

Test Report No.: EKR24500381 Date: 21-May-2024 Page: 1 of 20

ADVANCED ASSEMBLY MATERIALS(M) SDN BHD

PLO 534 BLOK 1 & BLOK 2, JALAN KELULI 3, KAWASAN PERINDUSTRIAN PASIR GUDANG, 81700 PASIR GUDANG, JOHOR

The following sample(s) was/were submitted and identified by the applicant as:

Sample Submitted By : ADVANCED ASSEMBLY MATERIALS(M) SDN BHD Sample Name : A194/C194 Cu ALLOY(AFTER ETCHING PROCESS)

Sample Receiving Date

: 09-May-2024

Testing Period : 09-May-2024 to 20-May-2024

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

Ray Chang Ph.D./Departmen Manager Signed for and on behalf SGS TAIWAN LTD.
Chemical Laboratory-Kaohsiung



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Test Part Description

No.1 : COPPER COLORED METAL SHEET

Test Result(s)

Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Cadmium (Cd)	With reference to IEC 62321-5: 2013,	mg/kg	2	n.d.	100
Lead (Pb)	analysis was performed by ICP-OES.	mg/kg	2	n.d.	1000
Mercury (Hg)	With reference to IEC 62321-4: 2013+	mg/kg	2	n.d.	1000
	AMD1: 2017, analysis was performed				
	by ICP-OES.				
Hexavalent Chromium Cr(VI) (#2)	With reference to IEC 62321-7-1: 2015,	μg/cm²	0.1	n.d.	-
	analysis was performed by UV-VIS.				
Monobromobiphenyl		mg/kg	5	n.d.	1
Dibromobiphenyl		mg/kg	5	n.d.	ı
Tribromobiphenyl		mg/kg	5	n.d.	-
Tetrabromobiphenyl		mg/kg	5	n.d.	1
Pentabromobiphenyl		mg/kg	5	n.d.	ı
Hexabromobiphenyl		mg/kg	5	n.d.	ı
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 PBBs	With reference to IEC 62321-6: 2015,	mg/kg	-	n.d.	1000
Monobromodiphenyl ether	analysis was performed by GC/MS.	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.	-
Sum of PBDEs		mg/kg	1	n.d.	1000



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Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Antimony (Sb) (CAS No.: 7440-36-0)	With reference to US EPA 3052: 1996,	mg/kg	2	n.d.	-
	analysis was performed by ICP-OES.				
Antimony trioxide (Sb_2O_3) (CAS No.: 1309-64-4)	Calculated from the result of Antimony.	mg/kg	2▲	n.d.	-
Beryllium (Be) (CAS No.: 7440-41-7)	With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.	mg/kg	2	n.d.	-
Arsenic (As) (CAS No.: 7440-38-2)	With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.	mg/kg	2	n.d.	-
Phosphorus (P) (CAS No.: 7723-14-0)	With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.	mg/kg	2	239	-
Polychlorinated biphenyls (PCBs)	With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.	mg/kg	0.5	n.d.	-
Polychlorinated naphthalene (PCNs)	With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.	mg/kg	5	n.d.	-
Polychlorinated terphenyls (PCTs)	With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.	mg/kg	0.5	n.d.	-
Short Chain Chlorinated Paraffins(C10-C13) (SCCP) (CAS No.: 85535-84-8)	With reference to ISO 18219-1: 2021, analysis was performed by GC/MS.	mg/kg	50	n.d.	-
Medium Chain Chlorinated Paraffins(C14-C17) (MCCP) (CAS No.: 85535-85-9)	With reference to ISO 18219-2: 2021, analysis was performed by GC/MS.	mg/kg	50	n.d.	-
Tetrabromobisphenol A (TBBP-A) (CAS No.: 79-94-7)	With reference to RSTS-E&E-121, analysis was performed by LC/MS.	mg/kg	10	n.d.	-
Bisphenol A (CAS No.: 80-05-7)	With reference to RSTS-CHEM-239-1, analysis was performed by LC/MS/MS.	mg/kg	1	n.d.	-
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α - HBCDD, β - HBCDD, γ - HBCDD) (CAS No.: 25637-99-4, 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8))	With reference to IEC 62321: 2008, analysis was performed by GC/MS.	mg/kg	5	n.d.	-
Polyvinyl chloride (PVC)	With reference to ASTM E1252: 2021, analysis was performed by FT-IR and Flame Test.	**	-	Negative	-



