

Test Report

Number: 150400859SHA-001

Applicant: EPCOS (ZHUHAI FTZ) CO., LTD.
LIANFENG LU, FREE TRADE ZONE, WANZAI,
519030 ZHUHAI CITY, PR CHINA

Date: Apr. 24, 2015

Sample Description:

Test Items	Material Description	Application
1	Metallized Polypropylene film(MKP)	c, e, k
2	Metallized Polyester film(MKT)	a, b, d, e, g
3	Cover film	a, d, l
4	Sprayed metal SnCu3	a, b, c, d, e, f, g, j, k, l
5	Sprayed metal Al	a, b, c, d, e, f, j, k, l
6	Sprayed metal Zn	b, c, e, f, j, k
7	Cured Epoxy (blue)	b, c, e, f, j, k
8	Plain film	e
9	Lead wire Cu	b, c, k, e, f
10	Tin coating of lead wire Cu	b, c, k, e, f
11	Lead wire Fe	a, b, c, d, e, l
12	Tin coating of lead wire Fe	a, b, c, d, e, l
13	PBT Plastic box	b, c, e, f, j, k
14	Plastic tube(PET)	d
15	Print ink	a, b, c, d, e, f, g, h, l, j, k, l
16	Lead wire Cu	g, i, k
17	Tin coating of lead wire Cu	g, i, k
18	Terminal	j, k
19	Yellow Tape	g, h, i
20	Metallized film	g, h, i, j, k
21	Sprayed metal	g, h, i, j

To be continued

Authorized by:
For Intertek testing services Ltd., Shanghai



Berlin Duan
Manager



Test Report

Number: 150400859SHA-001

Test Items	Material Description	Application
22	Cured Epoxy (yellow/white)	g, h, i
23	Wire---Metal	h
24	Wire---Plastic	h
25	PET Transparent tape	a
26	PP Transparent tape	a
27	Plastic tube (POLIOLEFINA)	d
28	Metallized Polyethylene naphthalate film(MKN)	l
29	Marking film	a, d, l
30	Sprayed metal SnZn50	b, c, k, f, e
31	Glue	b, c, e, f, j
32	Leadframe Multipin	b
33	Polyphenylene Sulfide film(PPS)	f
34	Impregnation oil	b, c

Above substance used in below series:

- a MKT Film Capacitor (un-coated): B3256*, B3257*
- b MKT Film Capacitor (boxed): B3252*, B3293*
- c MKP Film Capacitor (boxed): B3265*, B32656S*, B3267*, B3292*, B8112*, B8113*, B3202*, B3277*, B3291*, B3262*, B3279*
- d MKT Film Capacitor (Miniblue): B3255*
- e MMKP FILM capacitor: B3264*
- f PPS Film: B3235*
- g MKT AXIAL ROUND: B32231*, B32232*, B32227*, B32237*,
- h MKP AXIAL CAPACITOR: B32665*
- i MKP AXIAL SNUBBER: B32669*
- j MKP BOXED SNUBBER: B32656*
- k MFP Film Capacitor (Boxed): B32686A*, B32686S*
- l MKN Film Capacitor (un-coated): B3286*

Tests conducted:

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

To be continued

Authorized by:
For Intertek testing services Ltd., Shanghai

Berlin

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Manager



Tests Conducted
1. RoHS Directive
(A) Test result:

