

Test Report

No. : KA/2020/10379

Date : 2020/01/15

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HERAEUS MATERIALS SINGAPORE PTE LTD

26 PIONEER CRESCENT #06-11/12 WEST PARK BIZCENTRAL SINGAPORE 628558

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

Sample Submitted By : HERAEUS MATERIALS SINGAPORE PTE LTD
Sample Description : SOLDER PASTE
Style/Item No. : F541Ag35 (HBF)
Sample Receiving Date : 2020/01/08
Testing Period : 2020/01/08 to 2020/01/15


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 next page(s).

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 Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Ray Chang
Ray Chang Ph.D. / Manager
Signed for and on behalf of
SGS Taiwan Limited
Chemical Laboratory-Kaohsiung



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Test Result(s)

PART NAME NO.1 : SILVER COLORED PASTE

Test Item (s)	Unit	Method	MDL	Result	Limit
				No.1	
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5: 2013 and performed by ICP-OES.	2	n.d.	100
Lead (Pb)	mg/kg	With reference to IEC 62321-5: 2013 and performed by ICP-OES.	2	45.2	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+AMD1:2017 and performed by ICP-OES.	2	n.d.	1000
Hexavalent Chromium Cr(VI)	mg/kg	With reference to IEC 62321-7-2:2017 and performed by UV-VIS.	8	n.d.	1000
Sum of PBBs	mg/kg	With reference to IEC 62321-6:2015 and performed by GC/MS.	-	n.d.	1000
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		With reference to IEC 62321-6:2015 and performed by GC/MS.	-	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	Limit
				No.1	
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)	mg/kg	With reference to IEC 62321-8:2017. Analysis was performed by GC/MS.	50	n.d.	1000
DBP (Dibutyl phthalate) (CAS No.: 84-74-2)	mg/kg		50	n.d.	1000
BBP (Butyl Benzyl phthalate) (CAS No.: 85-68-7)	mg/kg		50	n.d.	1000
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg		50	n.d.	1000
Antimony (Sb)	mg/kg	With reference to US EPA 3052: 1996. Analysis was performed by ICP-OES.	2	n.d.	-
Beryllium (Be)	mg/kg		2	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	860	-
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg		50	2250	-
Halogen-Iodine (I) (CAS No.: 14362-44-8)	mg/kg		50	n.d.	-

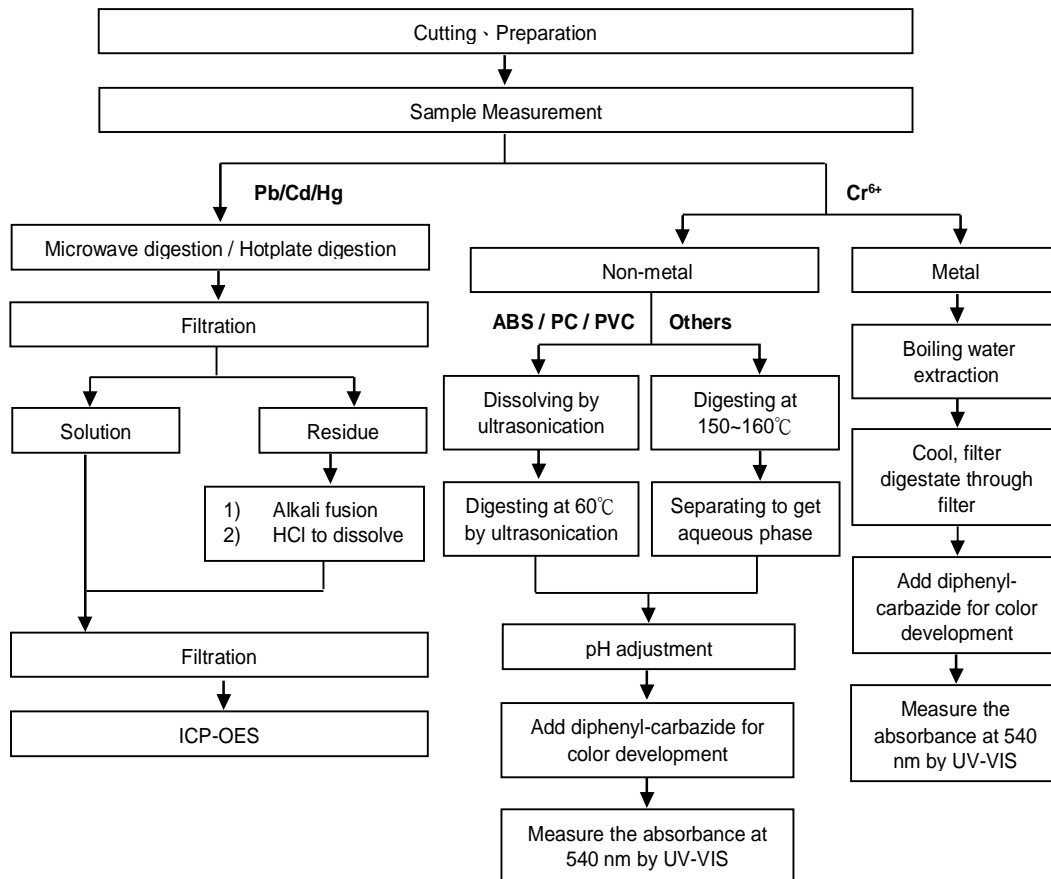
Note :

