

Test Report

No. : CE/2017/66541B

Date : 2017/07/07

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NANTONG HORNBY ELECTRONIC CO.,LTD.
(SMARTENGRAND LTD.)



NO.8, XING YUAN ROAD,RUCHENG INDUSTRIAL ZONE, RUGAO CITY, JIANGSU PROVINCE, P. R. C.
(NO. 168, SEC. 2, ZHONGZHENG ROAD, SANXIA DISTRICT, NEW TAIPEI CITY, TAIWAN, R. O. C.)

The following samples was/were submitted and identified by/on behalf of the applicant as :

Sample Submitted By : SMARTENGRAND LTD.
Sample Description : SOLDER、SILICONE、EPOXY MOLDING COMPOUND、HALOGEN-FREE EPOXY
MOLDING COMPOUND、PURE TIN
Used For : PLEASE REFER TO PAGE 6
Sample Receiving Date : 2017/06/29
Testing Period : 2017/06/29 TO 2017/07/06

Test Requested :

- (1) As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted sample(s).
- (2) Please refer to next pages for the other item(s).

Test Result(s) : Please refer to following pages.

Conclusion : (1) Based on the performed tests on submitted sample(s), the test results of Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP comply with the limits as set by RoHS and amending Directive (EU) 2015/863 with the exempted materials below according to the declaration from applicant: Lead in high melting temperature type solders.
1. PART NAME No.1 SILVER COLORED METAL (SOLDER): Lead (Pb)



Troy Chang, Manager - Tech
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei

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Test Result(s)

PART NAME No.1 : SILVER COLORED METAL (SOLDER)
 PART NAME No.2 : WHITE LUMP (SILICONE)
 PART NAME No.3 : BLACK LUMP (EPOXY MOLDING COMPOUND)
 PART NAME No.4 : BLACK LUMP (HALOGEN-FREE EPOXY MOLDING COMPOUND)
 PART NAME No.5 : SILVER COLORED METAL (PURE TIN)

Test Item(s)	Unit	Method	MDL	Result				
				No.1	No.2	No.3	No.4	No.5
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-AES.	2	n.d.	n.d.	n.d.	n.d.	n.d.
Lead (Pb)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-AES. (Balance)	-	927000 (*)	---	---	---	---
	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-AES.	2	---	n.d.	4.56	n.d.	13.0
Mercury (Hg)	mg/kg	With reference to IEC 62321-4 (2013) and performed by ICP-AES.	2	n.d.	n.d.	n.d.	n.d.	n.d.
Hexavalent Chromium Cr(VI)(#2)	µg/cm ²	With reference to IEC 62321-7-1 (2015) and performed by UV-VIS.	0.10	n.d.	---	---	---	n.d.
Hexavalent Chromium Cr(VI) (◆)	mg/kg	With reference to IEC 62321-7-2 (2017) and performed by UV-VIS. ; With reference to IEC 62321-5 (2013) and performed by ICP-AES.	8	---	n.d.	n.d.	n.d.	---

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Test Item(s)	Unit	Method	MDL	Result				
				No.1	No.2	No.3	No.4	No.5
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α -HBCDD, β -HBCDD, γ -HBCDD) (CAS No.: 25637-99-4 and 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8))	mg/kg	With reference to IEC 62321 (2008). Analysis was performed by GC/MS.	5	---	---	n.d.	n.d.	---
Sum of PBBs	mg/kg	With reference to IEC 62321-6 (2015) and performed by GC/MS.	-	n.d.	n.d.	n.d.	n.d.	n.d.
Monobromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Dibromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Tribromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Tetrabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Pentabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Hexabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Heptabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Octabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Nonabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Decabromobiphenyl	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Sum of PBDEs	mg/kg		-	n.d.	n.d.	n.d.	n.d.	n.d.
Monobromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Dibromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Tribromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Tetrabromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Pentabromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Hexabromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Heptabromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Octabromodiphenyl ether	mg/kg		5	n.d.	n.d.	n.d.	n.d.	n.d.
Nonabromodiphenyl ether	mg/kg	5	n.d.	n.d.	n.d.	n.d.	n.d.	
Decabromodiphenyl ether	mg/kg	5	n.d.	n.d.	n.d.	n.d.	n.d.	

