



## ICP Test Report Certification Packet

Company Name: Littelfuse, Inc.

Product Type: Metal Oxide Varistors

Product Series: TMOV/ iTMOV Series RoHS Compliant Models

Issue Date: January 20, 2014

It is hereby certified by Littelfuse, Inc. that there is neither RoHS (2011/65/EU) -restricted substance nor such use, for materials to be used for unit parts, for packing/packaging materials, and for additives and the like in the manufacturing processes.

In addition, it is hereby reported to you that the parts and sub-materials, the materials to be used for unit parts, the packing/packaging materials, and the additives and the like in the manufacturing processes, are all composed of the following components.

Issued by:   
JORDANUFF H. CABILAN

[Global EH&S Engineer]

(1) Parts, sub-materials and unit parts

This document covers the Metal Oxide Varistors TMOV-iTMOV compliant series products manufactured by Littelfuse, Inc.

Please see Table 1 for raw materials used.

(2) The ICP data on all measurable substances

Please see appropriate pages as identified in Table 1

Remarks:

Table 1: List of Raw Materials covered by this report

Parts	Part Number	Raw Material Description	Page
ICP-0420	NA	Black disc DD	3-9
ICP-0421	NA	Black disc DM	10-16
ICP-0425	SP-A6PL	Silver Paste	17-26
ICP-0439	GJ-305-3	Solder Paste	27-35
ICP-0440	96SC C400	Solder Wire	36-40
ICP-0427	NA	Tin Coated Copper Wire	41-45
ICP-0441	MS267	Hotmelt Adhesive	46-54
ICP-0442	NA	Alumina Insulator	55-61
ICP-0443	9544B	Epoxy Resin, Red	52-65



**Test Report**

Number: SZHH0079239603

Applicant: LITTELFUSE, INC  
8755 WEST HIGGINS ROAD SUITE  
500CHICAGO IL 60631 USA

Date: Jun 18, 2013

Attn: KRISTEEN BACILA/ARSENIO CESISTA JR.

**Sample Description:**

One (1) submitted sample said to be **dull grey core (DD Black Disc)**.



\*\*\*\*\*

**Tests conducted:**

As requested by the applicant, refer to attached page(s) for details.

\*\*\*\*\*

**Conclusion:**

Tested Samples  
Submitted sample

Standard  
Restriction of the use of certain hazardous substance  
in electrical and electronic equipment (RoHS  
Directive 2011/65/EU)

Result  
See test  
conducted

Test Item  
Halogen (F, Cl, Br, I) Content

See test  
conducted

\*\*\*\*\*

Authorized by:  
For Intertek Testing Services  
Shenzhen Ltd.


Ben N.L. Lin  
General Manager



Page 1 of 7

# Test Report

Number: SZHH0079239603

## Tests Conducted

### 1 RoHS Chemical Test

#### (A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr <sup>6+</sup> ) Content (mg/kg)	3.1
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected

\*\*\*\*\*



# Test Report

Number: SZHH0079239603

Tests Conducted

(B) RoHS Requirement:

Restricted Substances	Limits
Cadmium (Cd)	0.01% (100 mg/kg)
Lead (Pb)	0.1% (1000 mg/kg)
Mercury (Hg)	0.1% (1000 mg/kg)
Chromium (VI) (Cr <sup>6+</sup> )	0.1% (1000 mg/kg)
Polybrominated Biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000 mg/kg)

The above limits were quoted from 2011/65/EU for homogeneous material.

(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr <sup>6+</sup> ) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received : Jun 07, 2013

Testing period : Jun 07, 2013 to Jun 15, 2013

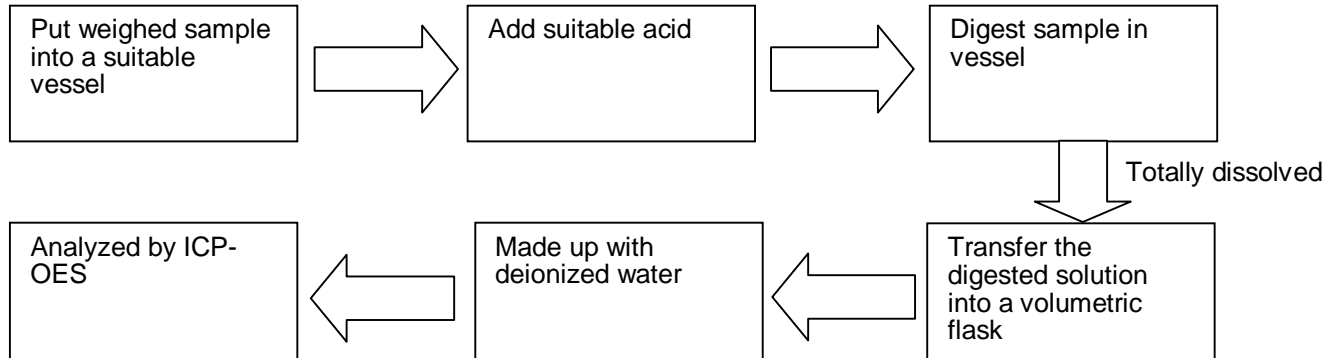
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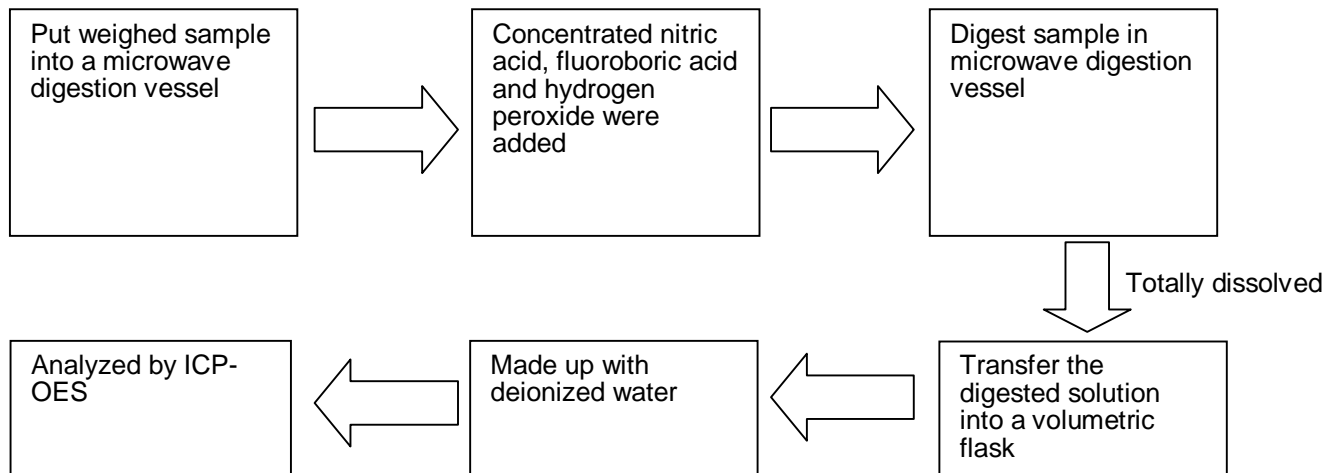
Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents



2. Test for Hg Content

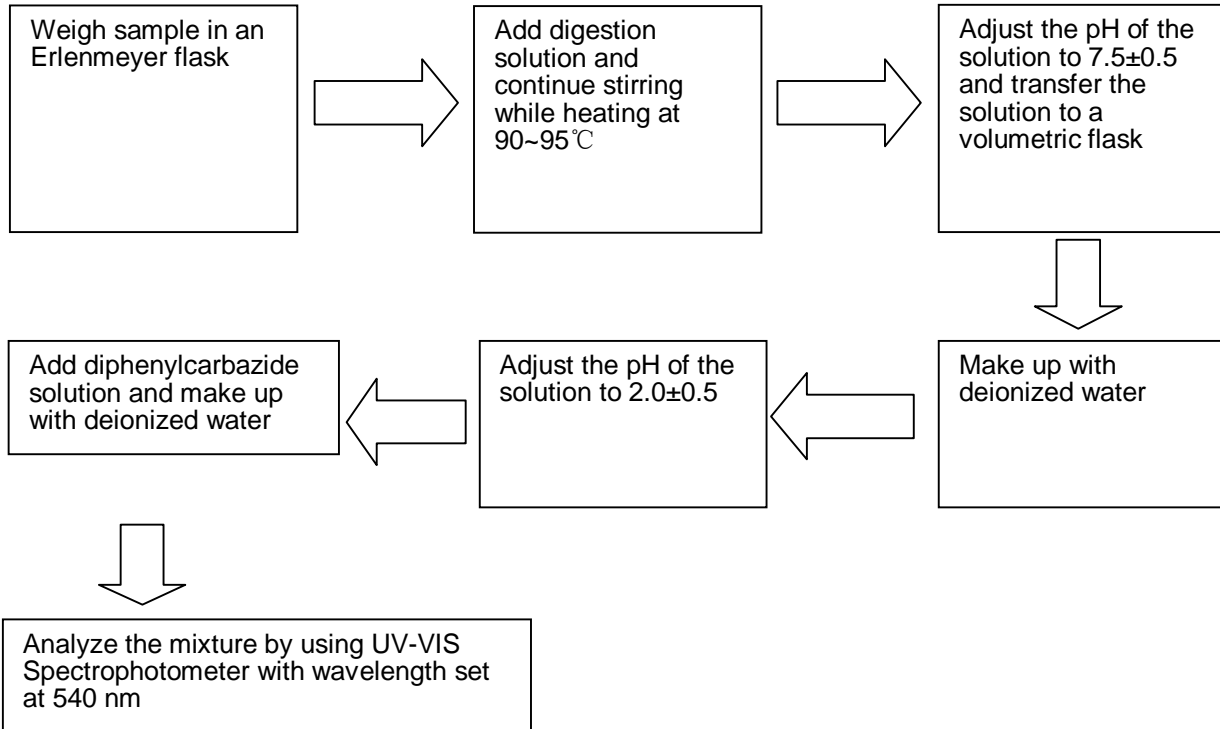


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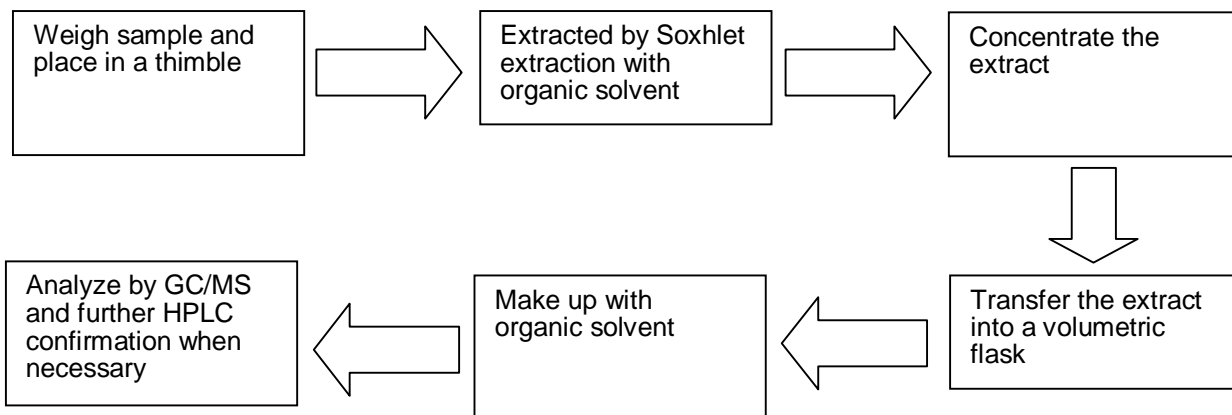


Tests Conducted

3. Test for Chromium (VI) ( $\text{Cr}^{6+}$ ) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents



\*\*\*\*\*



**Test Report**

Number: SZHH0079239603

## Tests Conducted

2 Halogen Content

## ( I ) Test Result Summary:

<u>Testing Item</u>	<u>Result (mg/kg)</u>
Fluorine (F) Content	ND
Chlorine (Cl) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg = milligram per kilogram = ppm

ND = Not detected

## ( II ) Test Method:

<u>Testing Item</u>	<u>Testing Method</u>	<u>Reporting Limit</u>
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Date sample received : Jun 07, 2013