Testing item	Result					
	(1)	(2)	(3)	(7)	(8)	(13)
Cadmium (Cd) content (mg/kg)	ND	ND	ND	ND	ND	ND
Lead (Pb) content (mg/kg)	ND	ND	ND	ND	ND	ND
Mercury (Hg) content (mg/kg)	ND	ND	ND	ND	ND	ND
Chromium (VI) (Cr ⁶⁺) content (mg/kg)(for non-metal)	ND	ND	ND	ND	ND	ND
Polybrominated biphenyls (PBBs) (mg/kg)						
monobromo biphenyls (MonoBB)	ND	ND	ND	ND	ND	ND
Dibromo biphenyls (DiBB)	ND	ND	ND	ND	ND	ND
Tribromo biphenyls (TriBB)	ND	ND	ND	ND	ND	ND
Tetrabromo biphenyls (TetraBB)	ND	ND	ND	ND	ND	ND
Pentabromo biphenyls (PentaBB)	ND	ND	ND	ND	ND	ND
Hexabromo biphenyls (HexaBB)	ND	ND	ND	ND	ND	ND
Heptabromo biphenyls (HeptaBB)	ND	ND	ND	ND	ND	ND
Octabromo biphenyls (OctaBB)	ND	ND	ND	ND	ND	ND
Nonabromo biphenyls (NonaBB)	ND	ND	ND	ND	ND	ND
Decabromo biphenyl (DecaBB)	ND	ND	ND	ND	ND	ND
Polybrominated diphenyl ethers (PBDEs) (mg/kg)						
Monobromo diphenyl ethers (MonoBDE)	ND	ND	ND	ND	ND	ND
Dibromo diphenyl ethers (DiBDE)	ND	ND	ND	ND	ND	ND
Tribromo diphenyl ethers (TriBDE)	ND	ND	ND	ND	ND	ND
Tetrabromo diphenyl ethers (TetraBDE)	ND	ND	ND	ND	ND	ND
Pentabromo diphenyl ethers (PentaBDE)	ND	ND	ND	ND	ND	ND
Hexabromo diphenyl ethers (HexaBDE)	ND	ND	ND	ND	ND	ND
Heptabromo diphenyl ethers (HeptaBDE)	ND	ND	ND	ND	ND	ND
Octabromo diphenyl ethers (OctaBDE)	ND	ND	ND	ND	ND	ND
Nonabromo diphenyl ethers (NonaBDE)	ND	ND	ND	ND	ND	ND
Decabromo diphenyl ether (DecaBDE)	ND	ND	ND	ND	ND	ND

To be continued

Tests Conducted

Testing item	Result						
	(14)	(15)	(19)	(20)	(22)	(24)	(25)
Cadmium (Cd) content (mg/kg)	ND	ND	ND	ND	ND	ND	ND
Lead (Pb) content (mg/kg)	ND	ND	ND	ND	ND	ND	ND
Mercury (Hg) content (mg/kg)	ND	ND	ND	ND	ND	ND	ND
Chromium (VI) (Cr ⁶⁺) content (mg/kg)(for non-metal)	ND	ND	ND	ND	ND	ND	ND
Polybrominated biphenyls (PBBs) (mg/kg)							
monobromo biphenyls (MonoBB)	ND	ND	ND	ND	ND	ND	ND
Dibromo biphenyls (DiBB)	ND	ND	ND	ND	ND	ND	ND
Tribromo biphenyls (TriBB)	ND	ND	ND	ND	ND	ND	ND
Tetrabromo biphenyls (TetraBB)	ND	ND	ND	ND	ND	ND	ND
Pentabromo biphenyls (PentaBB)	ND	ND	ND	ND	ND	ND	ND
Hexabromo biphenyls (HexaBB)	ND	ND	ND	ND	ND	ND	ND
Heptabromo biphenyls (HeptaBB)	ND	ND	ND	ND	ND	ND	ND
Octabromo biphenyls (OctaBB)	ND	ND	ND	ND	ND	ND	ND
Nonabromo biphenyls (NonaBB)	ND	ND	ND	ND	ND	ND	ND
Decabromo biphenyl (DecaBB)	ND	ND	ND	ND	ND	ND	ND
Polybrominated diphenyl ethers (PBDEs) (mg/kg)							
Monobromo diphenyl ethers (MonoBDE)	ND	ND	ND	ND	ND	ND	ND
Dibromo diphenyl ethers (DiBDE)	ND	ND	ND	ND	ND	ND	ND
Tribromo diphenyl ethers (TriBDE)	ND	ND	ND	ND	ND	ND	ND
Tetrabromo diphenyl ethers (TetraBDE)	ND	ND	ND	ND	ND	ND	ND
Pentabromo diphenyl ethers (PentaBDE)	ND	ND	ND	ND	ND	ND	ND
Hexabromo diphenyl ethers (HexaBDE)	ND	ND	ND	ND	ND	ND	ND
Heptabromo diphenyl ethers (HeptaBDE)	ND	ND	ND	ND	ND	ND	ND
Octabromo diphenyl ethers (OctaBDE)	ND	ND	ND	ND	ND	ND	ND
Nonabromo diphenyl ethers (NonaBDE)	ND	ND	ND	ND	ND	ND	ND
Decabromo diphenyl ether (DecaBDE)	ND	ND	ND	ND	ND	ND	ND