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Test Item(s)	Unit	Method	MDL	Result				
				No.1	No.2	No.3	No.4	No.5
BBP (Butyl Benzyl phthalate) (CAS No.: 85-68-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	n.d.	n.d.	n.d.	n.d.
DBP (Dibutyl phthalate) (CAS No.: 84-74-2)	mg/kg		50	n.d.	n.d.	n.d.	n.d.	n.d.
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg		50	n.d.	n.d.	n.d.	n.d.	n.d.
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)	mg/kg		50	n.d.	n.d.	n.d.	n.d.	n.d.
Perfluorooctane sulfonates (PFOS-Acid, Metal Salt, Amide)	mg/kg	With reference to US EPA 3550C (2007). Analysis was performed by LC/MS.	10	---	---	n.d.	n.d.	n.d.
PFOA (CAS No.: 335-67-1)	mg/kg	With reference to US EPA 3550C (2007). Analysis was performed by LC/MS.	10	---	---	n.d.	n.d.	n.d.
Beryllium (Be)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	---	---	n.d.	n.d.	---
Red phosphorus	**	Analysis was performed by Pyrolyzer-GC/MS.	-	---	---	Negative	Negative	---
Halogen								
Halogen-Fluorine (F) (CAS No.: 14762-94-8)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	---	---	---	n.d.	---
Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	---	---	---	158	---
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	---	---	---	n.d.	---
Halogen-Iodine (I) (CAS No.: 14362-44-8)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	---	---	---	n.d.	---

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Note :

1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. MDL = Method Detection Limit
3. n.d. = Not Detected = less than MDL
4. " - " = Not Regulated
5. "----" = Not Conducted
6. ** = Qualitative analysis (No Unit)
7. Negative = Undetectable / Positive = Detectable
8. (#2) =
 - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 $\mu\text{g}/\text{cm}^2$.
The sample coating is considered to contain Cr(VI)
 - b. The sample is negative for Cr(VI) if Cr(VI) is n.d. (concentration less than 0.10 $\mu\text{g}/\text{cm}^2$).
The coating is considered a non-Cr(VI) based coating
 - c. The result between 0.10 $\mu\text{g}/\text{cm}^2$ and 0.13 $\mu\text{g}/\text{cm}^2$ is considered to be inconclusive - unavoidable coating variations may influence the determination.
9. (◆) : The result of Cr(VI) is "n.d." as the result of Chromium (Cr) is less than the MDL of Cr(VI), and confirmation test of Cr(VI) is not required. If the Chromium (Cr) content is not less than the MDL of Cr(VI), confirmation test of Cr(VI) is required.
10. (*) : The test result of balance was calculated by subtracting positive results of other elements from 100%.
11. This report supersedes the previous document bearing the test report number CE/2017/66541.

PFOS Reference Information : POPs - (EU) 757/2010

Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1%(1000ppm), in textiles or other coated materials above 1 $\mu\text{g}/\text{m}^2$.

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Used For :