Testing period : Jun 07, 2013 to Jun 17, 2013

\*\*\*\*\*

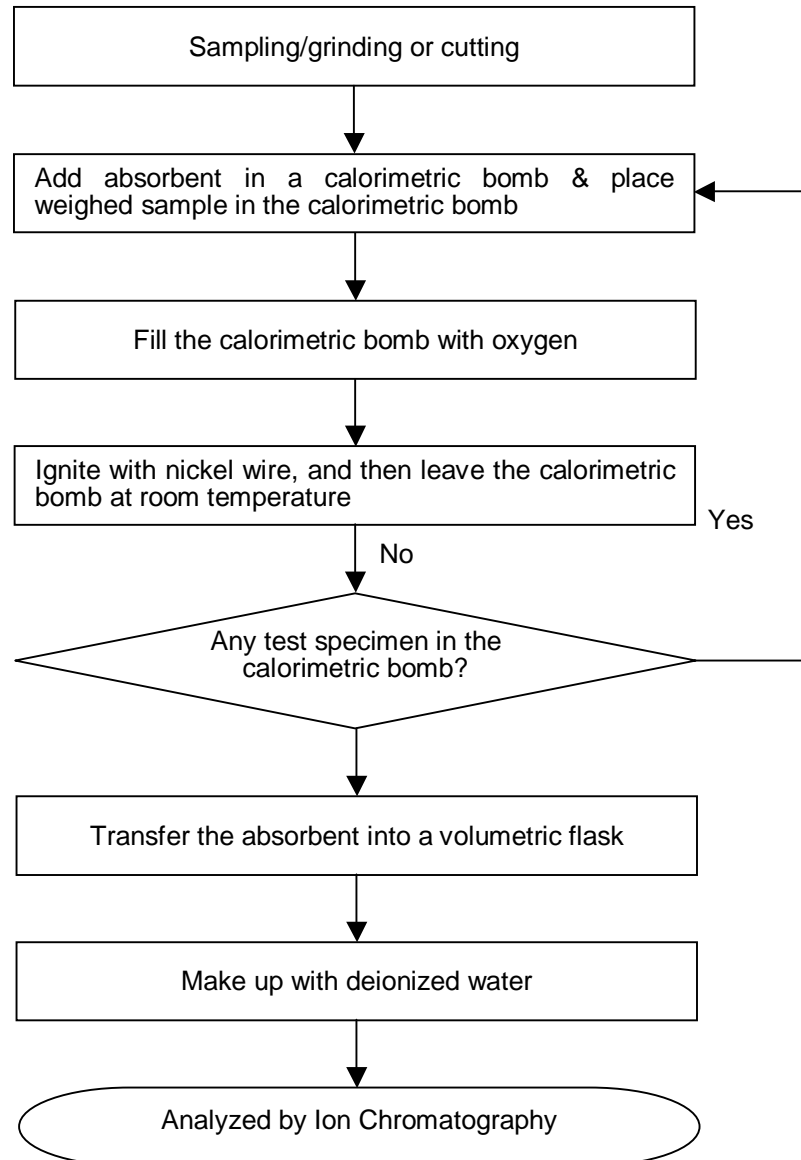




Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



\*\*\*\*\*

End of report

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As requested by the applicant, refer to attached page(s) for details.

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Tested Samples  
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Standard  
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Directive 2011/65/EU)

Result  
See test  
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Test Item  
Halogen (F, Cl, Br, I) Content

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Authorized by:  
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General Manager



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Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr <sup>6+</sup> ) Content (mg/kg)	ND(<1)
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected

\*\*\*\*\*



# Test Report

Number: SZHH0079239604

## Tests Conducted

### (B) RoHS Requirement:

Restricted Substances	Limits
Cadmium (Cd)	0.01% (100 mg/kg)
Lead (Pb)	0.1% (1000 mg/kg)
Mercury (Hg)	0.1% (1000 mg/kg)
Chromium (VI) (Cr <sup>6+</sup> )	0.1% (1000 mg/kg)
Polybrominated Biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000 mg/kg)

The above limits were quoted from 2011/65/EU for homogeneous material.

### (C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr <sup>6+</sup> ) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received : Jun 07, 2013

Testing period : Jun 07, 2013 to Jun 15, 2013

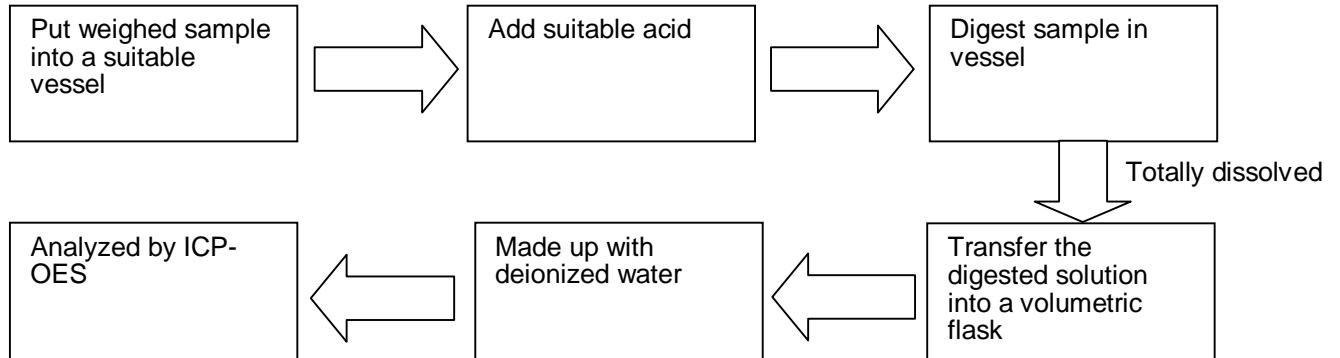
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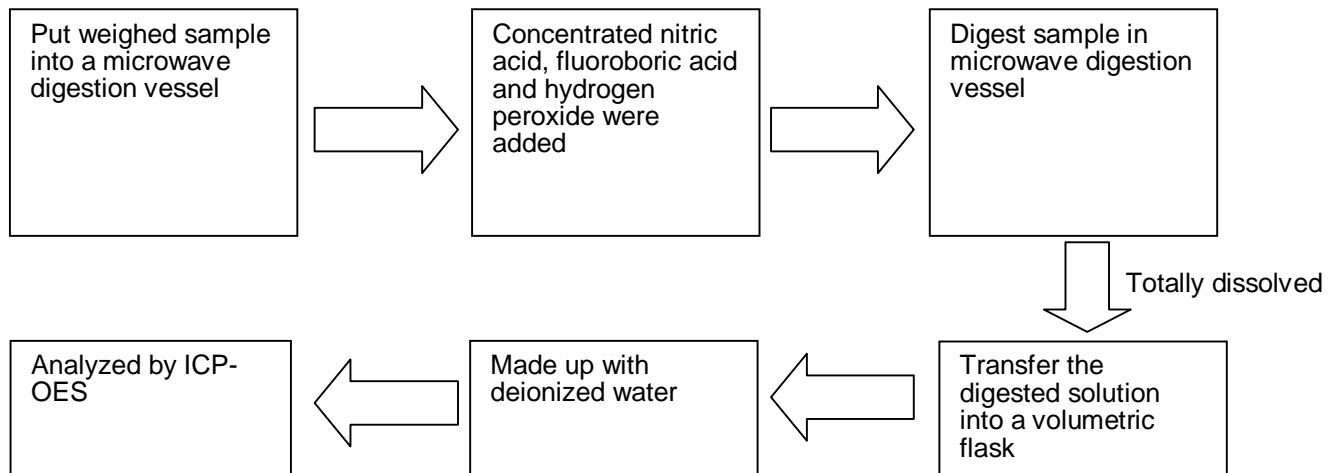
Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents



2. Test for Hg Content

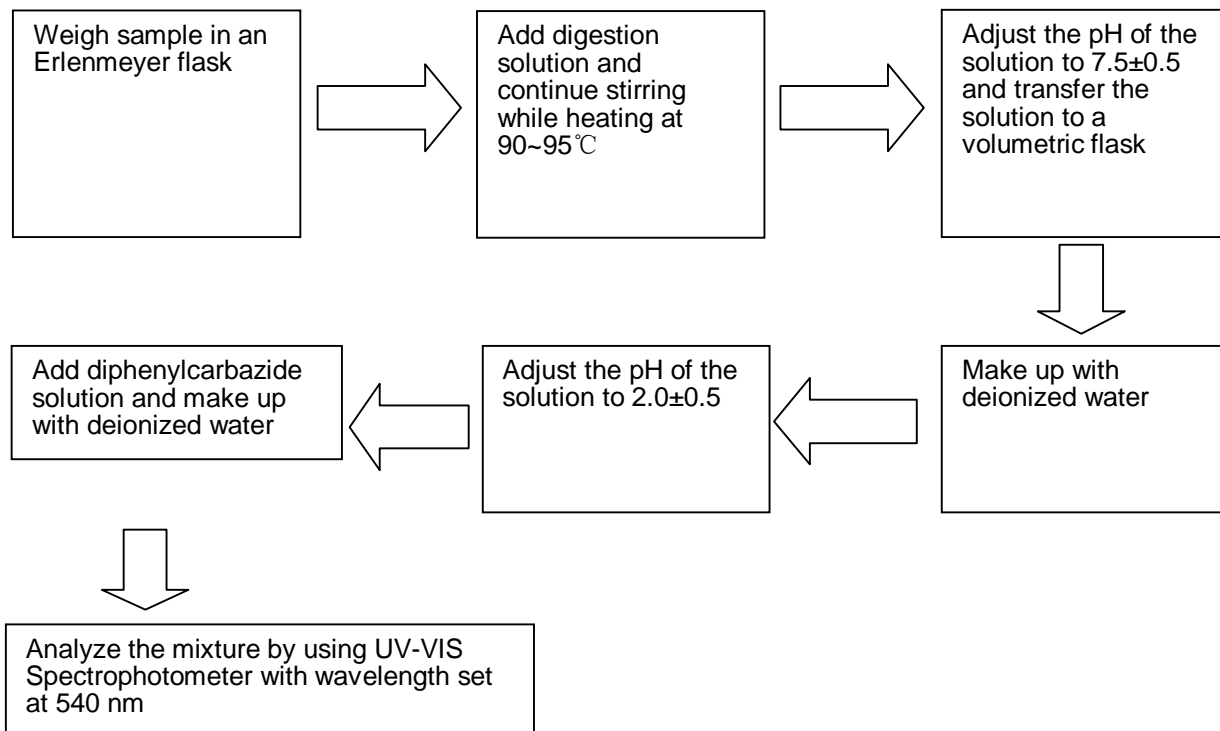


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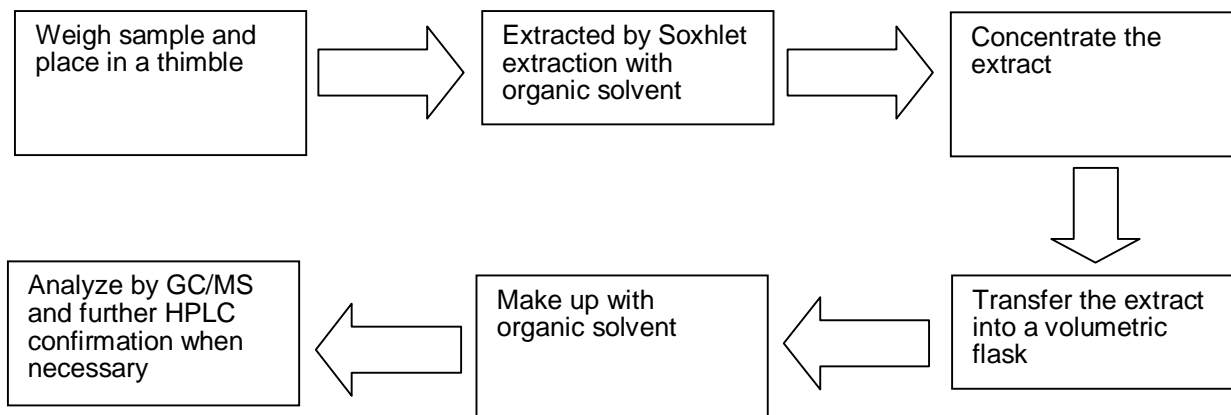


Tests Conducted

3. Test for Chromium (VI) ( $\text{Cr}^{6+}$ ) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents



\*\*\*\*\*



**Test Report**

Number: SZHH0079239604

## Tests Conducted

2 Halogen Content

## ( I ) Test Result Summary:

<u>Testing Item</u>	<u>Result (mg/kg)</u>
Fluorine (F) Content	ND
Chlorine (Cl) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg = milligram per kilogram = ppm

ND = Not detected

## ( II ) Test Method:

<u>Testing Item</u>	<u>Testing Method</u>	<u>Reporting Limit</u>
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Date sample received : Jun 07, 2013

Testing period : Jun 07, 2013 to Jun 17, 2013

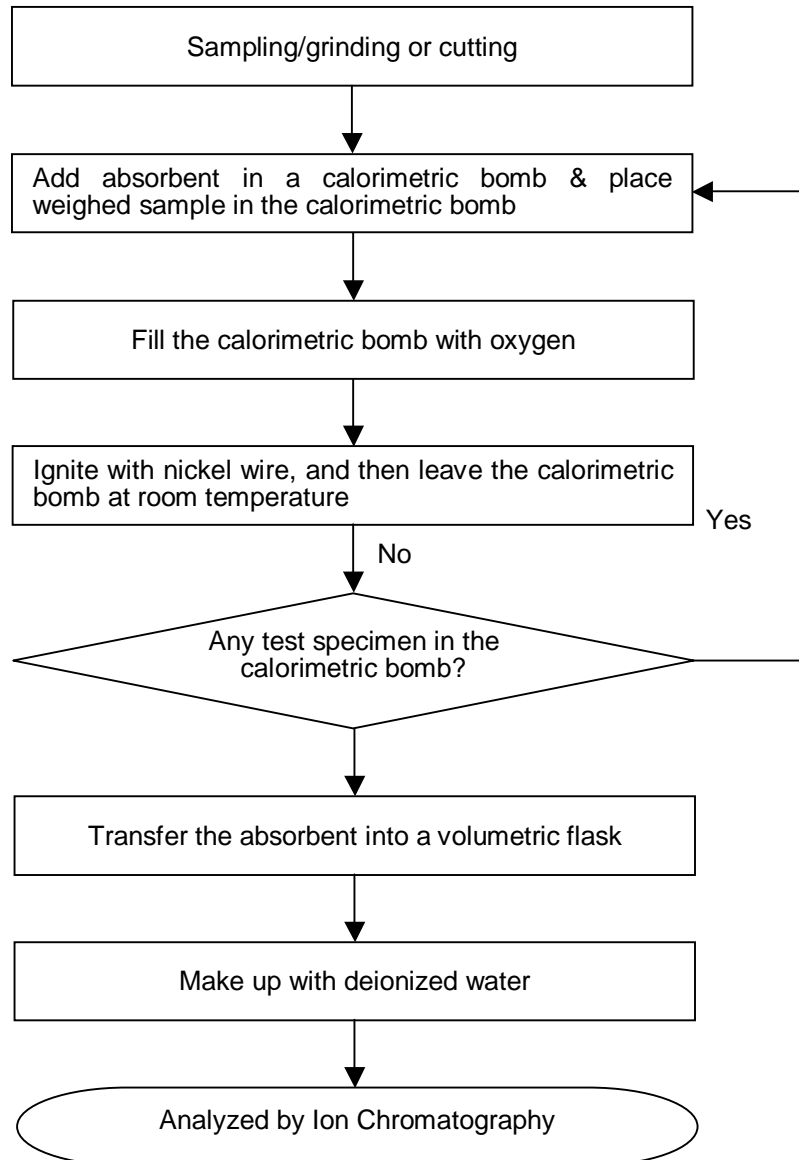
\*\*\*\*\*



Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



\*\*\*\*\*

End of report

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## Test Report

No. SHAEC1303398301

Date: 15 Mar 2013

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SHIN-NIHON KAKIN CO.,LTD.