1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
4. " - " = Not Regulated

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: Jony Liu
- Supervisor: Ray Chang



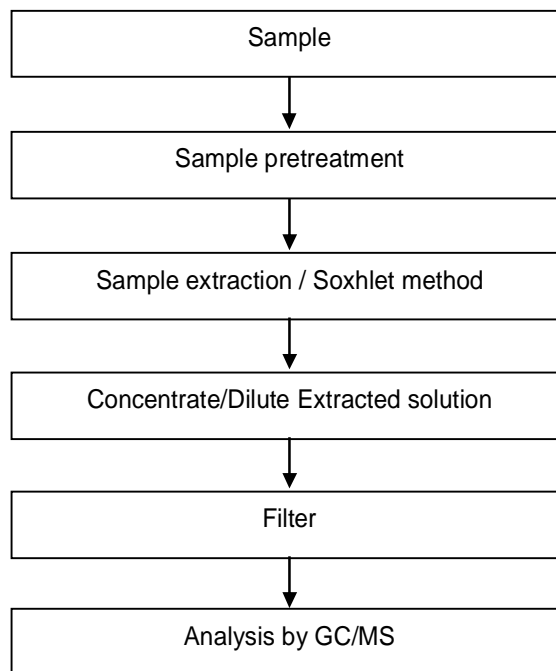
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PBB/PBDE analytical FLOW CHART

- Technician : Dorothy Chen
- Supervisor: Ray Chang



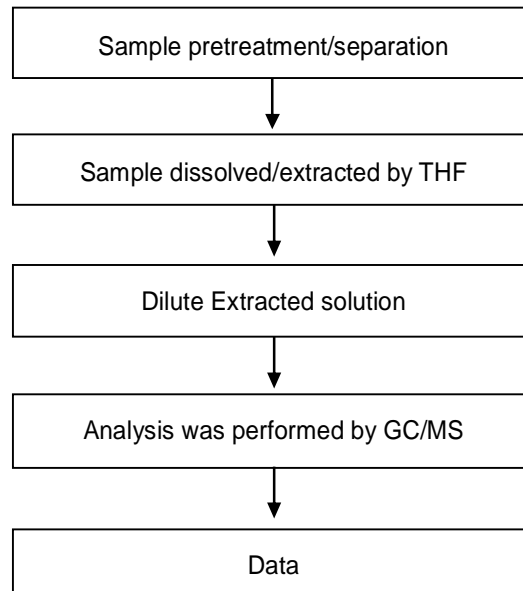
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Analytical flow chart of phthalate content

