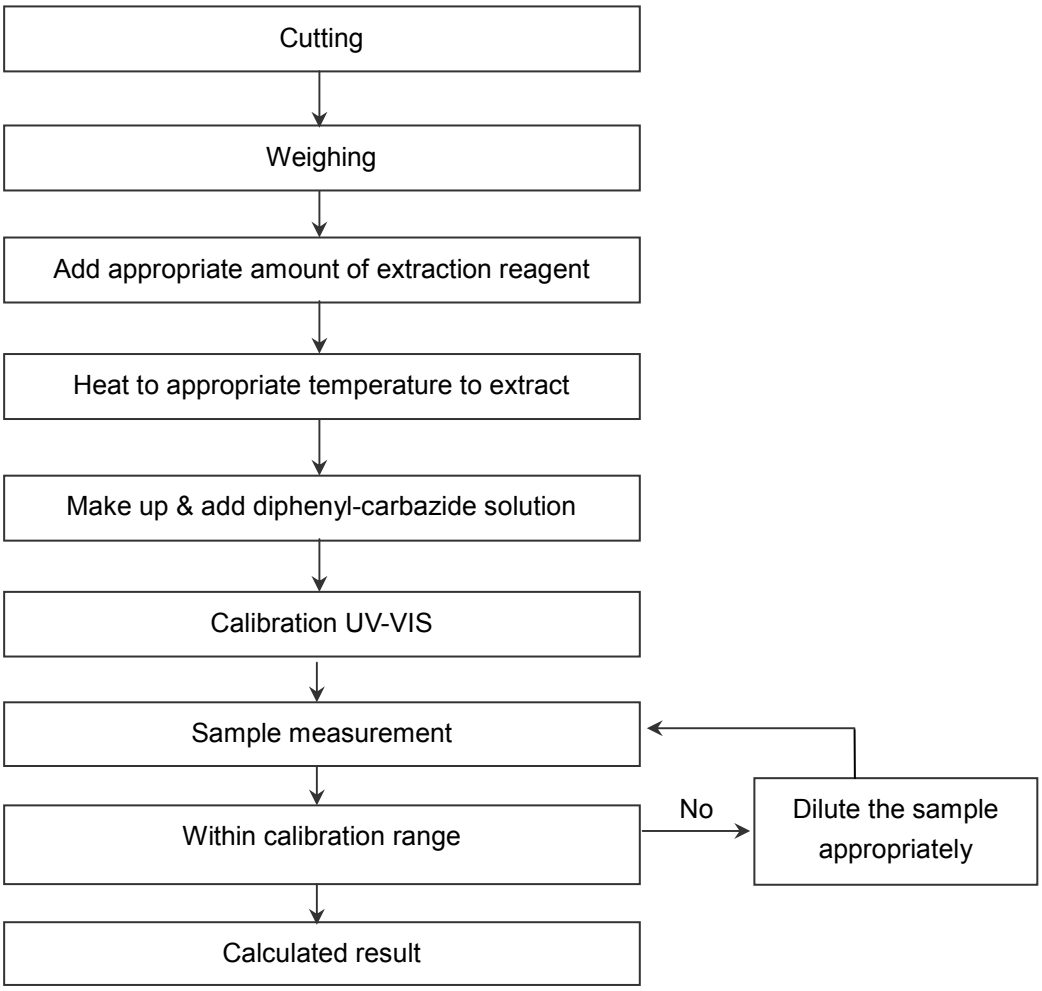
FLOW CHART

1. Heavy metal (Lead, Cadmium, Mercury)

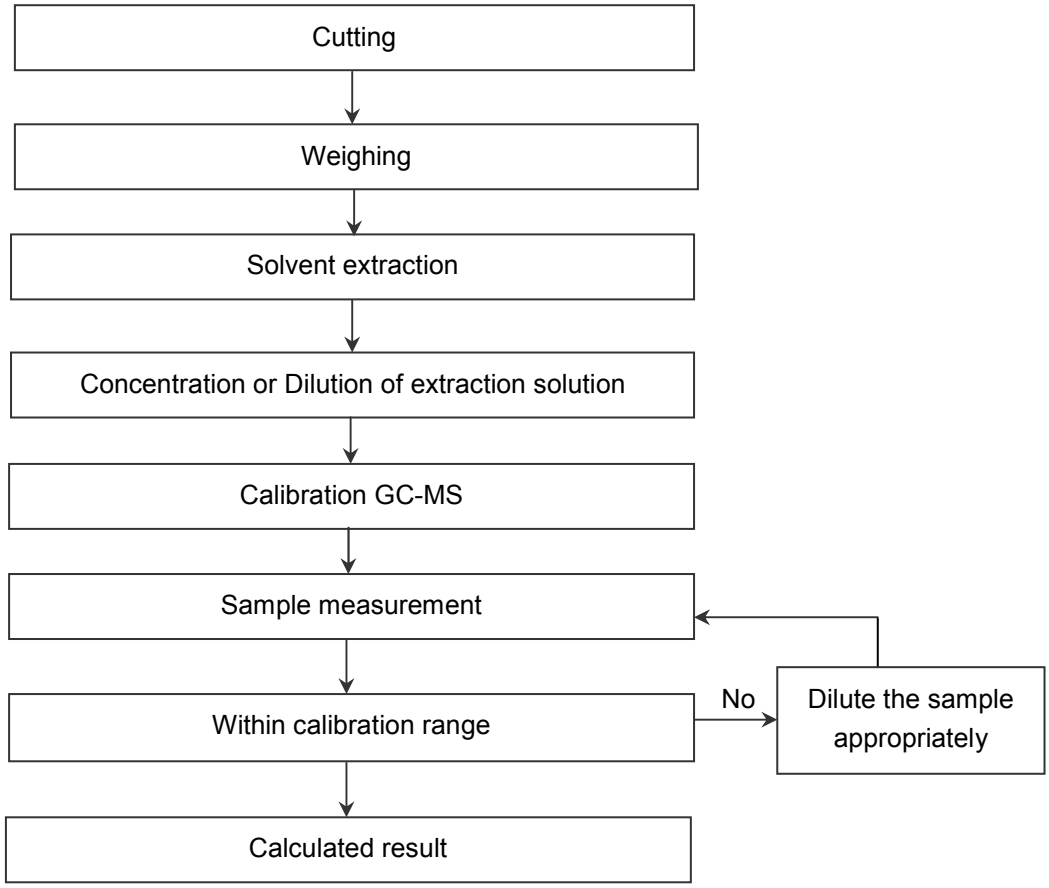


Material	Digestion Acid