1-6, MIYAMOTO,ITABASHI, TOKYO,JAPAN

The following sample(s) was/were submitted and identified on behalf of the clients as : SP-A6PL

SGS Job No. : SP13-005972 - SH

Composition : Silver Metal

Date of Sample Received : 11 Mar 2013

Testing Period : 11 Mar 2013 - 15 Mar 2013

Test Requested : Selected test(s) as requested by client.

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

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

Conclusion : Based on the performed tests on submitted samples, the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE) comply with the limits as set by RoHS Directive 2011/65/EU Annex II; recasting 2002/95/EC.

Signed for and on behalf of  
SGS-CSTC Ltd.

JJ Fan  
Approved Signatory

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## Test Report

No. SHAEC1303398301

Date: 15 Mar 2013

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Test Results :

### Test Part Description :

Specimen No.	SGS Sample ID	Description
1	SHA13-033983.001	Gray mud

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

### RoHS Directive 2011/65/EU

Test Method : With reference to IEC 62321:2008

- (1) Determination of Cadmium by ICP-OES.
- (2) Determination of Lead by ICP-OES.
- (3) Determination of Mercury by ICP-OES.
- (4) Determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
- (5) Determination of PBBs / PBDEs content by GC-MS.

Test Item(s)	Limit	Unit	MDL	001
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	2	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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## Test Report

No. SHAEC1303398301

Date: 15 Mar 2013

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Test Item(s)	Limit	Unit	MDL	001
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

### Notes :

- (1) The maximum permissible limit is quoted from the directive 2011/65/EU, Annex II

### Element(s)

Test Method : With reference to US EPA Method 3052:1996, analysis was performed by ICP-OES.

Test Item(s)	Unit	MDL	001
Arsenic (As)	mg/kg	10	ND
Selenium (Se)	mg/kg	10	ND
Antimony (Sb)	mg/kg	10	ND
Barium (Ba)	mg/kg	10	442

### Notes :

- (1) Arsenic Reference Information: Entry 19 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2006/139/EC):
- (i) Shall not be placed on the market, or used, as substances or in mixtures where the substance or mixture is intended for use to prevent the fouling by micro-organisms, plants or animals of:
    - the hulls of boats,
    - cages, floats, nets and any other appliances or equipment used for fish or shellfish farming,
    - any totally or partly submerged appliances or equipment.
  - (ii) Shall not be placed on the market, or used, as substances or in mixtures where the substance or mixture is intended for use in the treatment of industrial waters, irrespective of their use.
  - (iii) Shall not be used in the preservation of wood. Furthermore, wood so treated shall not be placed on the market.

Please refer to Regulation (EC) No 552/2009 to get more detail information

### Halogen

Test Method : With reference to EN 14582: 2007, analysis was performed by Ion Chromatograph (IC).

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## Test Report

No. SHAEC1303398301

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Page 4 of 10

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND

### Hexabromocyclododecane (HBCDD)

Test Method : Determination of HBCDD by GC-MS based on IEC 62321:2008.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

#### Notes :

- (1) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC:  
Hexabromocyclododecane (HBCDD) is considered as a priority for risk evaluation and substance restriction.

### Phthalates

Test Method : Determination of phthalates by GC-MS based on EN 14372:2004.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Dibutyl Phthalate (DBP)	%	0.003	ND
Benzylbutyl Phthalate (BBP)	%	0.003	ND
Bis-(2-ethylhexyl) Phthalate (DEHP)	%	0.003	ND

#### Notes :

- (1) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC:  
Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.

Remark: Result shown is of the total weight of wet sample.

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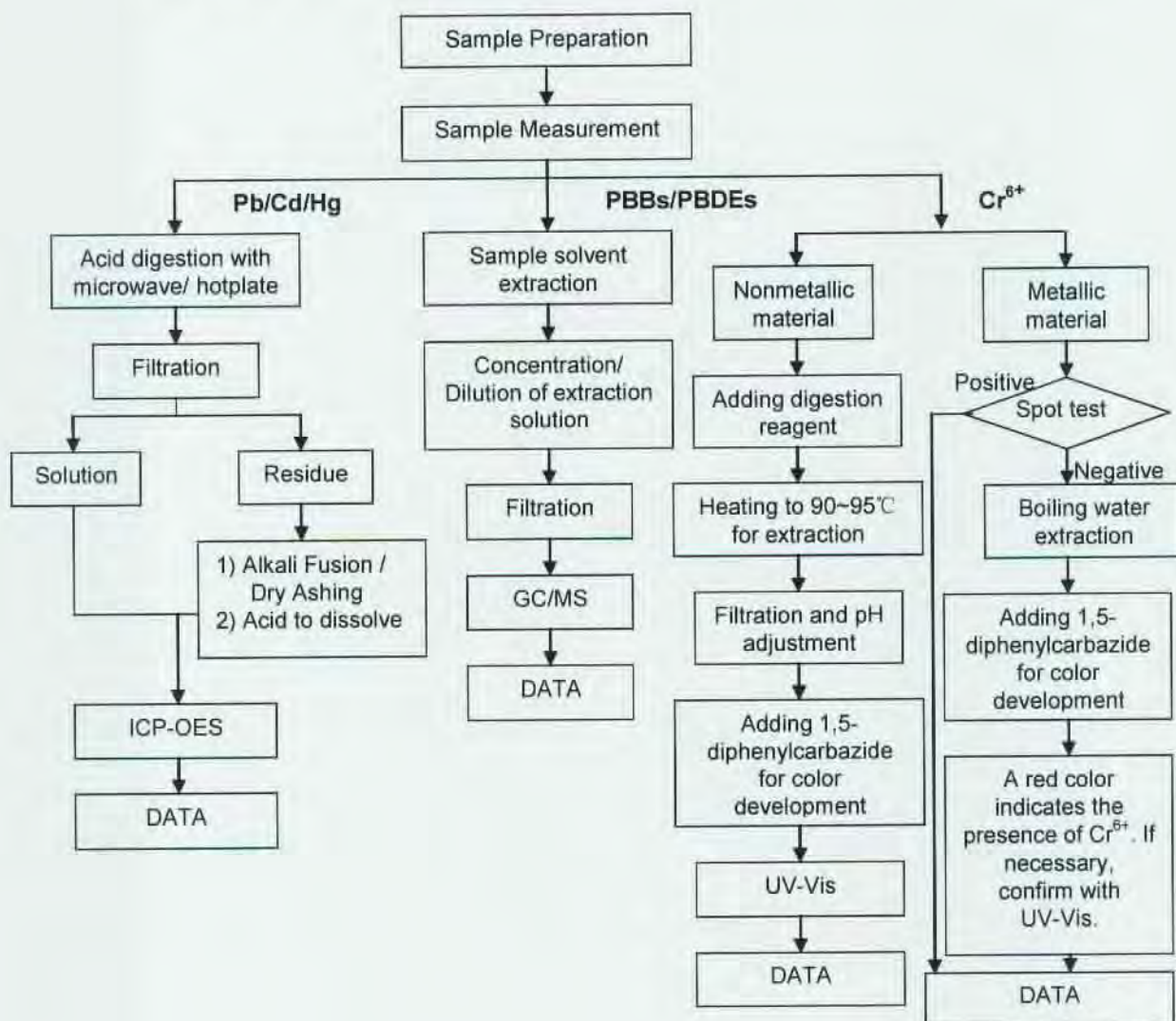
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## ATTACHMENTS

### RoHS Testing Flow Chart

- 1) Name of the person who made testing: Jan Shi/Yoyo Wang/Allen Xiao/Gary Xu
- 2) Name of the person in charge of testing: Jeff Zhang/George Xu/ Linda Li
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. ( $\text{Cr}^{6+}$  and PBBs/PBDEs test method excluded)

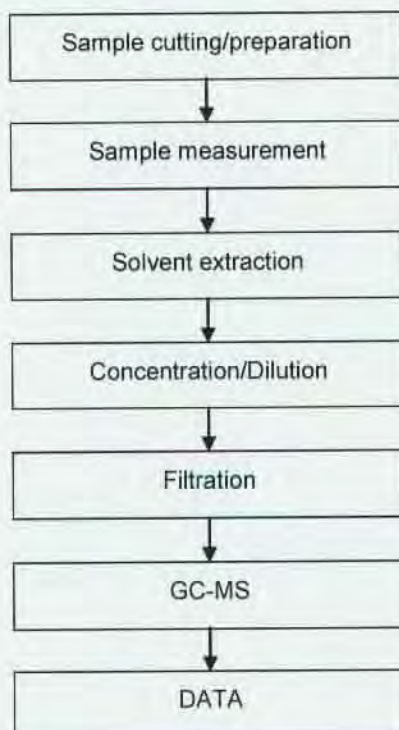


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## Phthalates Testing Flow Chart

- 1) Name of the person who made testing: Elyn Yao
- 2) Name of the person in charge of testing: Myra Ma



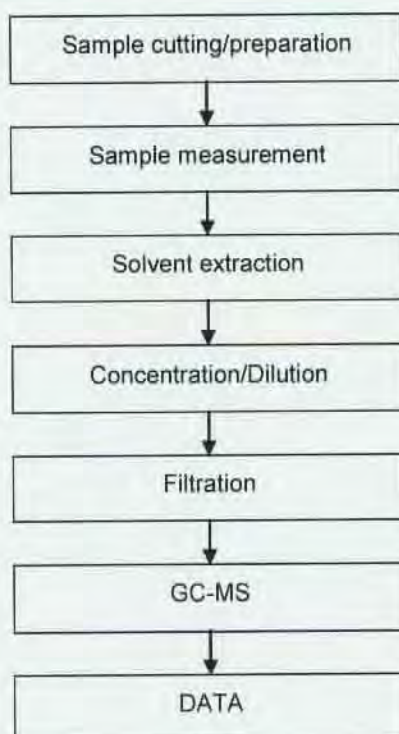
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## HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Gary Xu
- 2) Name of the person in charge of testing: Jessy Huang



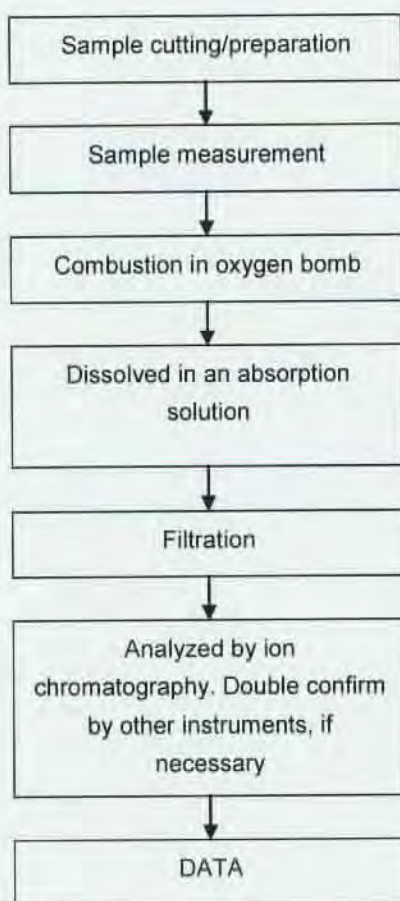
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## Halogen Testing Flow Chart

1) Name of the person who made testing: Sisily Yin

2) Name of the person in charge of testing: Linda Li



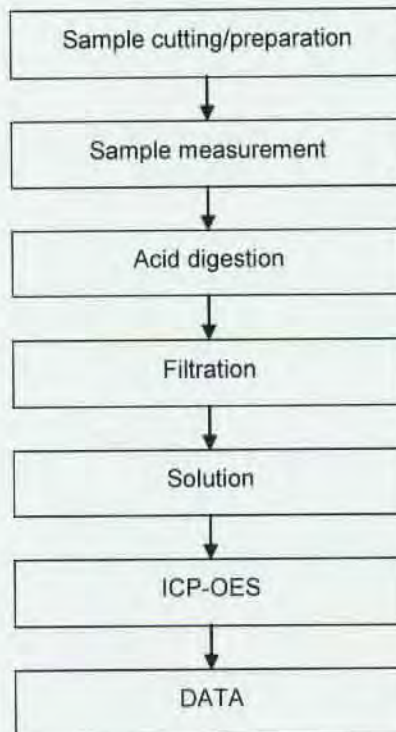
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## Elements Testing Flow Chart

- 1) Name of the person who made testing: Yoyo Wang/ Jan Shi
- 2) Name of the person in charge of testing: Jeff Zhang



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## Test Report

No. SHAEC1303398301

Date: 15 Mar 2013

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Sample photo:



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## Test Report

No. CANEC1303681202

Date: 26 Mar 2013

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DONGGUAN GUANGJU TIN ALLOY PRODUCT CO.,LTD.