DIODE & BRIDGE RECTIFIERS(R-1 , A-405(H) , DO-41 , DO-15 , R-3 , DO-201AD , R-6 , R-7 , GBP , GBL , GBU , GBJ , KBL , KBP , KBU , KBJ , JA , JB , 2S , D3K , TSB-5 , S25VB10 , SKBPC , 2CL , CL , MD-M , MD-S , MD-F , DB-1 , DB-S , DF , DF-S , LBF , ABS , MSBS , YBS , LDF , MBF(S/T1/T2) , WOM/RC-2 , MKBPC , MKBPC-W , KBPC-1 , KBPC-6 , KBPC-8 , KBPC , KBPC-W , MP , MP8 , MBR , MBR-W , BR , BR-W , BR-L , BR-6 , BR-8 , RA/RAS , CXA , TO-220AC , TO-220AB , ITO-220AC , ITO-220AB , TO-3P/TO-247AD(A) , SMA-X , DO-214AC/SMA , SMA-F , SMA-L , SMA-S , SMA-HE , SMA-T , DO-214AA/SMB , SMB-F , SMB-S , SMB-L , DO-214AB/SMC , SMC-F , SMC-T3 , SMC-T4 , SMC-HE , DO-218(AB) , MINI-MELF , MELF , TO-92 , TO-126 , TO-252(A) , TO252-4L , TO-251 , TO-262 , D-PAK , TO-263 , D2PAK , SOD-123(FL/T/S/H1/HT) , 1206(S) , SOD-323(FL/T/HE) , 0805 , SOD-523(FL) , 0603 , SOD-723(FL) , SOD-923(FL) , SOD-882 , 0402 , 0201 , SOT-23(-3/-3L/-3S/-5/-6/-6L) , SOT-26 , SOT-343 , SOT-363 , SOT-563 , SOT-223 , SOT-323(F) , SOT-523(F) , SOT-723(F) , SOT-883 , 2928-8L , CP , SOT-143 , TO-277(A) , WBFBP , DFN1006-2 , DFN0603 , DSON10 , TO-89 , SOP-8 , TSOP-6 , TSSOP-8 , PPAK2X3 , PPAK3X3 , DFN3X3(-8L) , DFN2X2-6 , DFN2X3-6 , DFN2X3-8 , PPAK5X6 , DFN5X6-8L)

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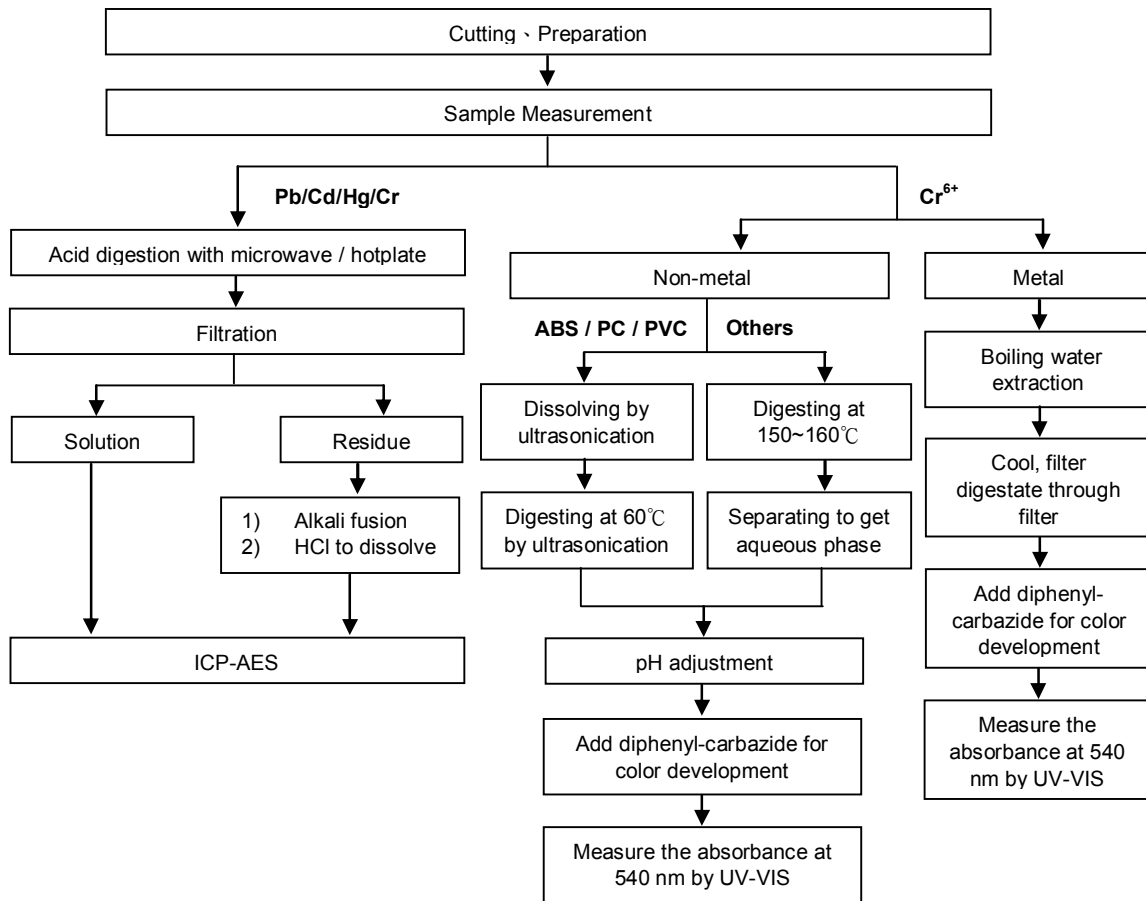
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Analytical flow chart of Heavy Metal

