

Test Report

No. : CE/2018/C0603

Date : 2018/12/11

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WAKAYAMA TAIYO YUDEN CO., LTD.

4026-22, INAMBARA, INAMI-CHO, HIDAKA-GUN, WAKAYAMA 649-1532, JAPAN



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

Sample Submitted By : WAKAYAMA TAIYO YUDEN CO., LTD.
Sample Description : ELECTRODE
Style/Item No. : MLD-22
Sample Receiving Date : 2018/12/05
Testing Period : 2018/12/05 to 2018/12/11

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.

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 : GRAY CHIP

Test Item(s)	Unit	Method	MDL	Result No.1
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-AES.	2	n.d.
Lead (Pb)	mg/kg		2	n.d.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4 (2013) and performed by ICP-AES.	2	n.d.
Hexavalent Chromium Cr(VI)(#2)	µg/cm²	With reference to IEC 62321-7-1 (2015) and performed by UV-VIS.	0.10	n.d.
Sum of PBBs	mg/kg	With reference to IEC 62321-6 (2015) and performed by GC/MS.	-	n.d.
Monobromobiphenyl	mg/kg		5	n.d.
Dibromobiphenyl	mg/kg		5	n.d.
Tribromobiphenyl	mg/kg		5	n.d.
Tetrabromobiphenyl	mg/kg		5	n.d.
Pentabromobiphenyl	mg/kg		5	n.d.
Hexabromobiphenyl	mg/kg		5	n.d.
Heptabromobiphenyl	mg/kg		5	n.d.
Octabromobiphenyl	mg/kg		5	n.d.
Nonabromobiphenyl	mg/kg		5	n.d.
Decabromobiphenyl	mg/kg		5	n.d.
Sum of PBDEs	mg/kg		-	n.d.
Monobromodiphenyl ether	mg/kg		5	n.d.
Dibromodiphenyl ether	mg/kg		5	n.d.
Tribromodiphenyl ether	mg/kg		5	n.d.
Tetrabromodiphenyl ether	mg/kg		5	n.d.
Pentabromodiphenyl ether	mg/kg		5	n.d.
Hexabromodiphenyl ether	mg/kg		5	n.d.
Heptabromodiphenyl ether	mg/kg		5	n.d.
Octabromodiphenyl ether	mg/kg		5	n.d.
Nonabromodiphenyl ether	mg/kg		5	n.d.
Decabromodiphenyl ether	mg/kg		5	n.d.

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Test Item(s)	Unit	Method	MDL	Result No.1
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.
DBP (Dibutyl phthalate) (CAS No.: 84-74-2)	mg/kg		50	n.d.
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg		50	n.d.
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)	mg/kg		50	n.d.
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		50	n.d.
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg		50	n.d.
Halogen-Iodine (I) (CAS No.: 14362-44-8)	mg/kg		50	n.d.
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.
Antimony (Sb)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	n.d.
Phosphorus (P)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	n.d.
Beryllium (Be)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	n.d.
Arsenic (As)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	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. (#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.