HENG Dong 1ST RD,8#,HENGKENG,LIAOBU TOWN,DONGGUANG CITY, GUANGDONG PROVINCE  
CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : Lead-Free Solder Paste

SGS Job No. : CP13-012954 - GZ

Model No. : GJ-305-3

Client Ref. Info. : GJ-990-3, GJ-4258-3, GJ-641-3

Date of Sample Received : 21 Mar 2013

Testing Period : 21 Mar 2013 - 26 Mar 2013

Test Requested : Selected test(s) as requested by client.

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

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

Conclusion : Based on the performed tests on submitted samples, the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE) comply with the limits as set by RoHS Directive 2011/65/EU Annex II; recasting 2002/95/EC.

Signed for and on behalf of  
SGS-CSTC Ltd.

Kenny Wang  
Approved Signatory

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# Test Report

No. CANEC1303681202

Date: 26 Mar 2013

Page 2 of 5

Test Results :

## Test Part Description :

Specimen No.	SGS Sample ID	Description
1	CAN13-036812.002	Grey paste

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

## RoHS Directive 2011/65/EU

Test Method : With reference to IEC 62321:2008

- (1) Determination of Cadmium by ICP-OES.
- (2) Determination of Lead by ICP-OES.
- (3) Determination of Mercury by ICP-OES.
- (4) Determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
- (5) Determination of PBBs / PBDEs content by GC-MS.

Test Item(s)	Limit	Unit	MDL	002
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	63
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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## Test Report

No. CANEC1303681202

Date: 26 Mar 2013

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Test Item(s)	Limit	Unit	MDL	002
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

### Notes :

- (1) The maximum permissible limit is quoted from the directive 2011/65/EU, Annex II

Remark : The result(s) shown is/are of the total weight of wet sample.

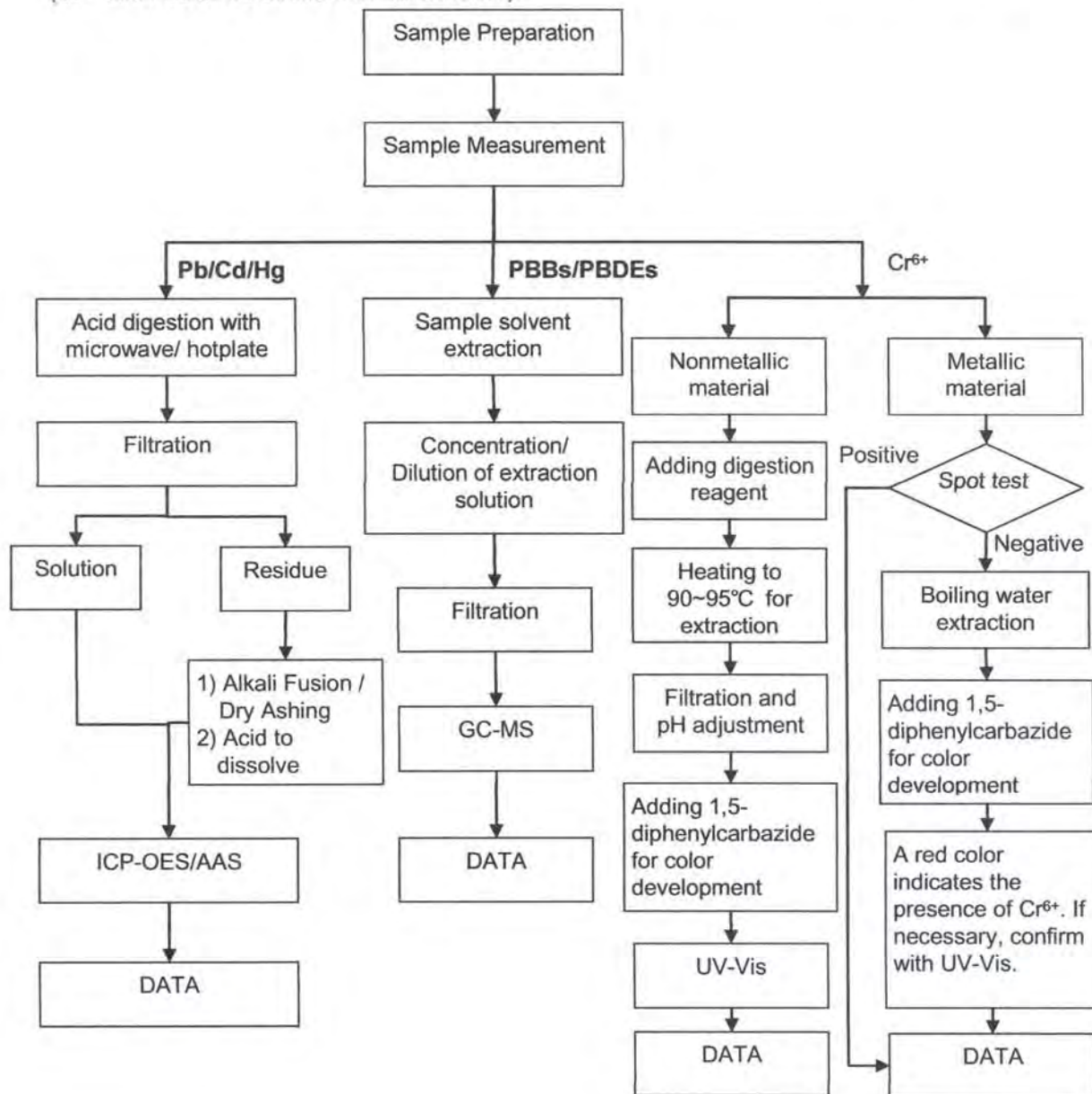
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## ATTACHMENTS

### RoHS Testing Flow Chart

- 1) Name of the person who made testing: Michael Tso / Cutey Yu
- 2) Name of the person in charge of testing: Adams Yu / Yolanda Wei
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded).



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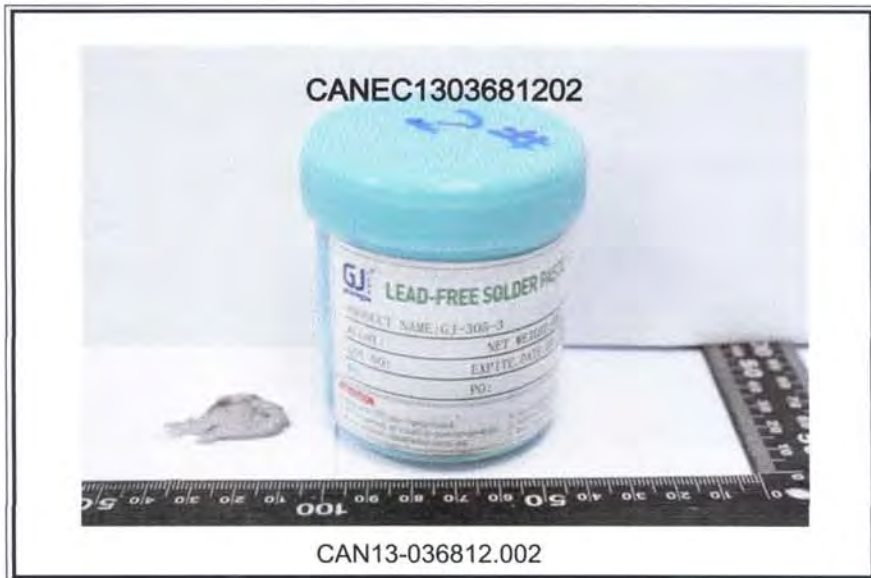
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## Test Report

No. CANEC1303681203

Date: 26 Mar 2013

Page 1 of 4

DONGGUAN GUANGJU TIN ALLOY PRODUCT CO.,LTD.

HENG DONG 1ST RD,8#,HENGKENG,LIAOBU TOWN,DONGGUANG CITY, GUANGDONG PROVINCE  
CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : Lead-Free Solder Paste

SGS Job No. : CP13-012954 - GZ  
Model No. : GJ-305-3  
Client Ref. Info. : GJ-990-3, GJ-4258-3, GJ-641-3  
Date of Sample Received : 21 Mar 2013  
Testing Period : 21 Mar 2013 - 26 Mar 2013  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).

Signed for and on behalf of  
SGS-CSTC Ltd.

Kenny Wang  
Approved Signatory

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# Test Report

No. CANEC1303681203

Date: 26 Mar 2013

Page 2 of 4

Test Results :

## Test Part Description :

Specimen No.	SGS Sample ID	Description
1	CAN13-036812.002	Grey paste

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

## Halogen

Test Method : With reference to EN 14582: 2007, analysis was performed by Ion Chromatograph (IC).

Test Item(s)	Unit	MDL	002
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

Remark : The result(s) shown is/are of the total weight of wet sample.

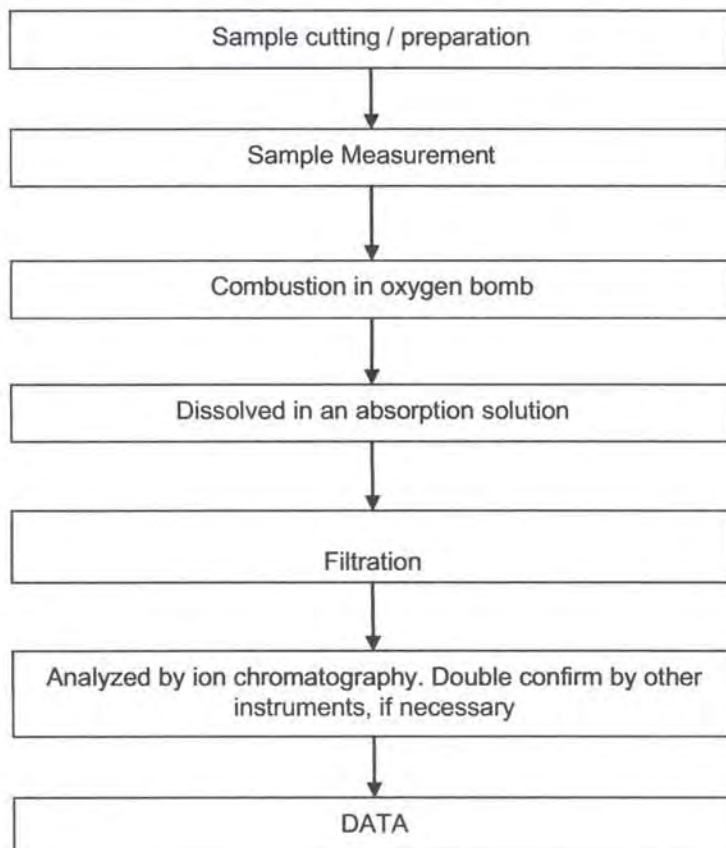
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## ATTACHMENTS

### Halogen Testing Flow Chart

- 1) Name of the person who made testing: Bella Wang  
2) Name of the person in charge of testing: Adams Yu



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## Test Report

No. CTSSA/01561/13  
CTS Ref. CTSSA/13/0261/Henkel

Date: 25/01/2013

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**HENKEL (MALAYSIA) SDN BHD**  
**LOT 62049, JALAN PORTLAND, TASEK INDUSTRIAL ESTATE**  
**31400 IPOH, PERAK DARUL EHSAN**

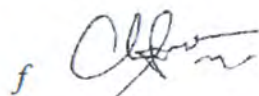
The following merchandise was (were) submitted and identified by the client as:

Sample Description	:	96SC C400 Solder Wire
Batch Number	:	O53A996895
Sample Receiving Date	:	18/01/2013
Testing Period	:	18/01/2013 to 25/01/2013

---

Test Requested	:	Selected test(s) as requested by client
Test Method	:	Please refer to next page(s).
Test Results	:	Please refer to next page(s).
Analysts	:	Ng Jing Wei, Cho Kar Yen, Tan Li Wei & Choong Lap Kit

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CHONG KIEN LEN  
B.Sc.(HONS) AMIC  
SENIOR LAB MANAGER

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## Test Report

No. CTSSA/01561/13

Date: 25/01/2013

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CTS Ref. CTSSA/13/0261/Henkel

Test results:

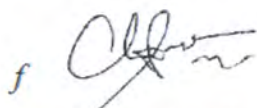
### Test Part Description :

Sample Description : 96SC C400 Solder Wire  
Batch Number : 053A996895

### RoHS Directive 2011/65/EU Annex II

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium(Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	223	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI) by Spot test / boiling water extraction (optional) #	---	With reference to IEC 62321:2008	Negative	-
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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# Test Report

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CTS Ref. CTSSA/13/0261/Henkel

Sum of PBDEs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

Note : (a) mg/kg = ppm ; (0.1wt% = 1000ppm)

(b) N.D. = Not Detected

(c) MDL = Method Detection Limit

(d) # = **Spot-Test:**

a. Negative means the absence of Cr(VI) on the tested areas

b. Positive means the presence of Cr(VI) on the tested areas

(The tested sample should be further verified by boiling-water-extraction method if the spot test result is negative or cannot be confirmed)

**Boiling water extraction:**

a. Negative means the absence of Cr(VI) on the tested areas

b. Positive means the presence of Cr(VI) on the tested areas;

The detected concentration in 50 mL boiling water extraction solution is equal or greater than 0.02 mg/kg with 50 cm<sup>2</sup> sample surface area.