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr⁶⁺ test method excluded)

- Technician : JR Wang
- Supervisor: Troy Chang



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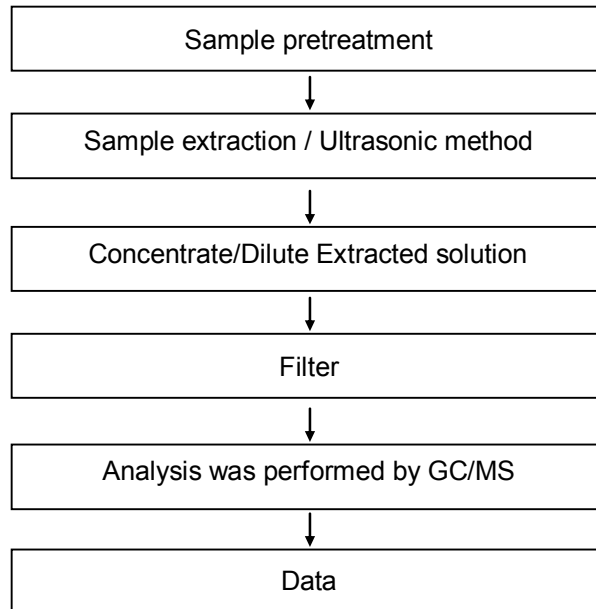
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Analytical flow chart - HBCDD

- Technician: Yaling Tu
- Supervisor: Troy Chang



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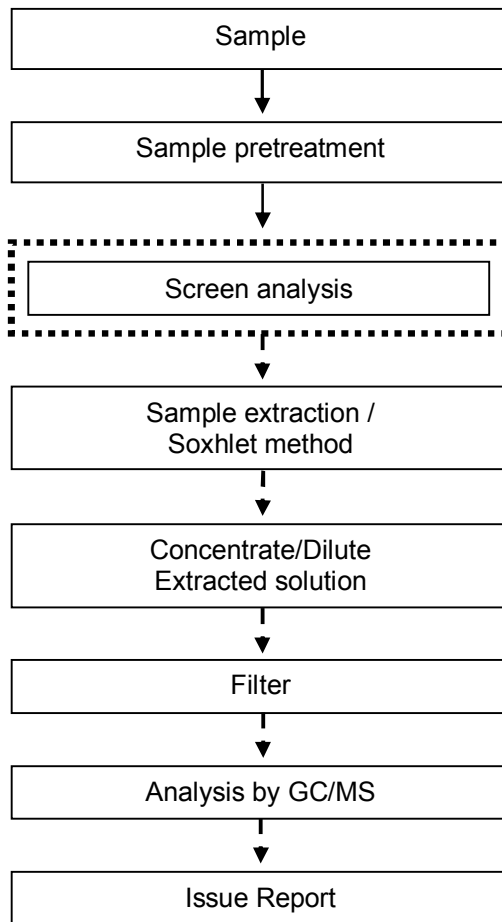
Analytical flow chart – PBB / PBDE