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Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Fluorine (F) (CAS No.: 14762-94-8)		mg/kg	50	n.d.	=
Chlorine (Cl) (CAS No.: 22537-15-1)	With reference to BS EN 14582: 2016,	mg/kg	50	n.d.	=
Bromine (Br) (CAS No.: 10097-32-2)	analysis was performed by IC.	mg/kg	50	n.d.	-
Iodine (I) (CAS No.: 14362-44-8)		mg/kg	50	n.d.	=
Tributyl tin (TBT)		mg/kg	0.03	n.d.	=
Triphenyl tin (TPT)	With reference to ISO 17353: 2004,	mg/kg	0.03	n.d.	=
Dibutyl tin (DBT)	analysis was performed by GC/FPD.	mg/kg	0.03	n.d.	=
Dioctyl tin (DOT)		mg/kg	0.03	n.d.	=
Bis(tributyltin) oxide (TBTO) (CAS No.:	Calculated from the result of Tributyl	mg/kg	0.03 🛦	n.d.	=
56-35-9)	Tin (TBT).				
PFOS and its salts (CAS No.: 1763-23-1	With reference to CEN/TS 15968: 2010,	mg/kg	0.01	n.d.	=
and its salts)	analysis was performed by LC/MS/MS.				
Perfluorooctanoic acid (PFOA) and it's	With reference to CEN/TS 15968: 2010,	mg/kg	0.01	n.d.	-
salt (CAS No.: 335-67-1 and its salts)	analysis was performed by LC/MS/MS.				
Dibutyl phthalate (DBP)		mg/kg	50	n.d.	1000
Butyl benzyl phthalate (BBP)		mg/kg	50	n.d.	1000
Diisobutyl phthalate (DIBP)		mg/kg	50	n.d.	1000
Di-(2-ethylhexyl) phthalate (DEHP)		mg/kg	50	n.d.	1000
Diisodecyl phthalate (DIDP) (CAS No.:		mg/kg	50	n.d.	-
26761-40-0, 68515-49-1)					
Diisononyl phthalate (DINP) (CAS No.:		mg/kg	50	n.d.	-
28553-12-0, 68515-48-0)					
Di-n-octyl phthalate (DNOP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
117-84-0)	analysis was performed by GC/MS.				
Di-n-pentyl phthalate (DNPP) (CAS No.:		mg/kg	50	n.d.	-
131-18-0)					
Di-n-hexyl phthalate (DNHP) (CAS No.:		mg/kg	50	n.d.	-
84-75-3)					
Bis(2-methoxyethyl) phthalate (DMEP)		mg/kg	50	n.d.	-
(CAS No.: 117-82-8)			<u></u>		
N-pentyl iso-pentyl phthalate (NPIPP)		mg/kg	50	n.d.	=
(CAS No.: 776297-69-9)					



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Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Diisopentyl phthalate (DIPP) (CAS No.: 605-50-5)		mg/kg	50	n.d.	-
1,2-Benzenedicarboxylic acid, di-C7- 11-branched and linear alkyl esters (DHNUP) (CAS No.: 68515-42-4)	With reference to IEC 62321-8: 2017, analysis was performed by GC/MS.	mg/kg	50	n.d.	-
1,2-Benzenedicarboxylic acid, di-C6-8- branched alkyl esters, C7-rich (DIHP) (CAS No.: 71888-89-6)		mg/kg	50	n.d.	-

Note:

- 1. mg/kg = ppm; 0.1wt% = 0.1% = 1000ppm
- 2. MDL = Method Detection Limit
- 3. n.d. = Not Detected (Less than MDL)
- 4. "-" = Not Regulated
- 5. **= Qualitative analysis (No Unit)
- 6. Negative = Undetectable; Positive = Detectable
- 7. (#2) =
 - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 μ g/cm². 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 $\mu g/cm^2$). The coating is considered a non-Cr(VI) based coating
 - c. The result between 0.10 μ g/cm² and 0.13 μ g/cm² is considered to be inconclusive unavoidable coating variations may influence the determination.
- 8. ▲ : The MDL was evaluated for element / tested substance.

Conversion Formula : $AX = A \times F$

AX	Α	F
Antimony trioxide (Sb₂O₃)	Antimony	1.1971
Bis(tributyltin)oxide (TBTO)	Tributyl Tin (TBT)	1.0276

Parameter Conversion Table: https://eecloud.sgs.com/Region TW/DocDownload.aspx?name=Others

9. Unless otherwise stated, the decision rule for conformity reporting is based on Binary Statement for Simple Acceptance Rule (w=0) stated in ILAC-G8:09/2019. According to this rule, the judgement of conformity is based on the comparing test results with limits.