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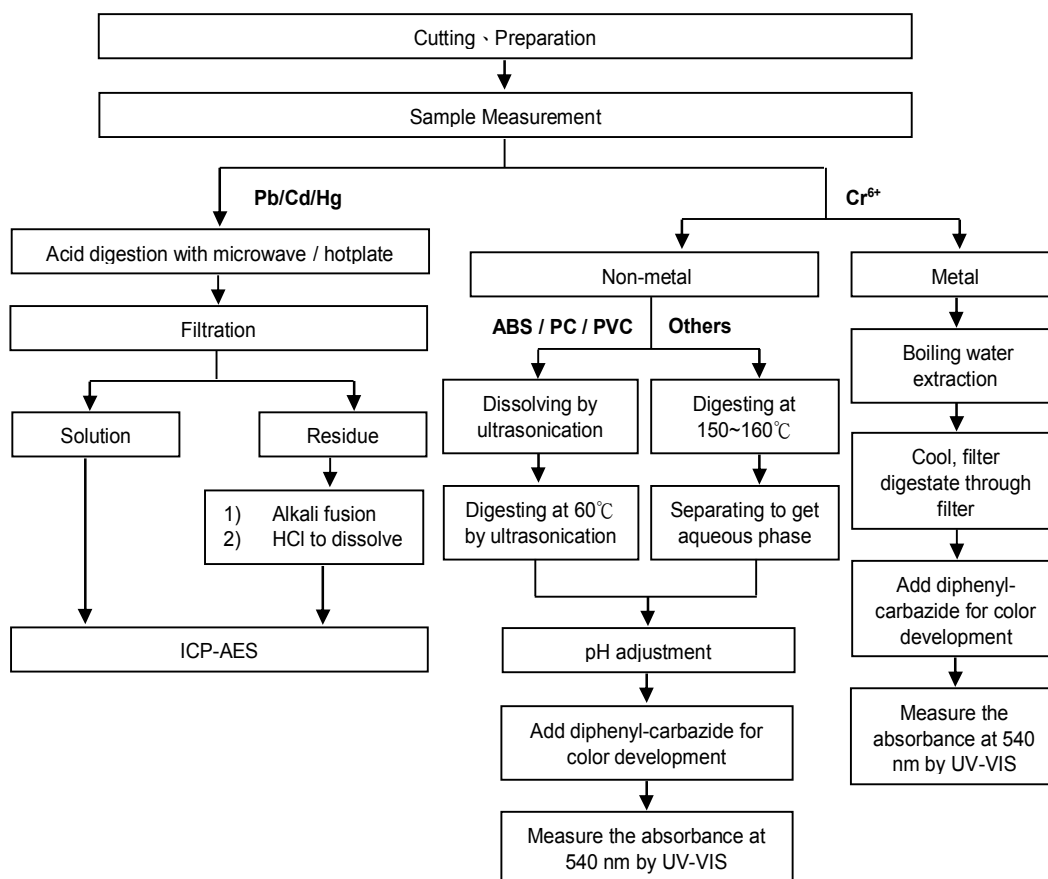
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Analytical flow chart of Heavy Metal

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

- Technician : Rita Chen
- Supervisor: Troy Chang



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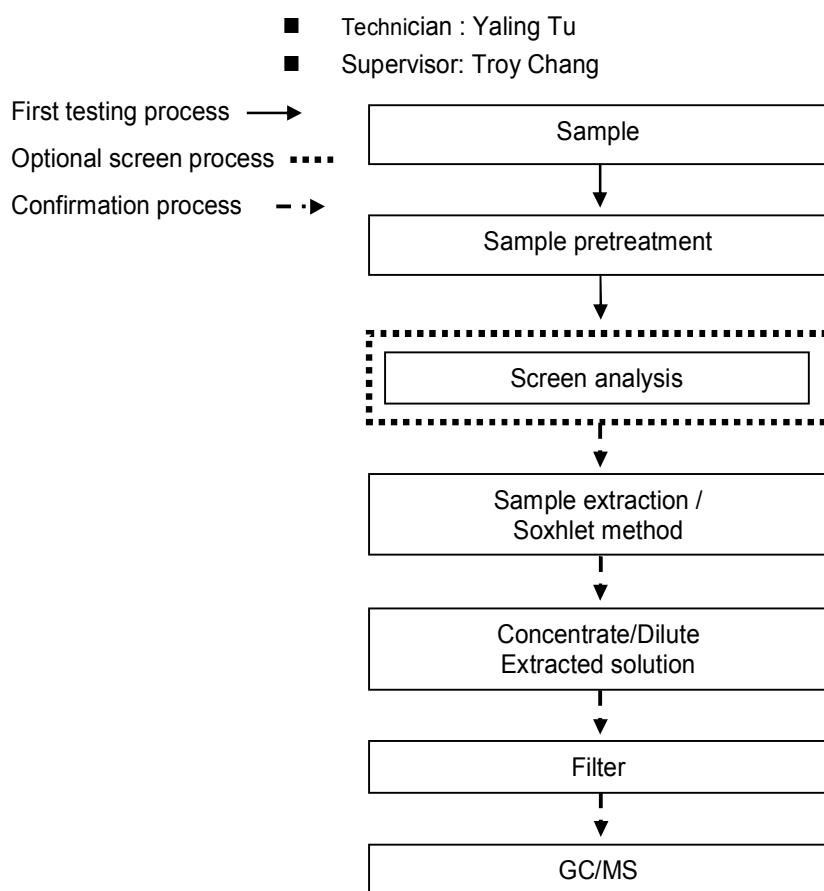
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Analytical flow chart – PBB / PBDE