- Technician : Yaling Tu
- Supervisor: Troy Chang

First testing process →

Optional screen process →

Confirmation process - - - - - →



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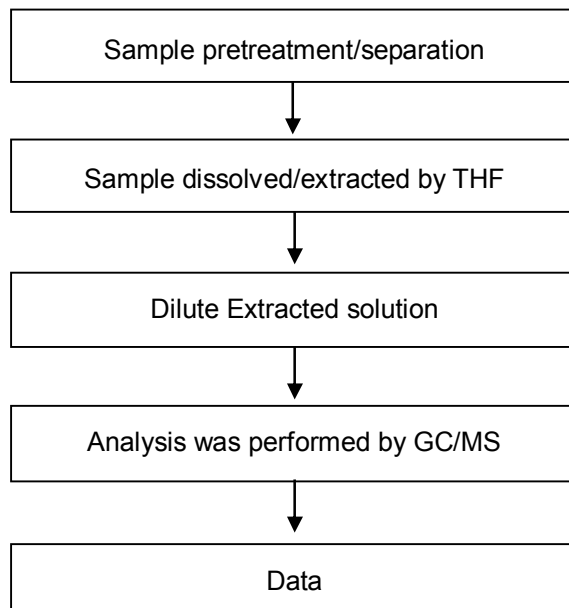


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Analytical flow chart - Phthalate

- Technician: Andy Shu
- Supervisor: Troy Chang

【Test method: IEC 62321-8】



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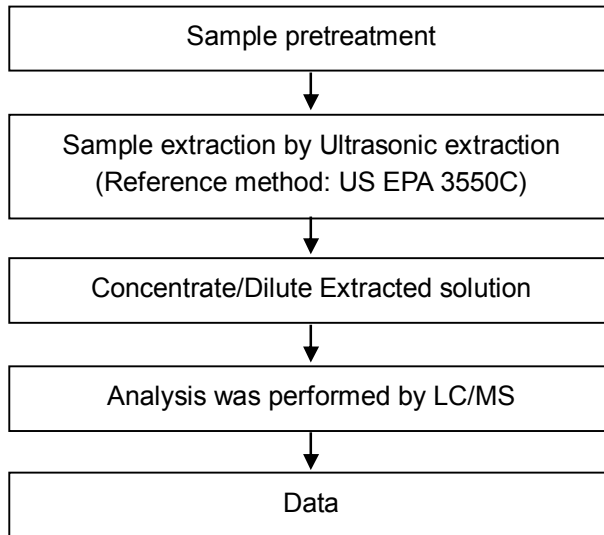
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Analytical flow chart - PFOA/PFOS