Polymers	HNO_3, HCl, HF, H_2O_2, H_2SO_4, etc.
Metals	HNO_3, HCl
Electronics	HNO_3, HCl, HF, H_2O_2, H_2SO_4, etc.

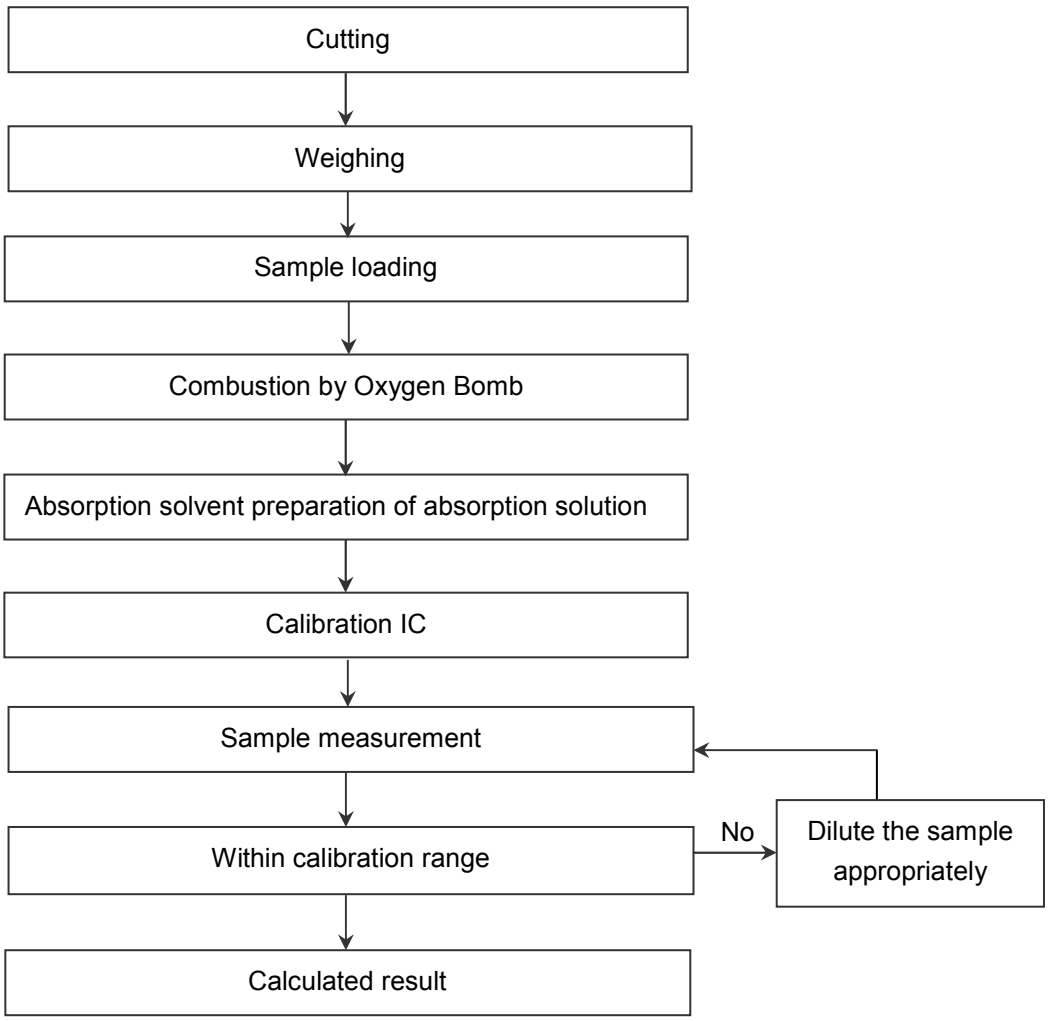
2. Heavy metal (Hexavalent chromium)