For corrosion protection coatings on metals: Information on storage conditions and production date of the tested sample is unavailable and thus results of Cr(VI) represent status of the sample at the time of testing.

(e) - = Not regulated

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## Test Report

No. CTSSA/01561/13  
CTS Ref. CTSSA/13/0261/Henkel

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### Test Part Description :

Sample Description : 96SC C400 Solder Wire  
Batch Number : O53A996895

HENKEL (MALAYSIA) SDN BHD  
CTSSA/01561/13



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## Test Report

No. CTSSA/01561/13  
CTS Ref. CTSSA/13/0261/Henkel

Date: 25/01/2013

Page: 5 of 5

### 1. DETERMINATION OF CADMIUM CONTENT BY IEC 62321 2008

Sample Receiving and Registration  
↓  
Cut sample in small pieces  
↓  
Weight sample (0.2-0.5g) into digestion vessel  
↓  
Acid digestion (Microwave)  
↓  
"Totally Dissolved"  
↓  
Filtration  
↓  
Analyses by ICP

### 2. DETERMINATION OF LEAD CONTENT BY IEC 62321 2008

Sample Receiving and Registration  
↓  
Cut sample in small pieces  
↓  
Weight sample (0.2-0.5g) into digestion vessel  
↓  
Acid digestion (Microwave)  
↓  
"Totally Dissolved"  
↓  
Filtration  
↓  
Analyses by ICP

### 3. DETERMINATION OF MERCURY CONTENT BY IEC 62321 2008

Sample Receiving and Registration  
↓  
Cut sample in small pieces  
↓  
Weight sample (0.2-0.5g) into digestion vessel  
↓  
Acid digestion (Microwave)  
↓  
"Totally Dissolved"  
↓  
Filtration  
↓  
Analyses by ICP

### 4. DETERMINATION OF HEXAVALENT CHROMIUM BY IEC 62321 2008

Sample Receiving and Registration  
↓  
Sample Preparation  
↓  
Spot-test (Qualitative)  
↓  
Boiling-water-extraction  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 5. DETERMINATION OF PBB/PBDE WITH GC-MS BY IEC 62321 2008

Cut sample in small pieces  
↓  
Weight sample (0.5-4.0g) into extraction thimble  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 µm membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

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

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## Test Report

No. TSNEC1301021601

Date: 12 Oct 2013

Page 1 of 5

The following sample(s) was/were submitted and identified on behalf of the clients as : TIN-COATED COPPER WIRE

SGS Job No. : TP13-005128 - TJ  
Main Substance : Cu  
Date of Sample Received : 09 Oct 2013  
Testing Period : 09 Oct 2013 - 12 Oct 2013  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted samples, the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE) comply with the limits as set by RoHS Directive 2011/65/EU Annex II; recasting 2002/95/EC.

Signed for and on behalf of  
SGS-CSTC Ltd.

Reabeca Zhou  
Approved Signatory

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中国·天津市经济技术开发区第五大街41号SGS大厦 邮编: 300457 t (86-22) 65288000 f (86-22) 25295252 e sgs.china@sgs.com

Member of the SGS Group (SGS SA)

# Test Report

No. TSNEC1301021601

Date: 12 Oct 2013

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Test Results :

## Test Part Description :

Specimen No.	SGS Sample ID	Description
1	TSN13-010216.001	silver gray metal wire

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

## RoHS Directive 2011/65/EU

- Test Method :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4) With reference to IEC 62321:2008, determination of Hexavalent Chromium by spot test / Colorimetric Method using UV-Vis.
  - (5) With reference to IEC 62321:2008, determination of PBBs and PBDEs by GC-MS.

Test Item(s)	Limit	Unit	MDL	001
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	-	-	◇	Negative
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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# Test Report

No. TSNEC1301021601

Date: 12 Oct 2013

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Test Item(s)	Limit	Unit	MDL	001
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

## Notes :

(1) The maximum permissible limit is quoted from directive 2011/65/EU, Annex II.

(2) ◇Spot-test:

Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;

(The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)

◇Boiling-water-extraction:

Negative = Absence of CrVI coating

Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm<sup>2</sup> sample surface area.

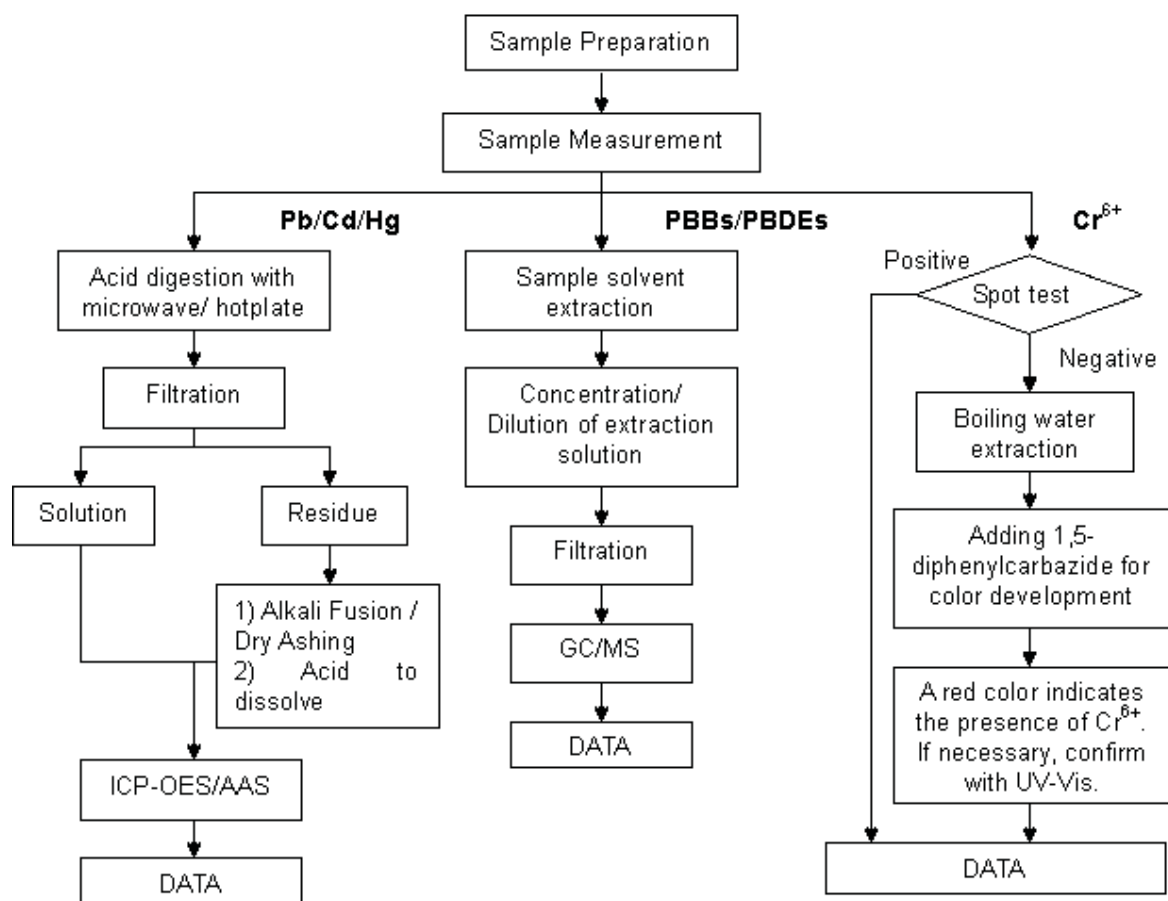
Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

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## ATTACHMENTS

### Cd/Pb/Hg/Cr<sup>6+</sup>/PBBs&PBDEs Testing Flow Chart

- 1) Name of the person who made testing: Aaron Wang/Jason Li/Angell Yao
- 2) Name of the person in charge of testing: Cindy Yin/Rex Zhu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart.  
(Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



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## Test Report

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Sample photo:



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**Test Report**

Number: SZHH00811014

Applicant: LITTELFUSE, INC  
8755 WEST HIGGINS ROAD SUITE  
500CHICAGO IL 60631 USA

Date: Aug 17, 2013

Attn: KRISTEEN BACILA/ARSENIO CESISTA JR.

**Sample Description:**

One (1) submitted sample said to be **transparent yellow plastic (hot melt).**  
Part No. MS267.



\*\*\*\*\*

**Tests conducted:**

As requested by the applicant, refer to attached page(s) for details.

\*\*\*\*\*

To be continued

Authorized by:  
For Intertek Testing Services  
Shenzhen Ltd.

Ben N.L. Lin  
General Manager



Page 1 of 9



**Test Report**

Number: SZHH00811014

Conclusion:

Tested Samples  
Submitted sample

Standard

Restriction of the use of certain hazardous substance in electrical and electronic equipment (RoHS Directive 2011/65/EU)

Result

See Test Conducted

Phthalates content requirement in Annex XVII Items 51 & 52 of the Reach Regulation (EC) No. 1907/2006 & Amendment No. 552/2009 (formerly known as Directive 2005/84/EC) (DEHP, DBP & BBP)

Pass

Test Item

Halogen (F, Cl, Br, I) Content

See Test Conducted

Total Antimony Content

See test conducted

Di-iso-butyl phthalate (DIBP)Content

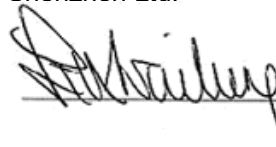

See Test Conducted

Hexabromocyclododecane Content

See Test Conducted

\*\*\*\*\*

Authorized by:  
For Intertek Testing Services  
Shenzhen Ltd.

Ben N.L. Lin  
General Manager



Page 2 of 9



# Test Report

Number: SZHH00811014

## Tests Conducted

### 1 RoHS Chemical Test

#### (A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr <sup>6+</sup> ) Content (mg/kg)	ND(<1)
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected

\*\*\*\*\*





# Test Report

Number: SZHH00811014

## Tests Conducted

### (B) RoHS Requirement:

Restricted Substances	Limits
Cadmium (Cd)	0.01% (100 mg/kg)
Lead (Pb)	0.1% (1000 mg/kg)
Mercury (Hg)	0.1% (1000 mg/kg)
Chromium (VI) (Cr <sup>6+</sup> )	0.1% (1000 mg/kg)
Polybrominated Biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000 mg/kg)

The above limits were quoted from 2011/65/EU for homogeneous material.