- Technician: Yaling Tu
- Supervisor: Troy Chang



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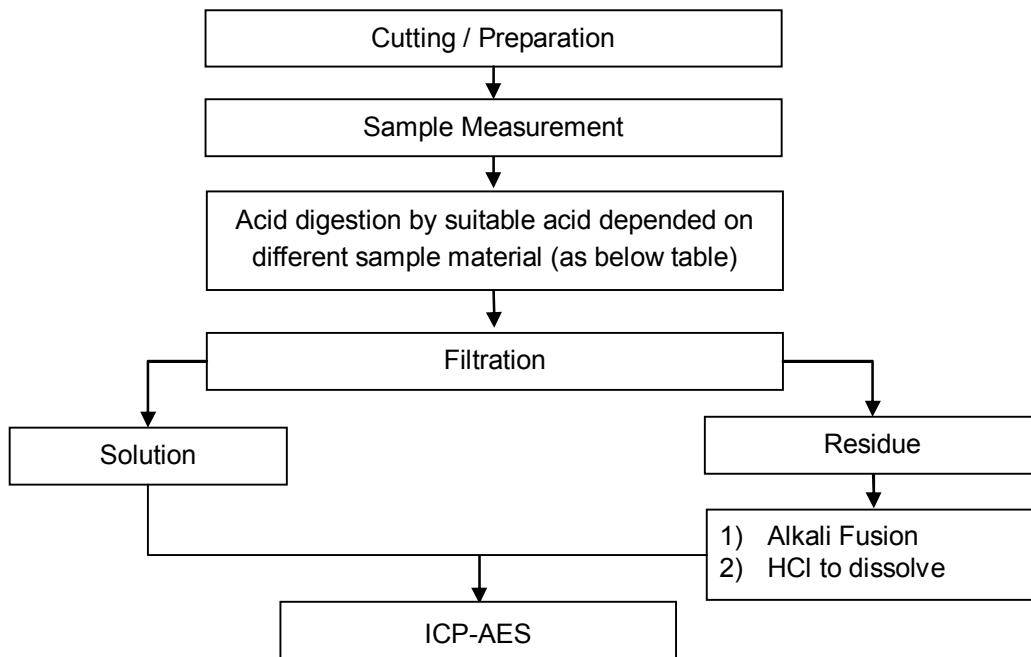


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These samples were dissolved totally by pre-conditioning method according to below flow chart.

- Technician: JR Wang
- Supervisor: Troy Chang

Flow Chart of digestion for the elements analysis performed by ICP-AES



Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Added appropriate reagent to total digestion

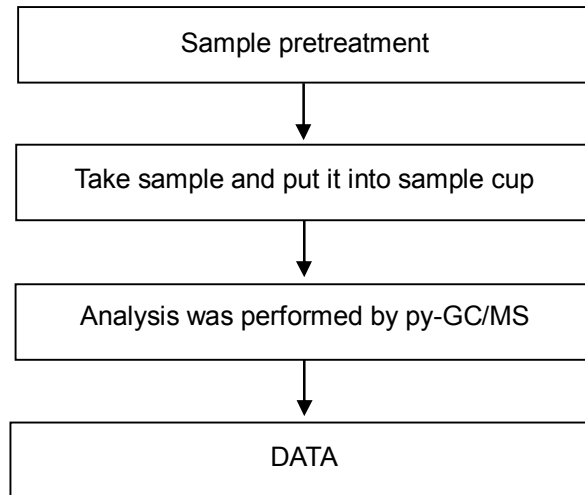
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Analytical flow chart - Red phosphorus

- Technician: Yaling Tu
- Supervisor: Troy Chang



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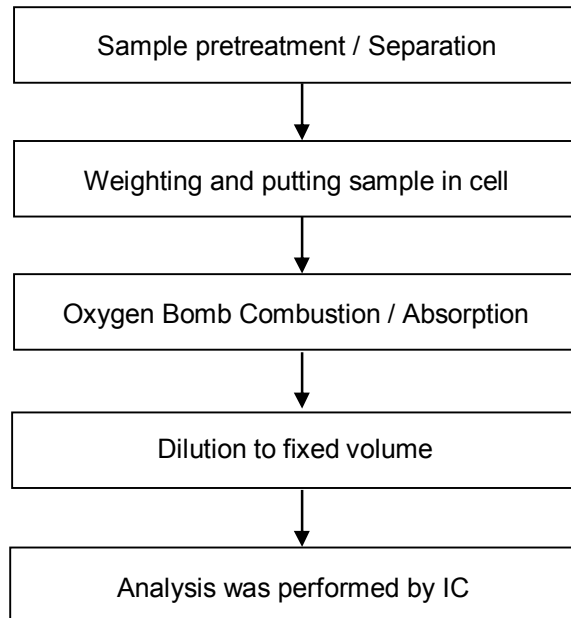
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Analytical flow chart - Halogen