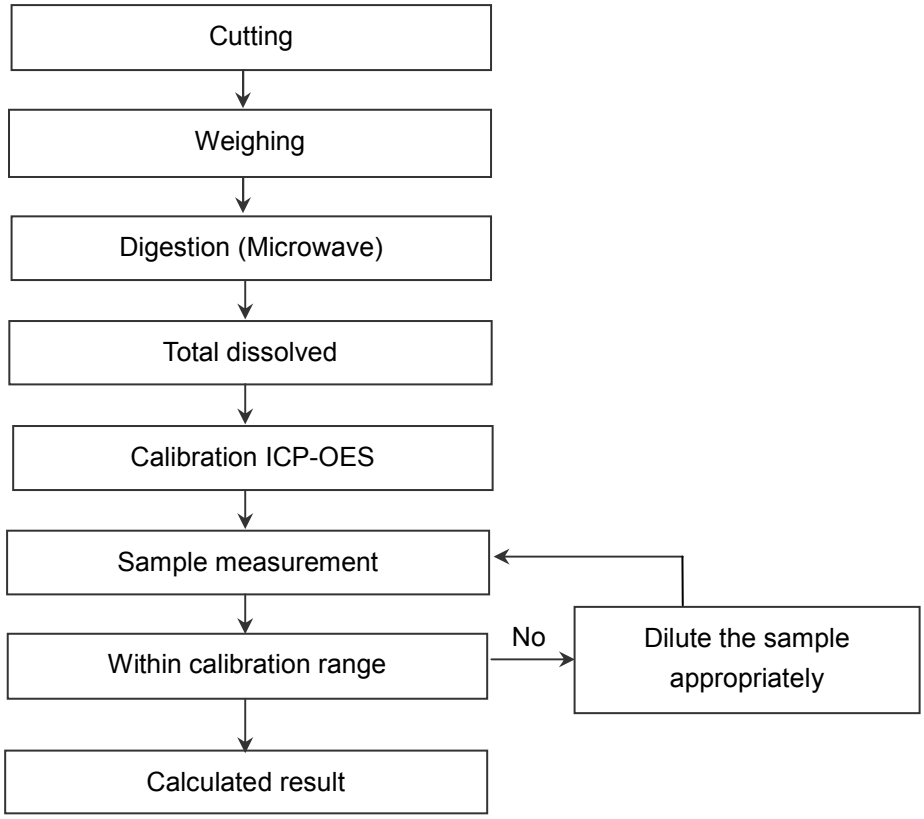
3. BFRs (PBBs, PBDEs)