### (C) Test Method:

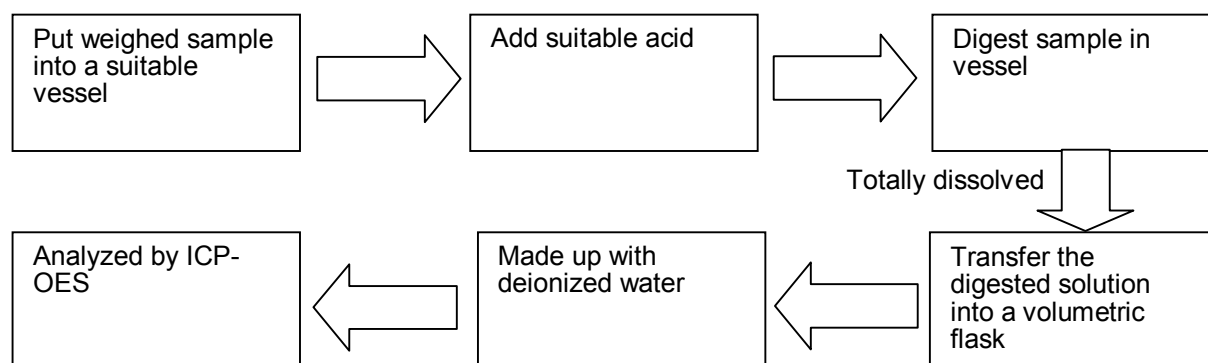
Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr <sup>6+</sup> ) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received: Aug 13, 2013

Testing period: Aug 13, 2013 to Aug 15, 2013

### (D) Measurement Flowchart:

#### 1. Test for Cd/Pb Contents

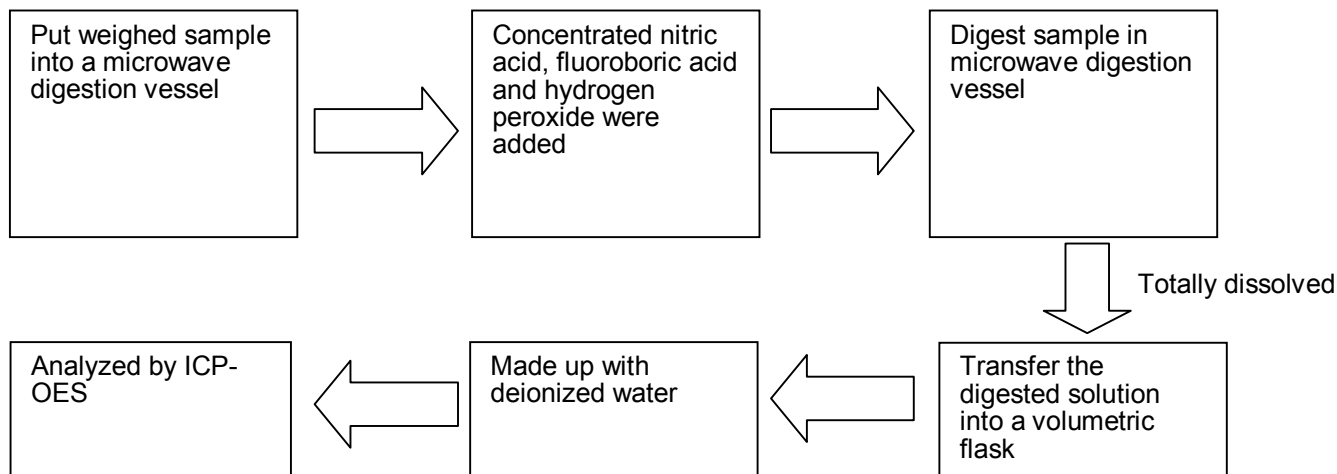


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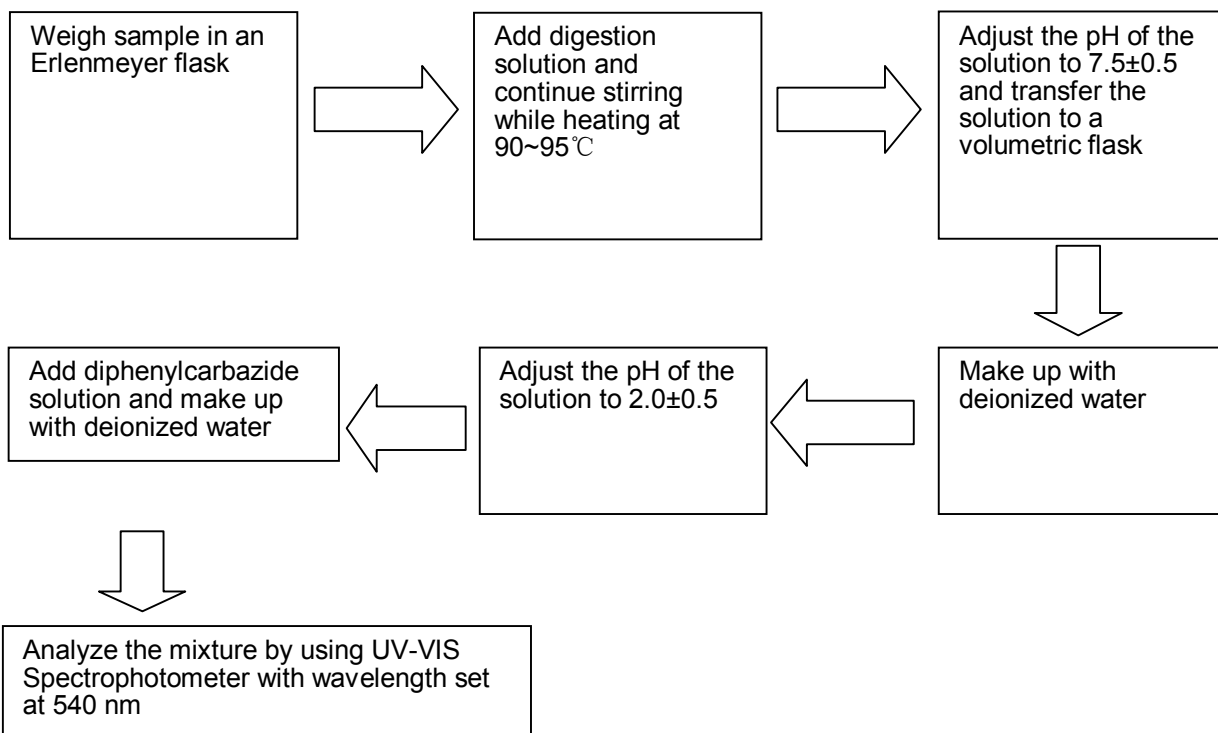


Tests Conducted

2. Test for Hg Content



3. Test for Chromium (VI) ( $\text{Cr}^{6+}$ ) Content (Alkaline Digestion)



\*\*\*\*\*

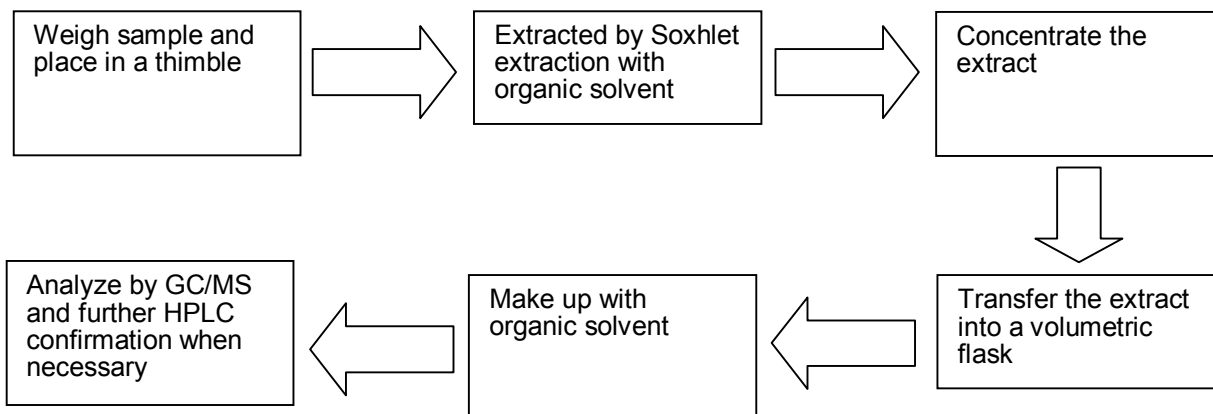


## Test Report

Number: SZHH00811014

### Tests Conducted

#### 4. Test for PBBs/PBDEs Contents



#### 2 Phthalate Content Test

With reference to EN14372, by Gas chromatographic-Mass Spectrometric (GC-MS) analysis.

	Result (%)
Dibutyl phthalate (DBP)	<0.01
Di-(2-ethyl hexyl) phthalate (DEHP)	<0.01
Benzyl butyl phthalate (BBP)	<0.01
Sum of three phthalates	<0.01
Limit (max.)	0.1 %

The above limit was quoted according to Annex XVII Items 51 & 52 of the Reach Regulation (EC) No. 1907/2006 & Amendment No. 552/2009(formerly known as Directive 2005/84/EC) for phthalate content in toys and children articles.

As per client's request, only DBP, DEHP and BBP were tested for tested for the submitted sample.

Date sample received :Aug 13, 2013

Testing period :Aug 13, 2013 to Aug 15, 2013

\*\*\*\*\*



**Test Report**

Number: SZHH00811014

## Tests Conducted

3 Halogen Content

## ( I ) Test Result Summary:

<u>Testing Item</u>	<u>Result (mg/kg)</u>
Fluorine (F) Content	ND
Chlorine (Cl) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg= milligram per kilogram = ppm

ND= Not detected

## ( II ) Test Method:

<u>Testing Item</u>	<u>Testing Method</u>	<u>Reporting Limit</u>
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Date sample received: Aug 13, 2013

Testing period: Aug 13, 2013 to Aug 15, 2013

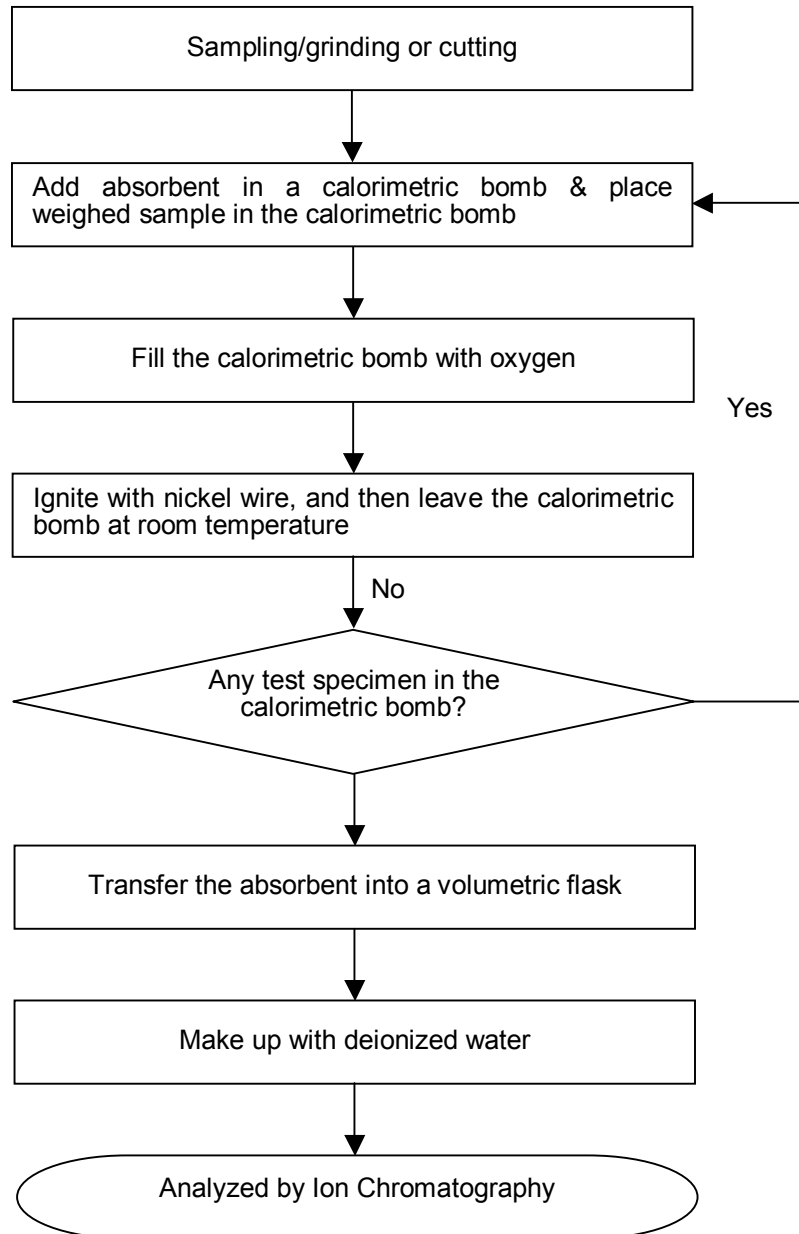
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Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



\*\*\*\*\*





**Test Report**

Number: SZHH00811014

## Tests Conducted

4 Total Antimony (Sb) Content

As per applicant's request, acid digestion method was used and total Antimony content was determined by Inductively Coupled Argon Plasma Spectrometry.

Result : Less than 10 ppm

ppm = parts per million

Date sample received : Aug 13, 2013

Testing period : Aug 13, 2013 to Aug 15, 2013

5 Di-iso-butyl phthalate (DIBP) Content

By solvent extraction and followed by Gas Chromatographic-Mass Spectrometric (GC-MS) analysis.

Result (%)

Di-iso-butyl phthalate (DIBP)

<0.01

Date sample received : Aug 13, 2013

Testing period : Aug 13, 2013 to Aug 15, 2013

6 Hexabromocyclododecane (HBCDD) Content:

By solvent extraction followed by Gas Chromatographic - Mass Spectrometric (GC-MS) analysis.

Result: Less than 10mg/kg

mg/kg =milligram per kilogram

Date sample received: Aug 13, 2013

Testing period: Aug 13, 2013 to Aug 15, 2013

\*\*\*\*\*

End of report

*This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.*





**Test Report**

Number: SZHH0079241801

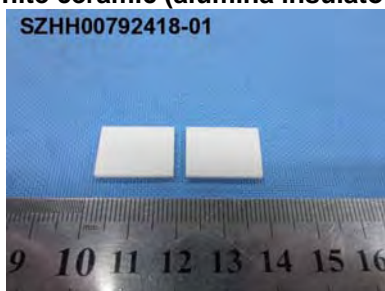
Applicant: LITTELFUSE, INC  
8755 WEST HIGGINS ROAD SUITE  
500CHICAGO IL 60631 USA

Date: Jun 19, 2013

Attn: KRISTEEN BACILA/ARSENIO CESISTA JR.