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PFAS Remark:

The quantitative technology of PFAS is to analyze the specific structure of PFAS substances. However, PFAS acid and its salts with the same carbon number group have the same specific structure that can be identified. The tested results of the analyzed specific structure cannot be distinguished to identify the contribution from PFAS acid or its salts. Therefore, the tested results display the sum of concentrations of PFAS acids and its salts with the same carbon number group. The concentration of PFAS substances in the below table have been included in the tested results, please refer to the table for relevant information: (The listed PFAS substances are examples only, it do not include all PFAS salts with the same carbon number group.)

Group Name	Substance Name	CAS No.
	Perfluorooctane sulfonates (PFOS)	1763-23-1
	Potassium perfluorooctanesulfonate (PFOS-K)	2795-39-3
	Perfluorooctanesulfonic acid, lithium salt (PFOS-Li)	29457-72-5
	Perfluorooctanesulfonic acid, ammonium salt (PFOS-NH ₄)	29081-56-9
	Perfluorooctane sulfonate diethanolamine salt (PFOS-NH(OH) ₂)	70225-14-8
	$\label{eq:perfluor} Perfluorooctane sulfonic acid, tetraethylammonium salt \\ (PFOS-N(C_2H_5)_4)$	56773-42-3
PFOS, its salts & derivatives	N-decyl-N,N-dimethyldecan-1-aminium 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1- sulfonate (PFOS-DDA)	251099-16-8
	Tetrabutyl Ammonium perfluorooctanesul fonate (PFOS-N(C ₄ H ₉) ₄)	111873-33-7
	Perfluorooctane sulfonyl fluoride (POSF)	307-35-7
	Perfluorooctanesulfonic acid, magnesium salt (PFOS-Mg)	91036-71-4
	Perfluorooctanesulfonic acid, sodium salt (PFOS-Na)	4021-47-0
	Piperidine 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8- heptadecafluorooctanesulfonate	71463-74-6
	Perfluorooctanoic acid (PFOA)	335-67-1
	Sodium perfluorooctanoate (PFOA-Na)	335-95-5
PFOA, its salts & derivatives	Potassium perfluorooctanoate (PFOA-K)	2395-00-8
	Silver perfluorooctanote (PFOA-Ag)	335-93-3
	Perfluorooctanoyl fluoride (PFOA-F)	335-66-0
	Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
	Lithium perfluorooctanoate (PFOA-Li)	17125-58-5
	Cobalt perfluorooctanoate (PFOA-Co)	35965-01-6



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Group Name	Substance Name	CAS No.
	Cesium perfluorooctanoate (PFOA-Cs)	17125-60-9
	Octanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluoro-, chromium(3+) (PFOA-Cr(3 ⁺))	68141-02-6
PFOA, its salts & derivatives	Pentadecafluorooctanoic acidpiperazine (2/1)PFOA- $NH(C_4H_{10}N)$	423-52-9
	Pentadecafluorooctanoate (anion)	45285-51-6
	Perfluorooctanoic Anhydride	33496-48-9

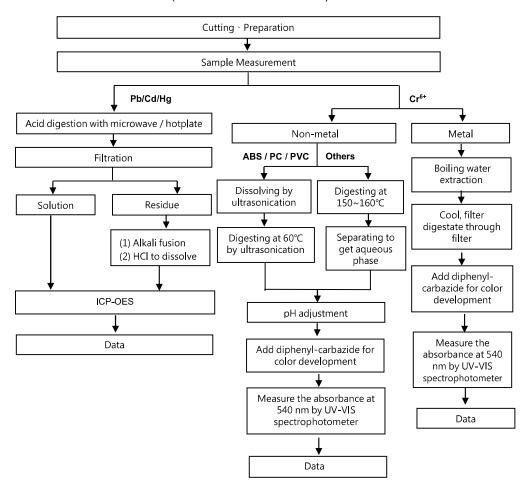


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Analytical flow chart of Heavy Metal

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr^{6+} test method excluded)

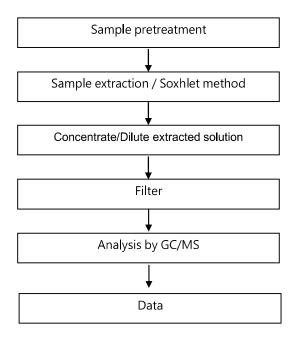




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PBB/PBDE analytical FLOW CHART