4. Halogen (Bromine, Chlorine)

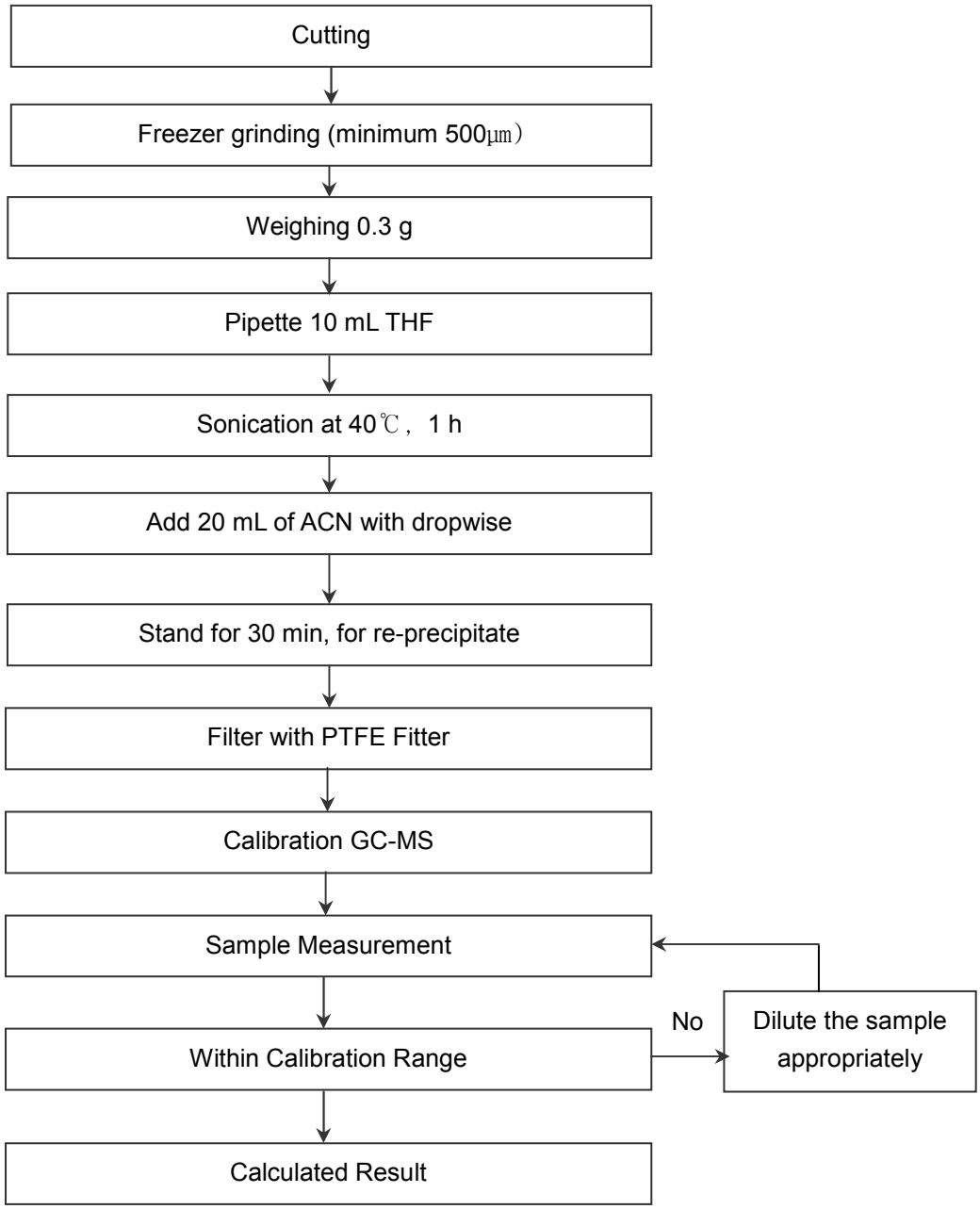


5. Heavy metal (Antimony, Beryllium)

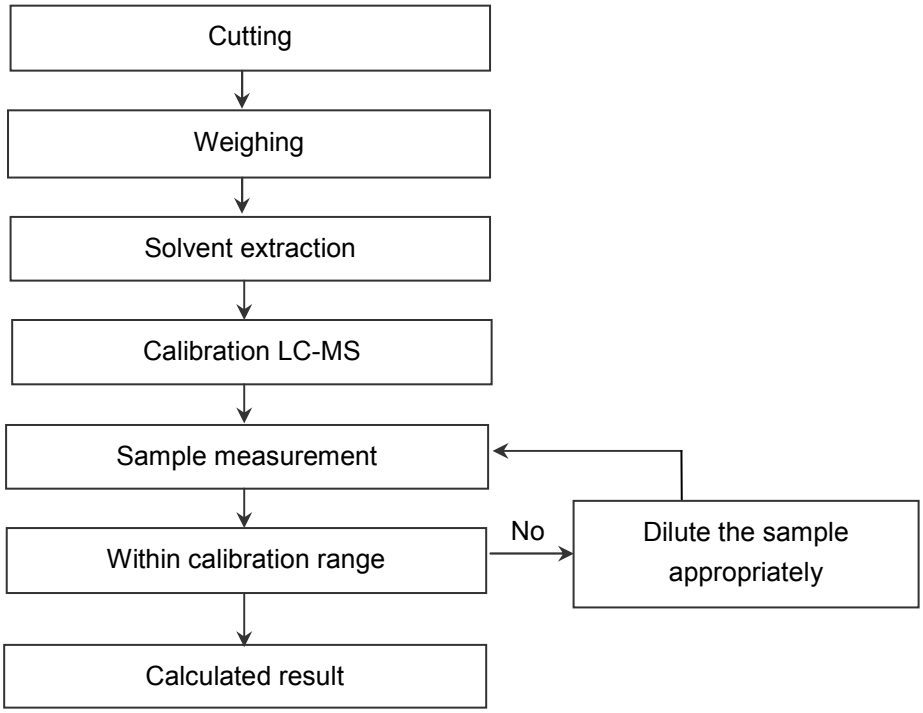


Material	Digestion Acid
Polymers	HNO_3, HCl, HF, H_2O_2, H_2SO_4, etc.
Metals	HNO_3, HCl
Electronics	HNO_3, HCl, HF, H_2O_2, H_2SO_4, etc.