To be continued

Tests Conducted

Testing item	Result						
	(26)	(27)	(28)	(29)	(31)	(33)	(34)
Cadmium (Cd) content (mg/kg)	ND	ND	ND	ND	ND	ND	ND
Lead (Pb) content (mg/kg)	ND	ND	ND	ND	ND	ND	ND
Mercury (Hg) content (mg/kg)	ND	ND	ND	ND	ND	ND	ND
Chromium (VI) (Cr ⁶⁺) content (mg/kg)(for non-metal)	ND	ND	ND	ND	ND	ND	ND
Polybrominated biphenyls (PBBs) (mg/kg)							
monobromo biphenyls (MonoBB)	ND	ND	ND	ND	ND	ND	ND
Dibromo biphenyls (DiBB)	ND	ND	ND	ND	ND	ND	ND
Tribromo biphenyls (TriBB)	ND	ND	ND	ND	ND	ND	ND
Tetrabromo biphenyls (TetraBB)	ND	ND	ND	ND	ND	ND	ND
Pentabromo biphenyls (PentaBB)	ND	ND	ND	ND	ND	ND	ND
Hexabromo biphenyls (HexaBB)	ND	ND	ND	ND	ND	ND	ND
Heptabromo biphenyls (HeptaBB)	ND	ND	ND	ND	ND	ND	ND
Octabromo biphenyls (OctaBB)	ND	ND	ND	ND	ND	ND	ND
Nonabromo biphenyls (NonaBB)	ND	ND	ND	ND	ND	ND	ND
Decabromo biphenyl (DecaBB)	ND	ND	ND	ND	ND	ND	ND
Polybrominated diphenyl ethers (PBDEs) (mg/kg)							
Monobromo diphenyl ethers (MonoBDE)	ND	ND	ND	ND	ND	ND	ND
Dibromo diphenyl ethers (DiBDE)	ND	ND	ND	ND	ND	ND	ND
Tribromo diphenyl ethers (TriBDE)	ND	ND	ND	ND	ND	ND	ND
Tetrabromo diphenyl ethers (TetraBDE)	ND	ND	ND	ND	ND	ND	ND
Pentabromo diphenyl ethers (PentaBDE)	ND	ND	ND	ND	ND	ND	ND
Hexabromo diphenyl ethers (HexaBDE)	ND	ND	ND	ND	ND	ND	ND
Heptabromo diphenyl ethers (HeptaBDE)	ND	ND	ND	ND	ND	ND	ND
Octabromo diphenyl ethers (OctaBDE)	ND	ND	ND	ND	ND	ND	ND
Nonabromo diphenyl ethers (NonaBDE)	ND	ND	ND	ND	ND	ND	ND
Decabromo diphenyl ether (DecaBDE)	ND	ND	ND	ND	ND	ND	ND

To be continued

Tests Conducted

Testing item	Result					
	(4)	(5)	(6)	(9)	(11)	(16)
Cadmium (Cd) content (mg/kg)	ND	21	ND	ND	ND	ND
Lead (Pb) content (mg/kg)	70	ND	28	ND	ND	ND
Mercury (Hg) content (mg/kg)	ND	ND	ND	ND	ND	ND
Chromium (VI)(Cr ⁶⁺) result (by boiling water extraction on metal) (mg/kg with 50cm ²)	N	N	N	N	N	N

Testing item	Result				
	(18)	(21)	(23)	(30)	(32)
Cadmium (Cd) content (mg/kg)	ND	ND	ND	ND	ND
Lead (Pb) content (mg/kg)	ND	24	ND	37	26
Mercury (Hg) content (mg/kg)	ND	ND	ND	ND	ND
Chromium (VI)(Cr ⁶⁺) result (by boiling water extraction on metal) (mg/kg with 50cm ²)	N	N	N	N	N

Testing item	Result		
	(10)	(12)	(17)
Cadmium (Cd) content (mg/kg) /plating	ND	ND	ND
Lead (Pb) content (mg/kg) /plating	ND	ND	ND
Mercury (Hg) content (mg/kg) /plating	ND	ND	ND
Chromium (VI)(Cr ⁶⁺) result (by boiling water extraction on metal) (mg/kg with 50cm ²) /plating	N	N	N

Remark: mg/kg with 50cm² = Milligram per kilogram with 50 square centimeter
 ND = Not Detected
 N = Negative

Positive = A positive test result indicated the presence of Cr(VI) at the time of testing, equal to or greater than threshold of 1 mg/kg for spot test procedure or 0.02 mg/kg for boiling -water-extraction procedures with a sample surface area of 50cm² used. However, it shall not be interpreted as the Cr (VI) concentration in the coating layer of the sample and should not be used as a method detection limit for this qualitative test.

Negative = A negative test result indicated above positive observation was not found at the time of testing. When the spot-test showed a negative result, the boiling-water-extraction procedure shall be used to verify the result.

To be continued

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 ⁶⁺)	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 RoHS Directive 2011/65/EU for homogeneous material.