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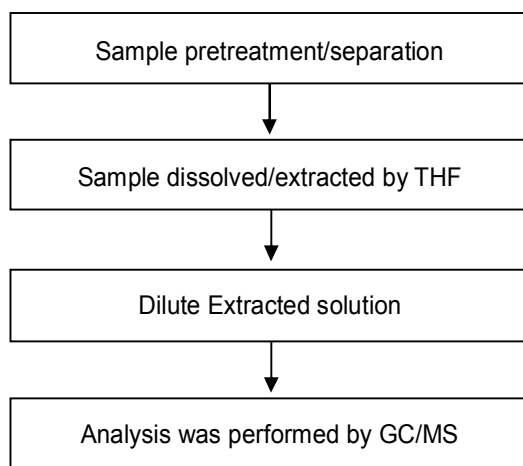
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Analytical flow chart - Phthalate

- Technician: Yaling Tu
- Supervisor: Troy Chang

【Test method: IEC 62321-8】



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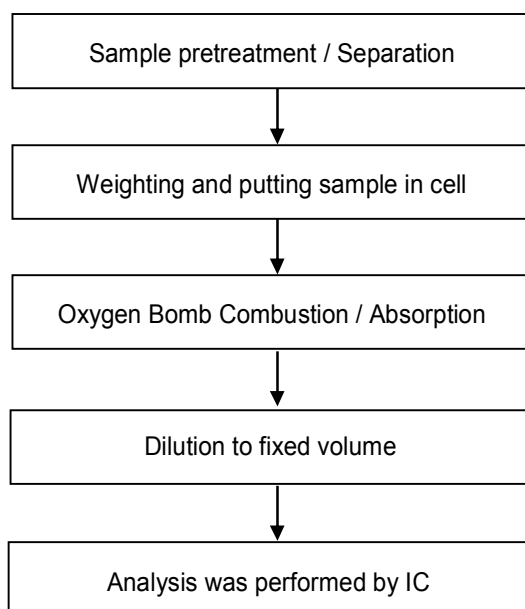
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Analytical flow chart - Halogen

- Technician: Rita Chen
- Supervisor: Troy Chang



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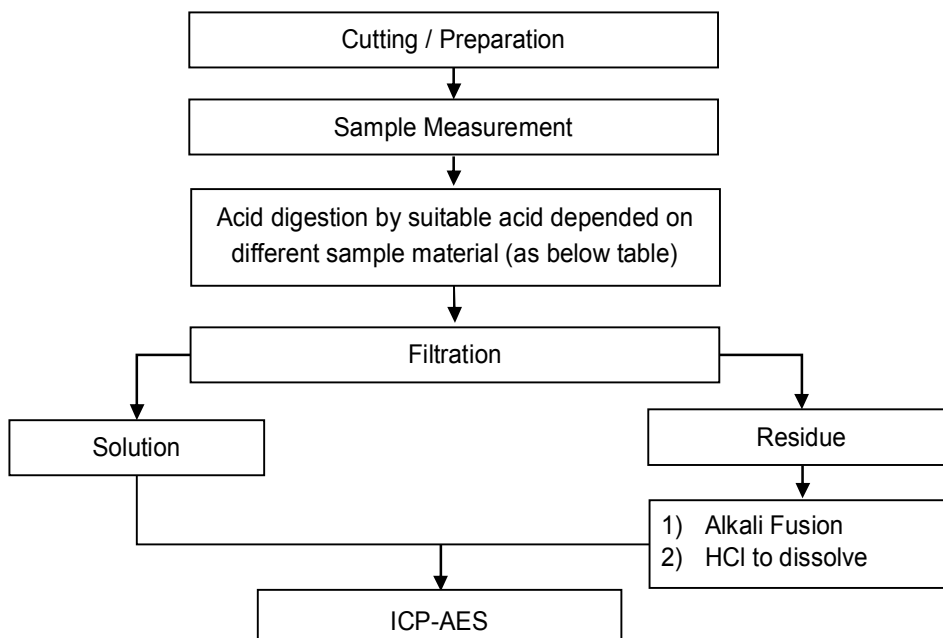
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These samples were dissolved totally by pre-conditioning method according to below flow chart.