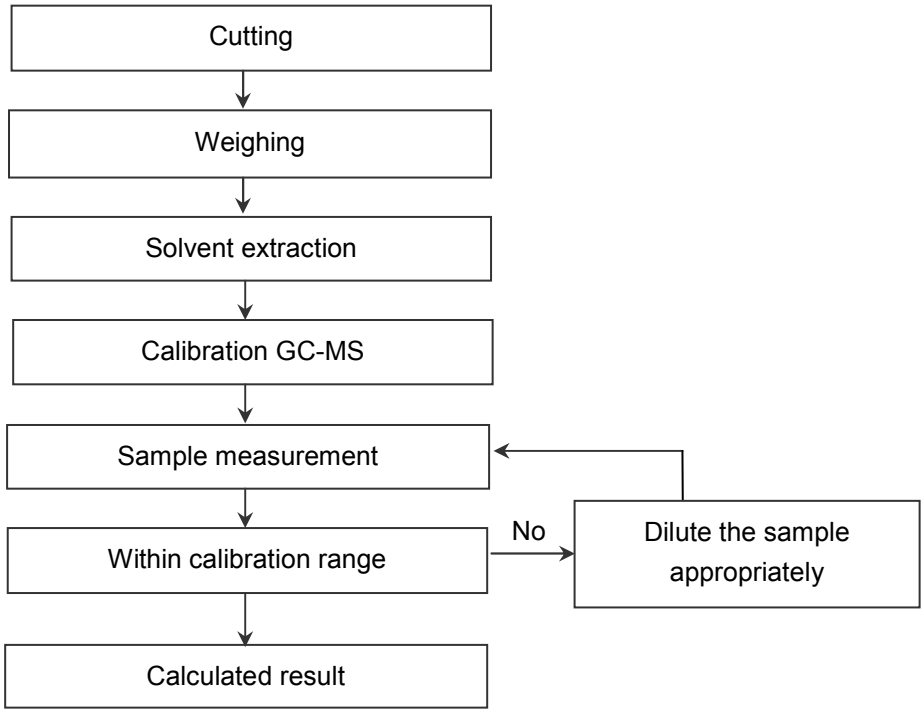
6. Phthalates



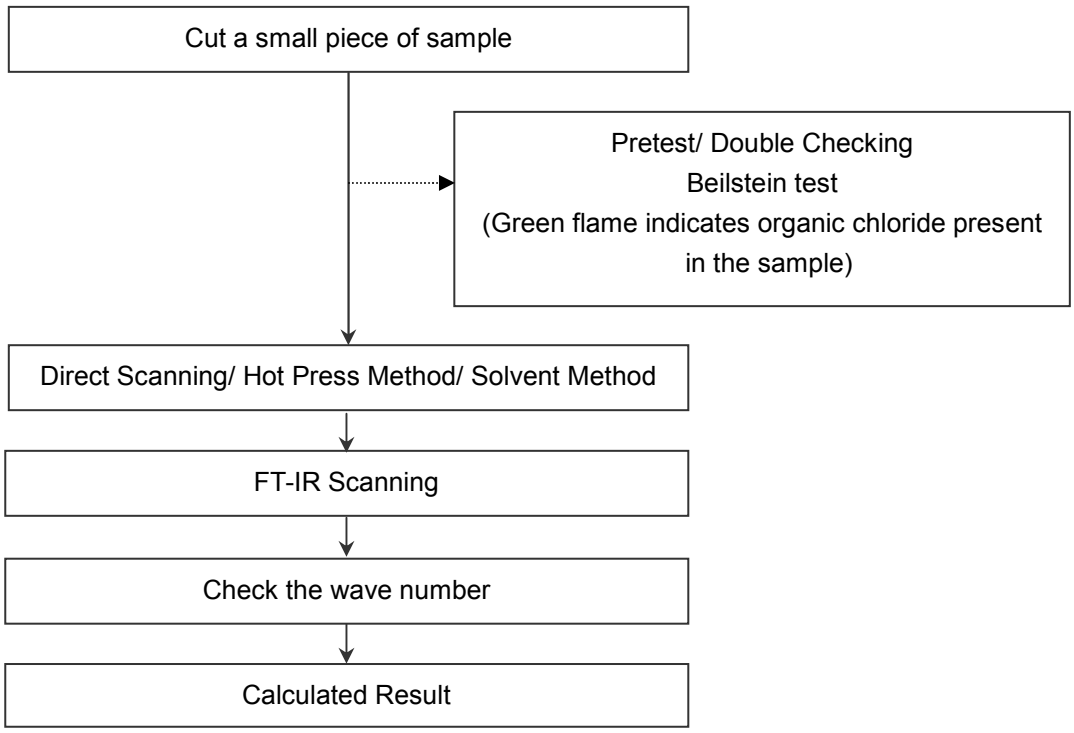
7. PFOA, PFOS


Cutting
Weighing
Solvent extraction
Calibration LC-MS
Sample measurement
Within calibration range
No