(C) Test method:

Testing item	Testing method	Reporting limit
Cadmium (Cd) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 mg/kg
Lead (Pb) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 mg/kg
Mercury (Hg) content	With reference to IEC 62321-4 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 mg/kg
Chromium (VI) (Cr ⁶⁺) content (for non-metal)	With reference to IEC 62321 Edition 1.0: 2008, by alkaline digestion and determined by UV-VIS Spectrophotometer.	1mg/kg
Chromium (VI) (Cr ⁶⁺) content (for metal)	With reference to IEC 62321 Edition 1.0: 2008, by boiling water extraction and determined by UV-VIS Spectrophotometer.	Positive/Negative (Threshold of 0.02mg/kg with 50cm ²)
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

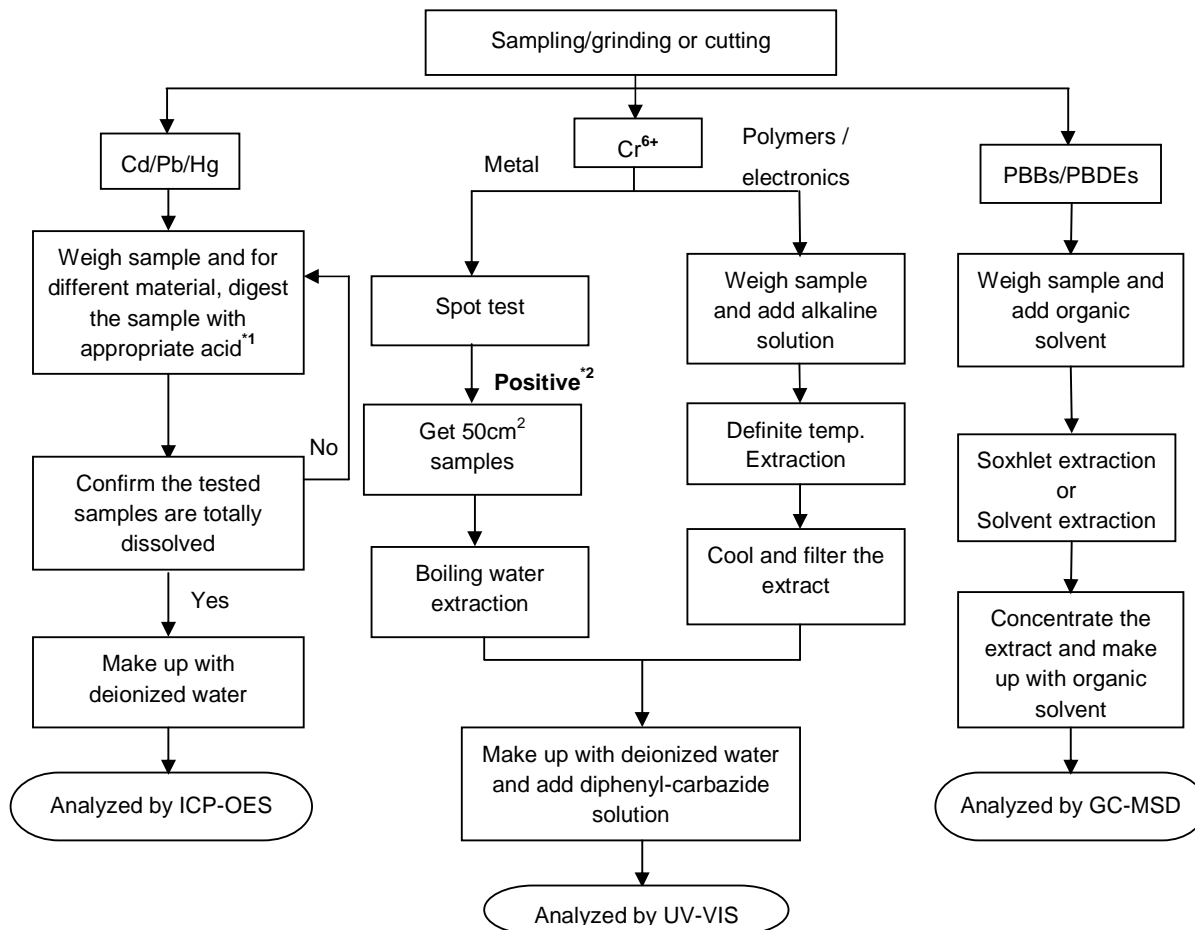
To be continued

Tests Conducted

(D) Measurement flowchart:

Test for Cd/Pb/Hg/Cr (VI)/PBBs/PBDEs contents

Reference standard: IEC 62321 Edition 1.0: 2008&2013



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: If the result of spot test is positive, Chromium VI would be determined as detected.