- Technician: Rita Chen
- 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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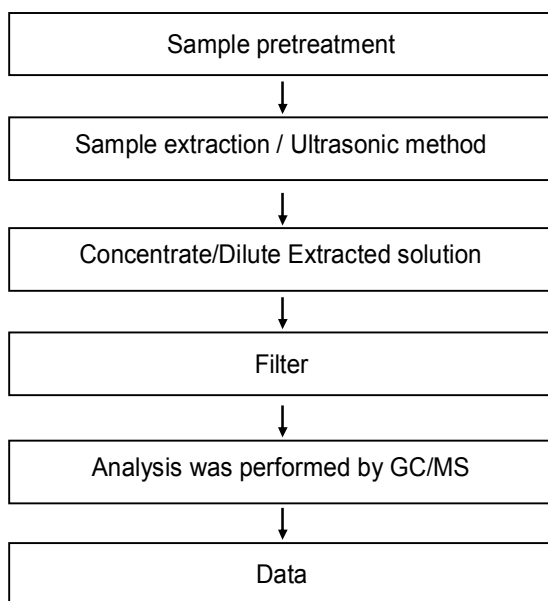
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4026-22, INAMBARA, INAMI-CHO, HIDAKA-GUN, WAKAYAMA 649-1532, JAPAN



Analytical flow chart - HBCDD

- Technician: Yaling Tu
- Supervisor: Troy Chang



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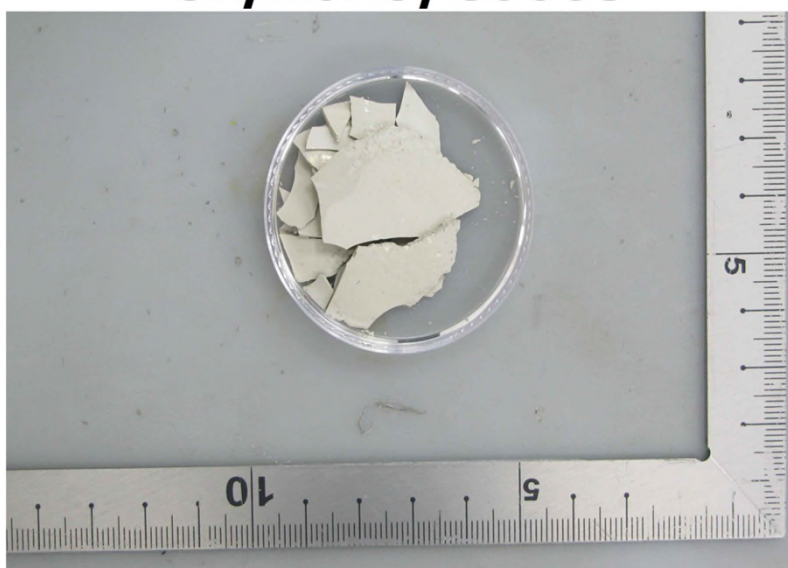
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* The tested sample / part is marked by an arrow if it's shown on the photo. *

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** End of Report **

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