**Sample Description:**

One (1) submitted sample said to be **white ceramic (alumina insulator)**.



\*\*\*\*\*

**Tests conducted:**

As requested by the applicant, refer to attached page(s) for details.

\*\*\*\*\*

**Conclusion:**

Tested Samples  
Submitted sample

Standard  
Restriction of the use of certain hazardous substance  
in electrical and electronic equipment (RoHS  
Directive 2011/65/EU)

Result  
See test conducted

Test Item  
Halogen (F, Cl, Br, I) Content

See test conducted

\*\*\*\*\*

Authorized by:  
For Intertek Testing Services  
Shenzhen Ltd.

Ben N.L. Lin  
General Manager



Page 1 of 7

## Test Report

Number: SZHH0079241801

### Tests Conducted

#### 1 RoHS Chemical Test

##### (A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr <sup>6+</sup> ) Content (mg/kg)	ND(<1)
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected

\*\*\*\*\*



# Test Report

Number: SZHH0079241801

Tests Conducted

(B) RoHS Requirement:

Restricted Substances	Limits
Cadmium (Cd)	0.01% (100 mg/kg)
Lead (Pb)	0.1% (1000 mg/kg)
Mercury (Hg)	0.1% (1000 mg/kg)
Chromium (VI) (Cr <sup>6+</sup> )	0.1% (1000 mg/kg)
Polybrominated Biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000 mg/kg)

The above limits were quoted from 2011/65/EU for homogeneous material.

(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr <sup>6+</sup> ) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received: Jun 07, 2013

Testing period: Jun 07, 2013 to Jun 18, 2013

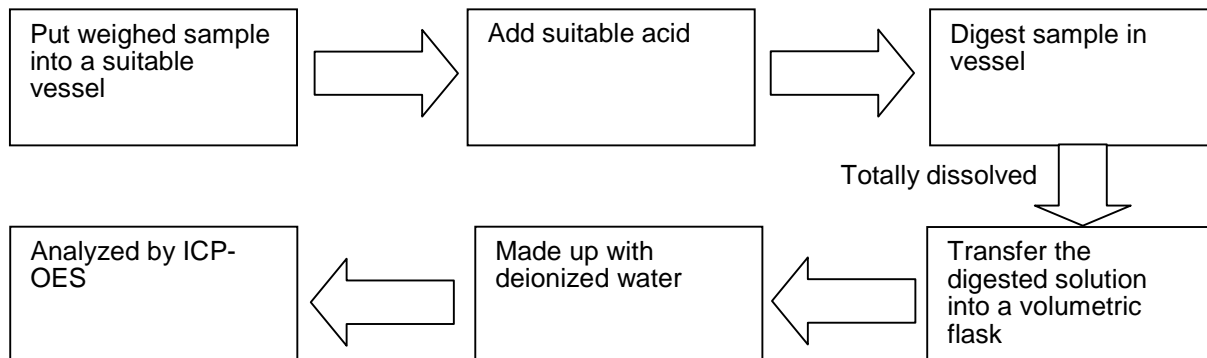
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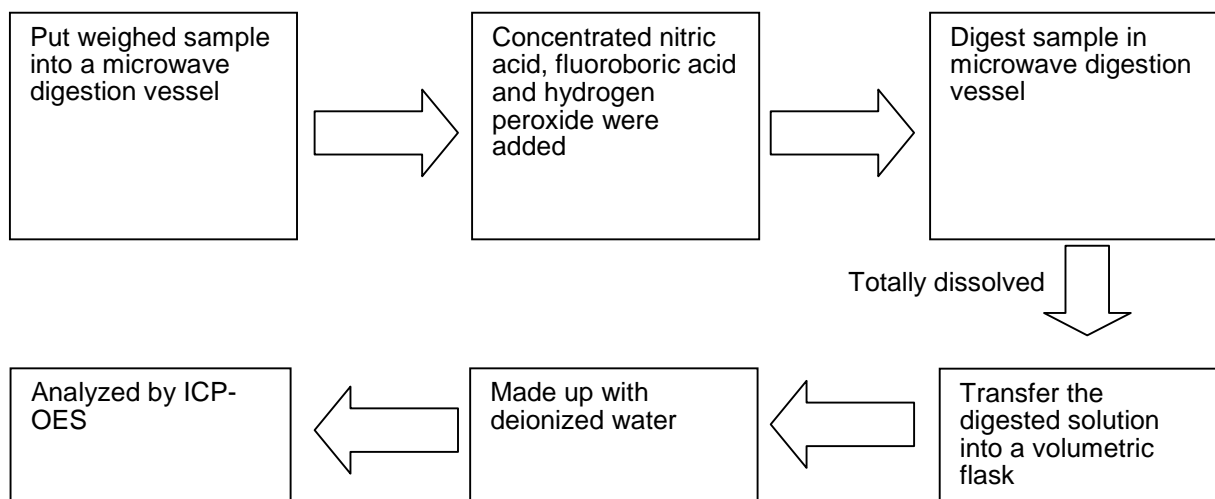
Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents



2. Test for Hg Content



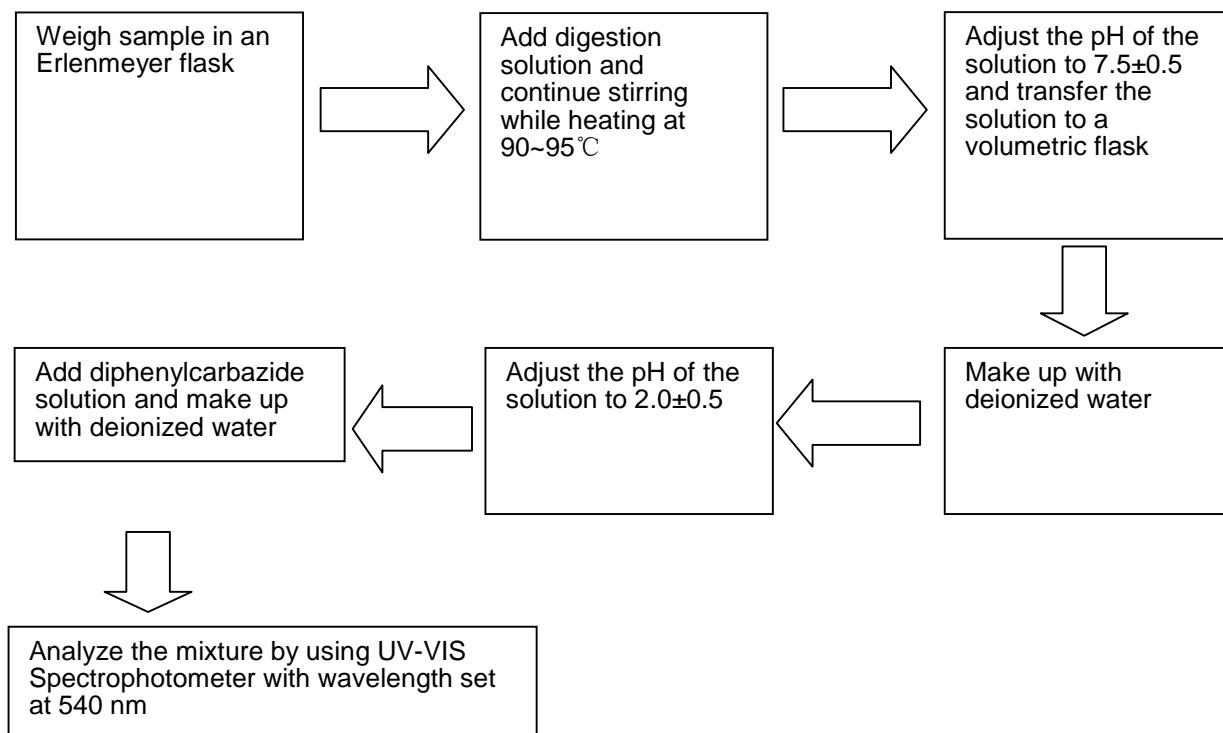
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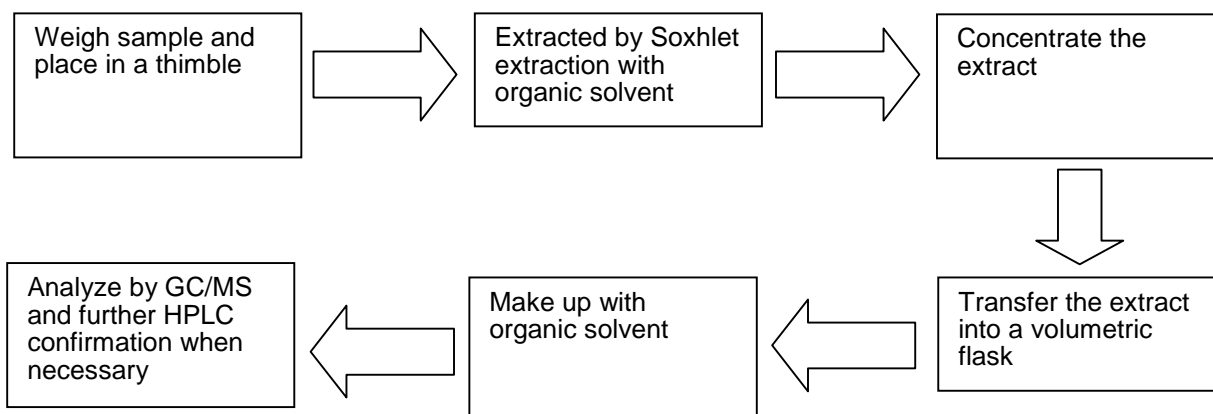


Tests Conducted

3. Test for Chromium (VI) ( $\text{Cr}^{6+}$ ) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents



\*\*\*\*\*



**Test Report**

Number: SZHH0079241801

## Tests Conducted

2 Halogen Content

## ( I ) Test Result Summary:

<u>Testing Item</u>	<u>Result (mg/kg)</u>
Fluorine (F) Content	ND
Chlorine (Cl) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg= milligram per kilogram = ppm

ND= Not detected

## ( II ) Test Method:

<u>Testing Item</u>	<u>Testing Method</u>	<u>Reporting Limit</u>
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Date sample received: Jun 07, 2013

Testing period: Jun 07, 2013 to Jun 17, 2013

\*\*\*\*\*

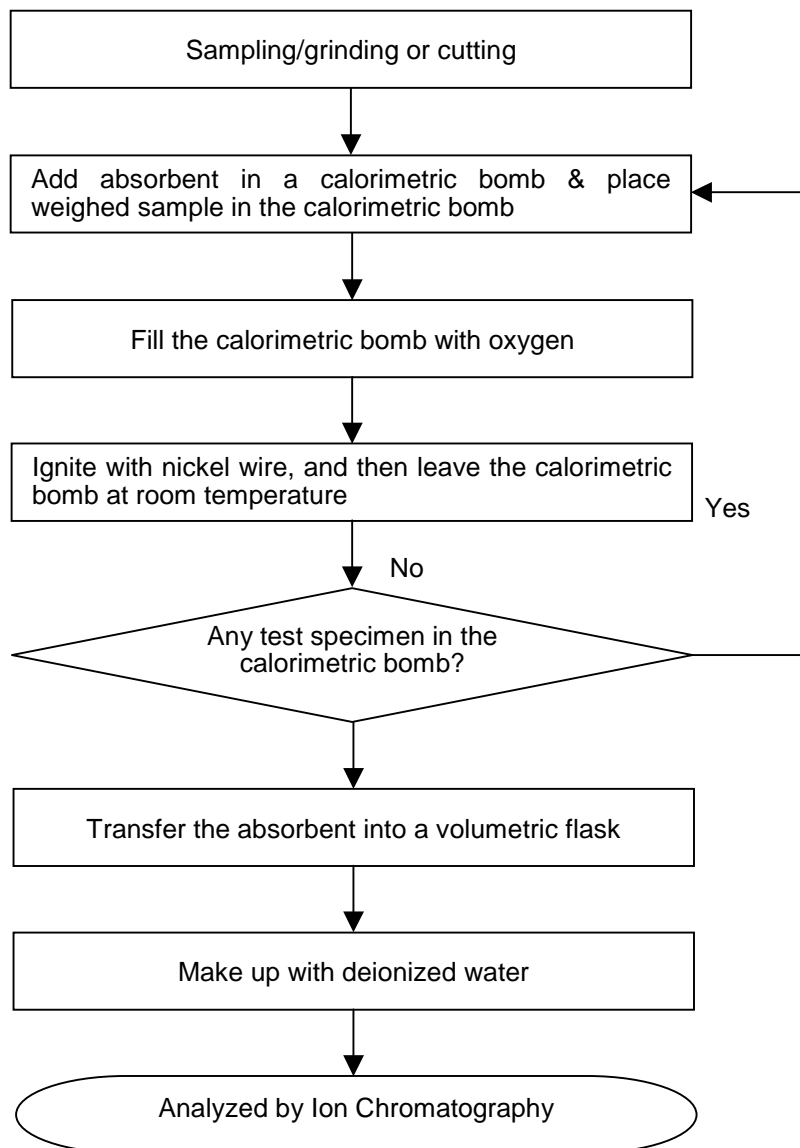


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Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



\*\*\*\*\*

End of report

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# Test Report

**Report No.** RHS01G000101001

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**Applicant** DONGGUAN DAEJOO ELECTRONIC MATERIALS CO.,LTD.