To be continued

Tests Conducted

2. Phthalate content test

With reference to EN 14372, by Gas Chromatography-Mass Spectrometry (GC-MS) analysis.

<u>Tested compound</u>	<u>Result (% w/w)</u>							
	(1)	(2)	(7)	(8)	(13)	(15)	(31)	(34)
Di-butyl phthalate (DBP)	ND	ND	ND	ND	ND	ND	ND	ND
Di(2-ethyl hexyl) phthalate(DEHP)	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl butyl phthalate (BBP)	ND	ND	ND	ND	ND	ND	ND	ND
Di-iso-butyl phthalate (DIBP)	ND	ND	ND	ND	ND	ND	ND	ND

Remark: Detection limit = 0.01%(w/w)

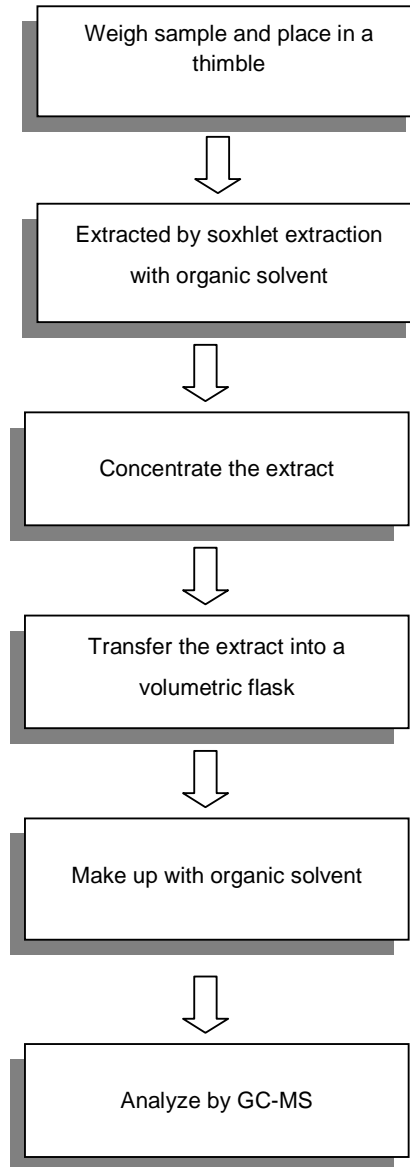
ND = Not detected

To be continued

Tests Conducted

Measurement flowchart:

Test for phthalate content



To be continued

Tests Conducted

3. HBCDD content

(I)Test result summary:

Testing item	Result (ppm)							
	(1)	(2)	(7)	(8)	(13)	(15)	(31)	(34)
HBCDD (hexabromocyclododecane)	ND	ND	ND	ND	ND	ND	ND	ND

Remarks: ppm = parts per million = mg/kg
ND = Not detected

(II) Test method:

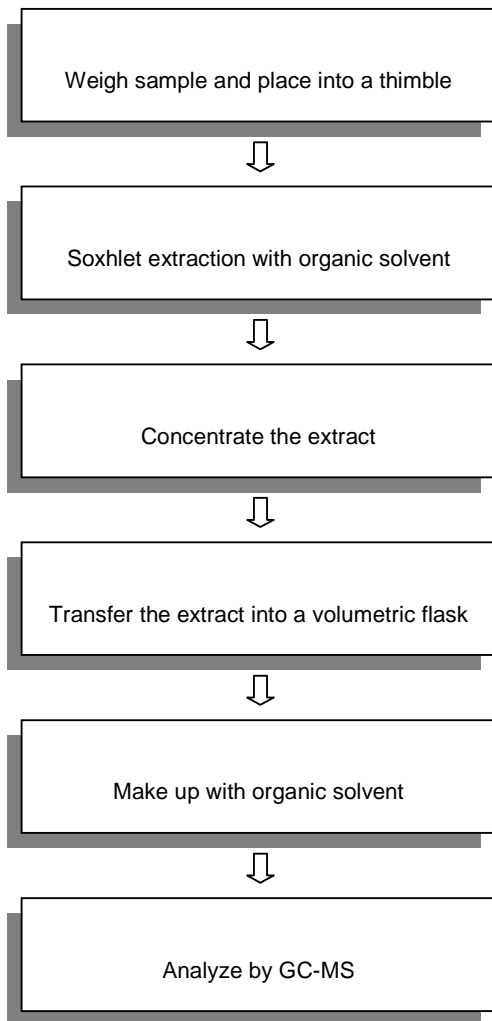
Testing item	Testing method	Reporting limit
HBCDD (hexabromocyclododecane)	With reference to US EPA 3540C, by solvent extraction and determined by GC-MS	10 ppm

To be continued

Tests Conducted

Measurement flowchart:

Test for HBCDD (hexabromocyclododecane) content



To be continued

Tests Conducted

4. Total Phosphorus (P) Content

As per client's request, acid digestion method was used and total Phosphorus (P) content was determined by Inductively Coupled Argon Plasma Spectrometry.