- Technician: Rita Chen
- Supervisor: Troy Chang



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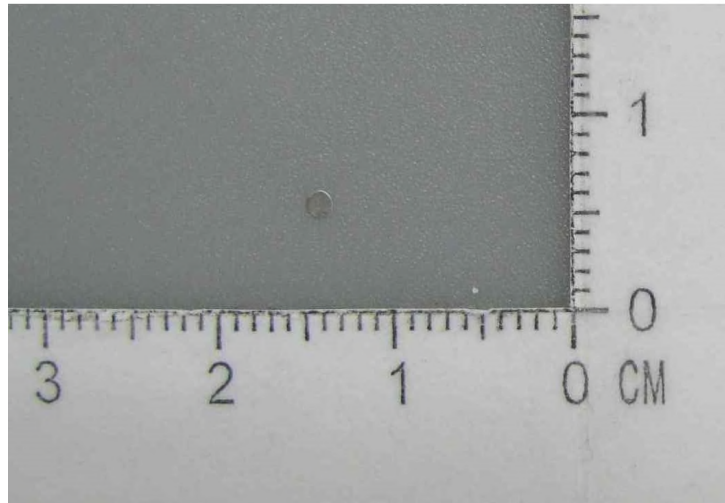
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* The tested sample / part is marked by an arrow if it's shown on the photo. *

CE/2017/66541 NO.1



CE/2017/66541 NO.2



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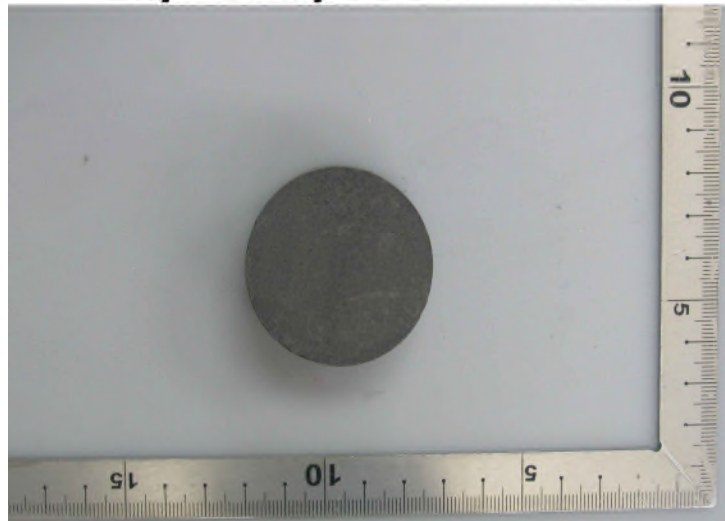
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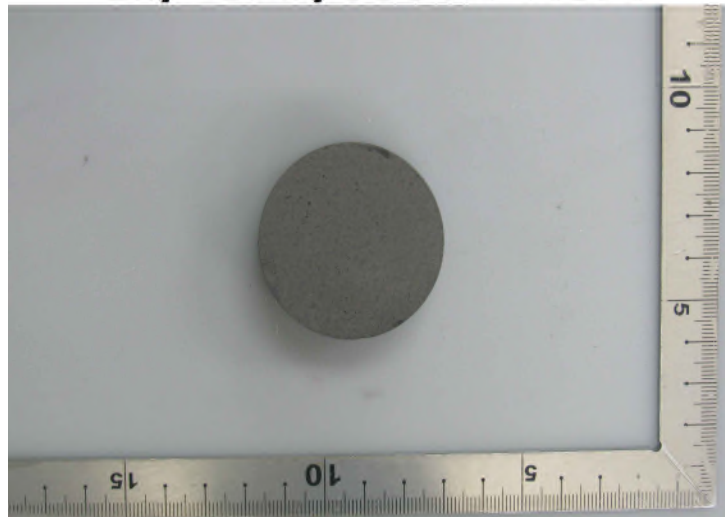
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CE/2017/66541 NO.3



CE/2017/66541 NO.4



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** End of Report **

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