- Technician: Dorothy Chen
- Supervisor: Ray Chang

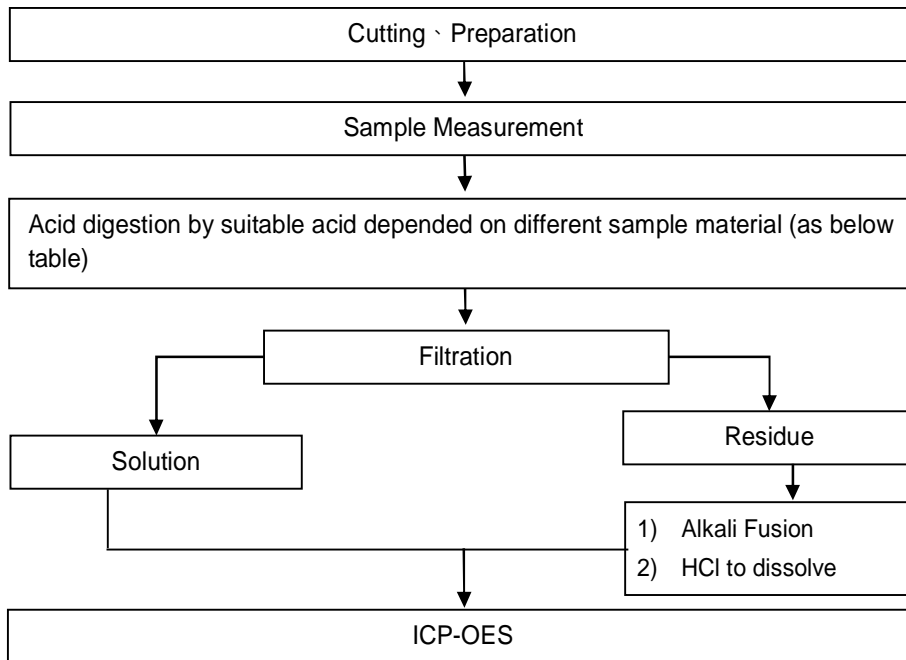
【Test method: IEC 62321-8】



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

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

- Technician: Jony Liu
- Supervisor: Ray Chang



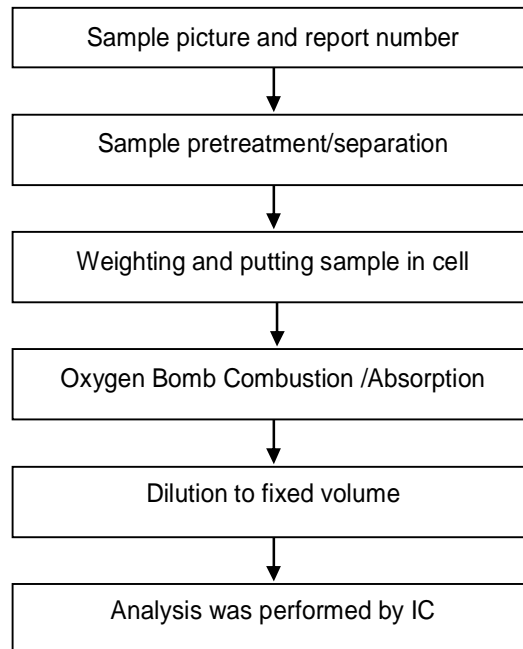
Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Any acid to total digestion

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Analytical flow chart of halogen content

- Technician : Jean Hung
- Supervisor: Ray Chang



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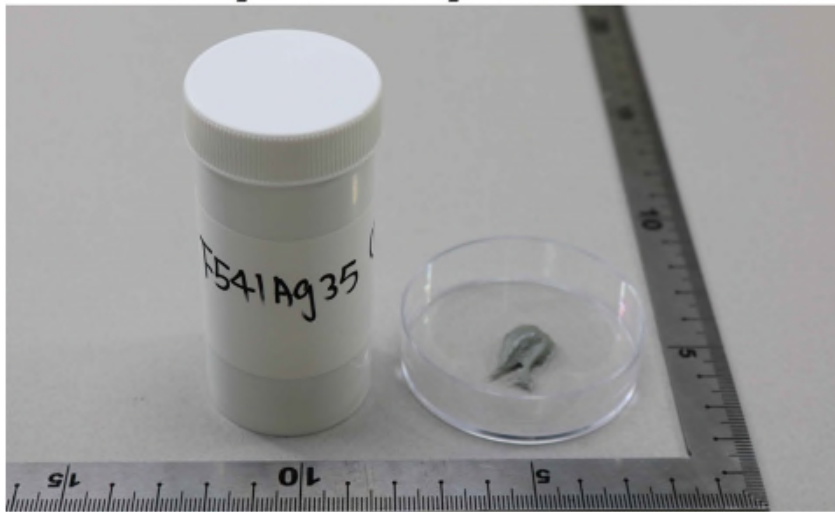
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* The tested sample / part is marked by an arrow if it's shown on the photo. *

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** End of Report **