<u>Tested items</u>	<u>Result in ppm</u>
(1)	90
(2)	<10
(7)	<10
(8)	<10
(13)	<10
(15)	<10
(31)	<10
(34)	<10

Remark: ppm = parts per million = mg/kg

Date sample received: Apr. 16, 2015

Testing period: Apr. 16, 2015 To Apr. 23, 2015

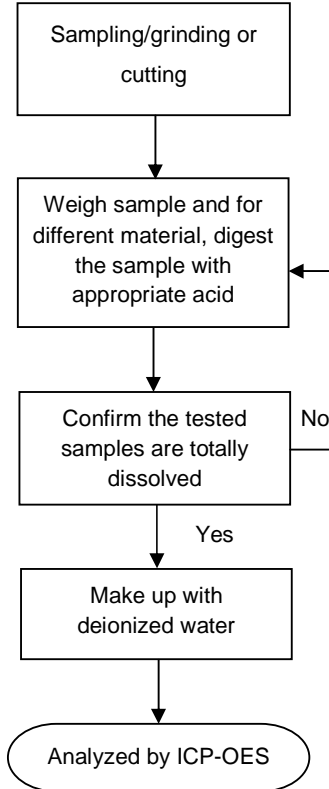
To be continued

Tests Conducted

Measurement flowchart:

Test for Phosphorus contents

Reference standard: EPA 3050B/EPA 3051/EPA 3052



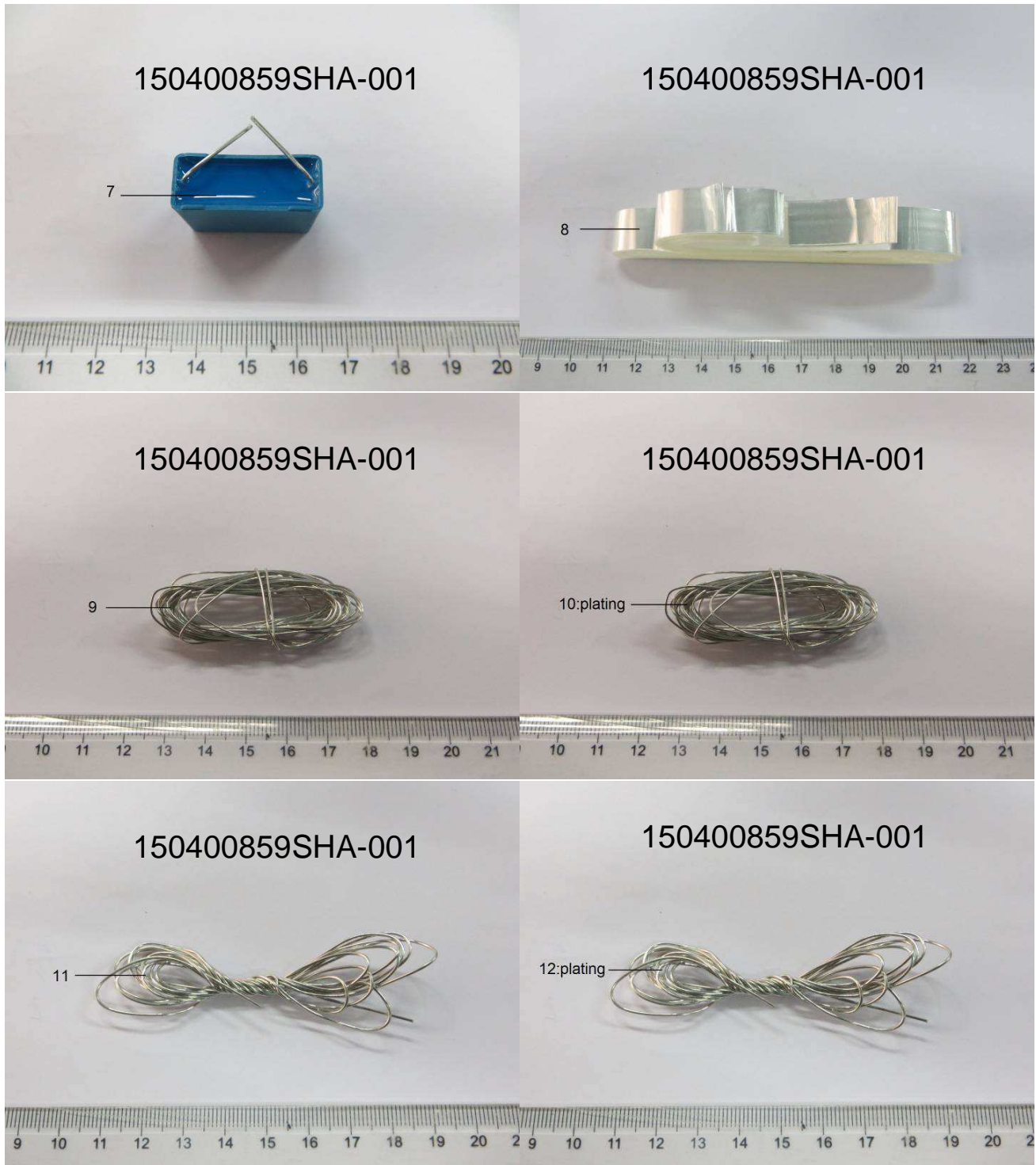
To be continued

Tests Conducted



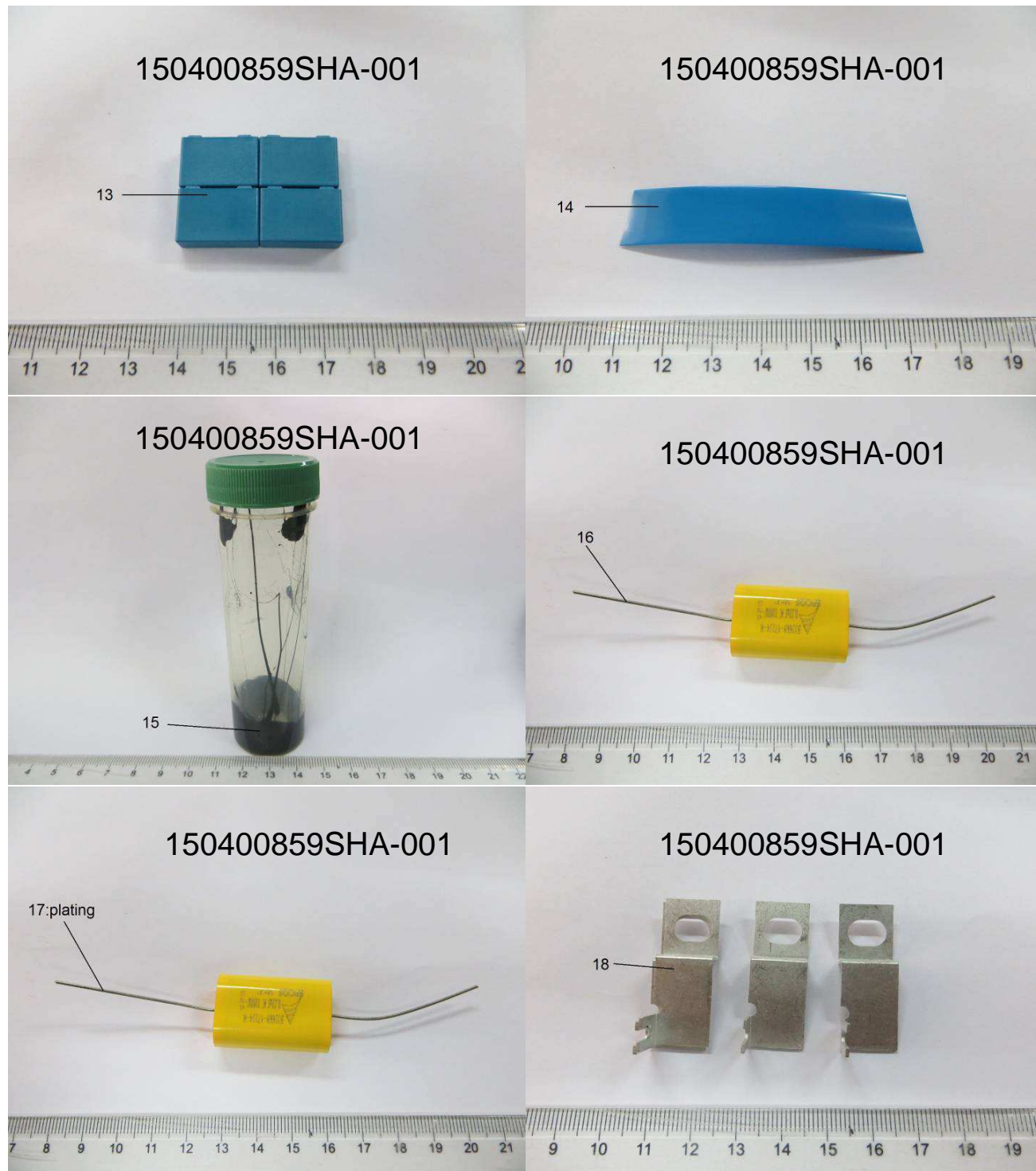
To be continued

Tests Conducted



To be continued