Dilute the sample appropriately
Calculated result

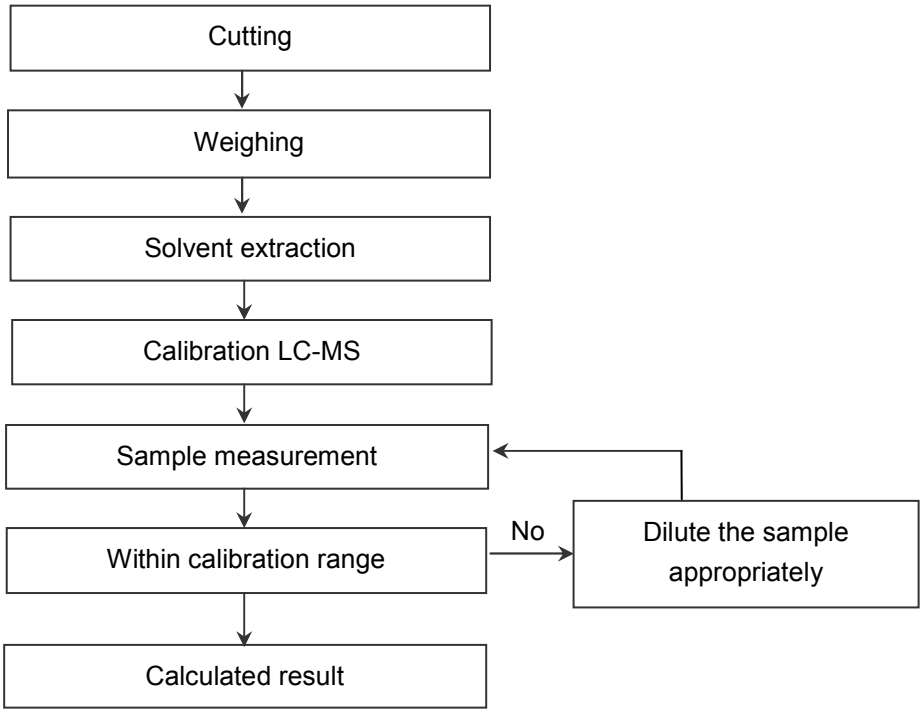
8. Short-chain chlorinated paraffins (SCCP)



9. Polyvinyl chloride (PVC)



8. Hexabromocyclododecane (HBCDD)



9. PCTs, PCNs, PCBs