**Address** XIANCONG INDUSTRIAL ZONE WANJIANG DIATRICK DONGGUAN  
GUANGDONG CHINA

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

**Sample Name** 9544B

**Sample Received Date** Jan. 3, 2014

**Testing Period** Jan. 3, 2014 to Jan. 7, 2014

**Test Requested** As specified by client, to test Lead(Pb), Cadmium(Cd), Mercury(Hg), Hexavalent Chromium(Cr(VI)), Polybrominated Biphenyls(PBBs), Polybrominated Diphenyl Ethers(PBDEs), Hexabromocyclododecane(HBCDD), Phthalates in the submitted sample(s).

**Test Method** Please refer to the following page(s).

**Test Result(s)** Please refer to the following page(s).

Tested by

*Rick Lin*

Reviewed by

*Vangar He*



*Danny Liu*

Date

Jan. 7, 2014

Danny Liu

Technical Manager

No. 1078465288

Centre Testing International (Shenzhen) Co., Ltd. Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China



# Test Report

**Report No.** RHS01G000101001

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**Test Method**

Test Item(s)	Test Method	Measured Equipment(s)
Lead(Pb)	IEC 62321:2008 Ed.1 Sec.10	ICP-OES
Cadmium(Cd)	IEC 62321:2008 Ed.1 Sec.10	ICP-OES
Mercury(Hg)	IEC 62321:2008 Ed.1 Sec.7	ICP-OES
Hexavalent Chromium(Cr(VI))	IEC 62321:2008 Ed.1 Annex C	UV-Vis
Polybrominated Biphenyls(PBBs)	IEC 62321:2008 Ed.1 Annex A	GC-MS
Polybrominated Diphenyl Ethers(PBDEs)	IEC 62321:2008 Ed.1 Annex A	GC-MS
Hexabromocyclododecane(HBCDD)	Refer to US EPA 3540C:1996	GC-MS
Phthalates	Refer to EN 14372:2004(E)	GC-MS

**Test Result(s)**

Tested Item(s)	Result	MDL
Lead(Pb)	N.D.	2 mg/kg
Cadmium (Cd)	N.D.	2 mg/kg
Mercury(Hg)	N.D.	2 mg/kg
Hexavalent Chromium(Cr(VI))	N.D.	2 mg/kg

Tested Item(s)	Result	MDL
<b>Polybrominated Biphenyls(PBBs)</b>		
Monobromobiphenyl	N.D.	5 mg/kg
Dibromobiphenyl	N.D.	5 mg/kg
Tribromobiphenyl	N.D.	5 mg/kg
Tetrabromobiphenyl	N.D.	5 mg/kg
Pentabromobiphenyl	N.D.	5 mg/kg
Hexabromobiphenyl	N.D.	5 mg/kg
Heptabromobiphenyl	N.D.	5 mg/kg
Octabromobiphenyl	N.D.	5 mg/kg
Nonabromobiphenyl	N.D.	5 mg/kg
Decabromobiphenyl	N.D.	5 mg/kg

# Test Report

**Report No.** RHS01G000101001

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Tested Item(s)	Result	MDL
<b>Polybrominated Diphenyl Ethers(PBDEs)</b>		
Monobromodiphenyl ether	N.D.	5 mg/kg
Dibromodiphenyl ether	N.D.	5 mg/kg
Tribromodiphenyl ether	N.D.	5 mg/kg
Tetrabromodiphenyl ether	N.D.	5 mg/kg
Pentabromodiphenyl ether	N.D.	5 mg/kg
Hexabromodiphenyl ether	N.D.	5 mg/kg
Heptabromodiphenyl ether	N.D.	5 mg/kg
Octabromodiphenyl ether	N.D.	5 mg/kg
Nonabromodiphenyl ether	N.D.	5 mg/kg
Decabromodiphenyl ether	N.D.	5 mg/kg

Tested Item(s)	Result	MDL
Hexabromocyclododecane (HBCDD)	N.D.	5 mg/kg

Tested Item(s)	Result	MDL
<b>Phthalates</b>		
Dibutyl phthalate(DBP) CAS#:84-74-2	N.D.	50 mg/kg
Benzylbutyl phthalate(BBP) CAS#:85-68-7	N.D.	50 mg/kg
Di-2-ethylhexyl phthalate(DEHP) CAS#:117-81-7	N.D.	50 mg/kg

**Tested Sample/Part Description** Red solid

**Note:** The sample(s) had been dissolved totally tested for Lead, Cadmium, Mercury.

-MDL = Method Detection Limit

-N.D. = Not Detected (&lt;MDL )

-mg/kg = ppm = parts per million

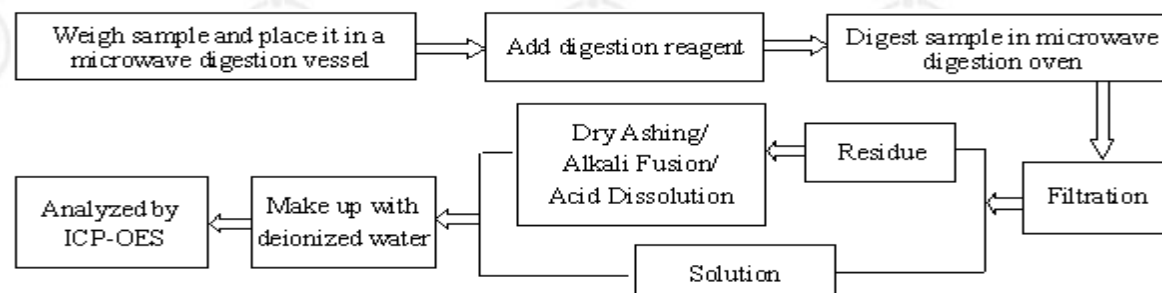
# Test Report

Report No. RHS01G000101001

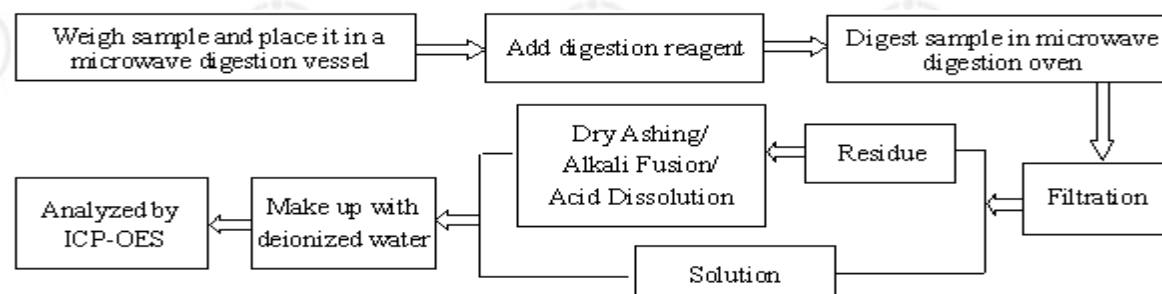
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## Test Process

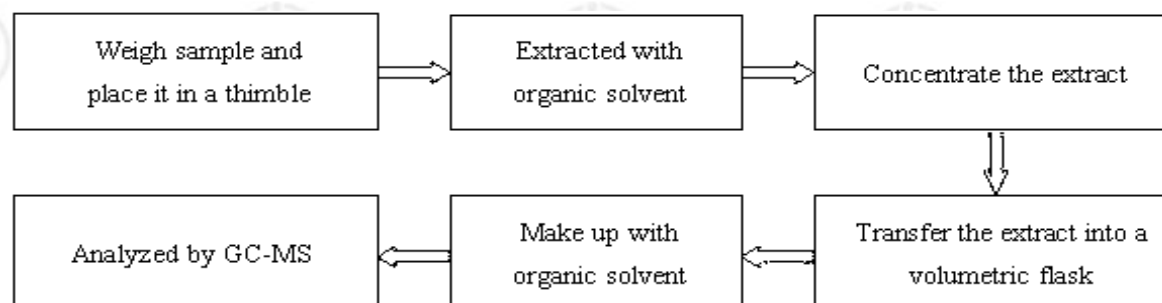
### 1. Lead(Pb), Cadmium(Cd)



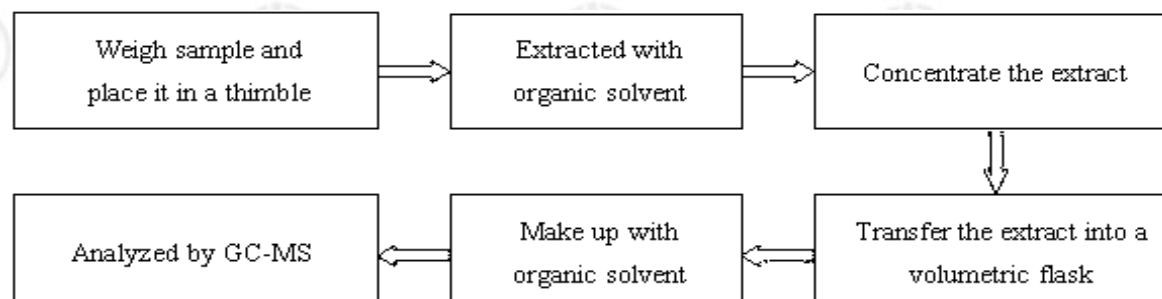
### 2. Mercury(Hg)



### 3. Phthalates



### 4. Polybrominated Biphenyls(PBBs), Polybrominated Diphenyl Ethers(PBDEs)

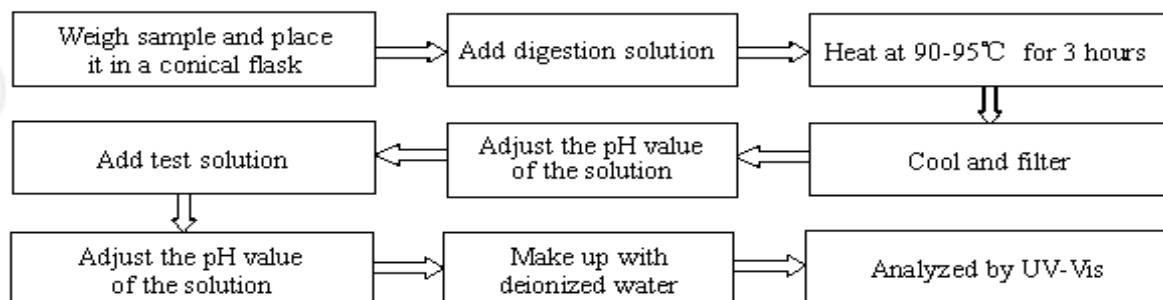


# Test Report

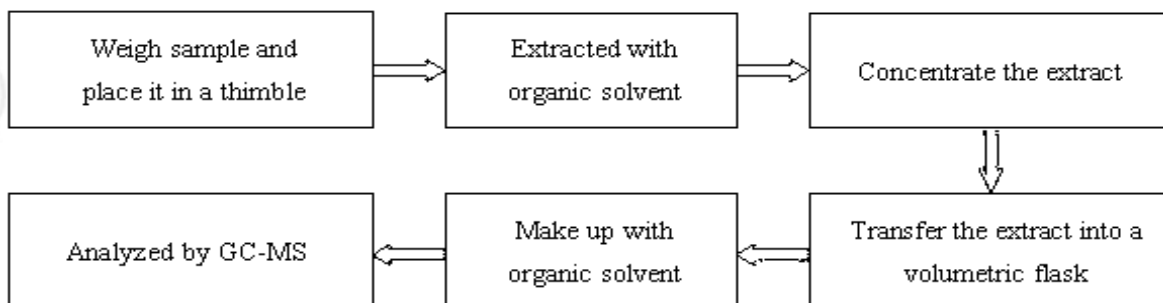
Report No. RHS01G000101001

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## 5. Hexavalent Chromium(Cr(VI))



## 6. Hexabromocyclododecane(HBCDD)



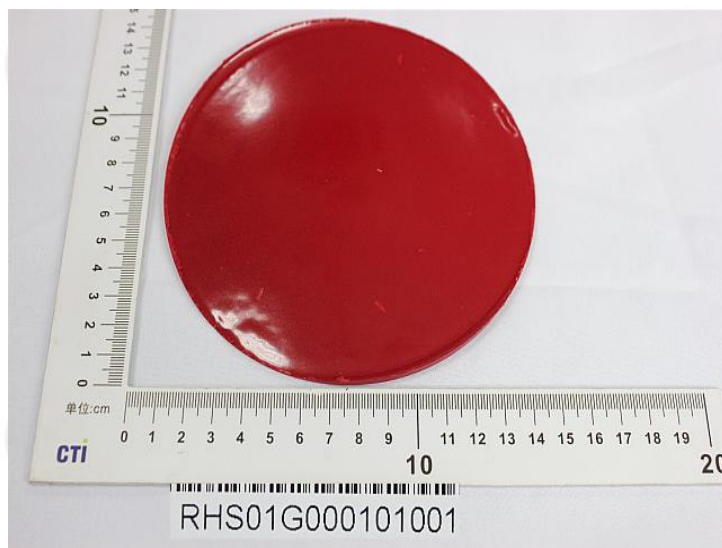


# Test Report

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## Photo(s) of the sample(s)



\*\*\* End of report \*\*\*

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