Tests Conducted



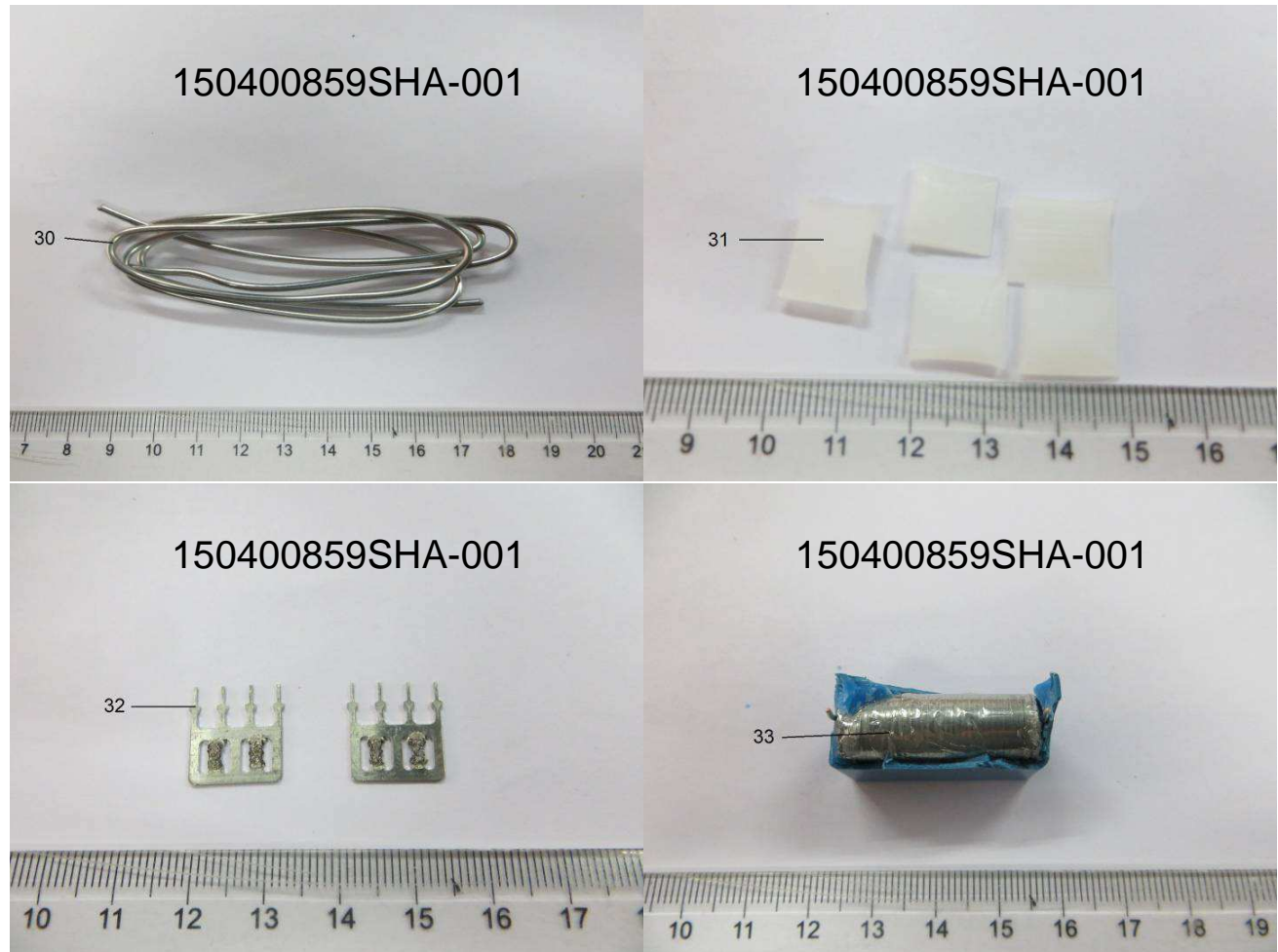
To be continued

Tests Conducted



To be continued

Tests Conducted



To be continued

Tests Conducted



End of report

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