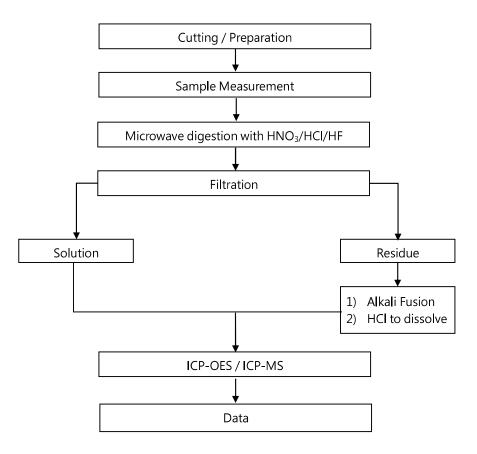
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Analytical flow chart of Elements (Heavy metal included)

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

【Reference method: US EPA 3051 \ US EPA 3052】



* US EPA 3051 method does not add HF.



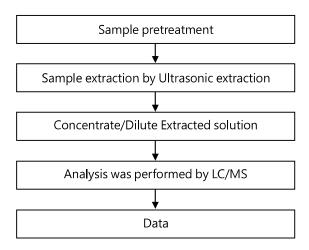
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TBBP-A analytical flow chart



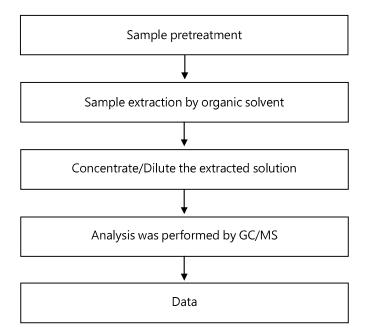


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Analytical flow chart

* Apply to: PCBs, PCNs, PCTs, Mirex, Chlorinated Paraffins, DBBT



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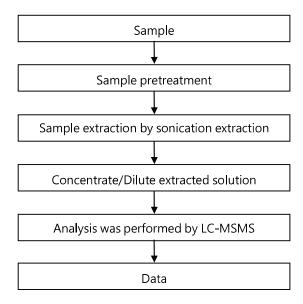
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BPA analytical flow chart

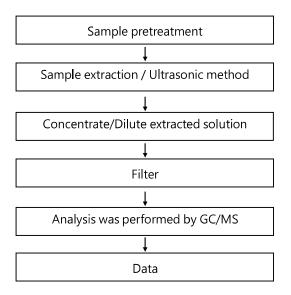




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Analytical flow chart - HBCDD

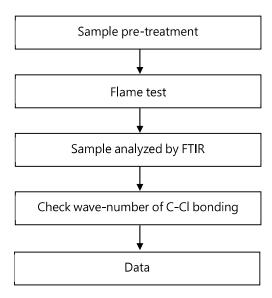




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Analysis flow chart - PVC

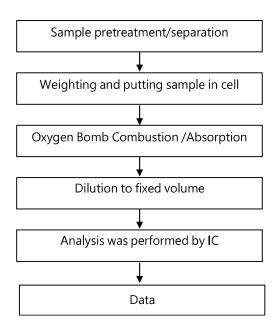




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Analytical flow chart of Halogen

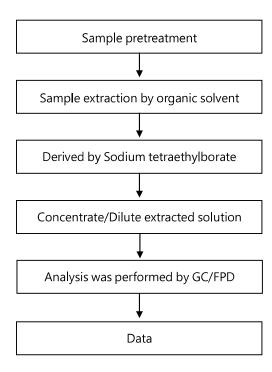




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Analytical flow chart - Organic-Tin

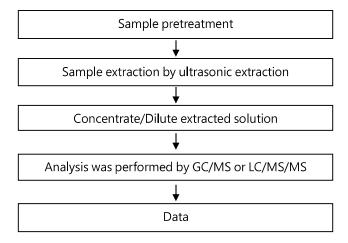




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Analytical flow chart - PFAS (including PFOA/PFOS/its related compound, etc.)



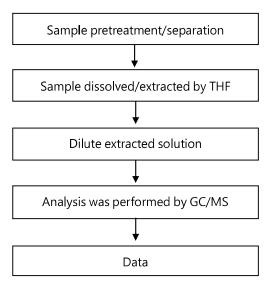


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Analytical flow chart of phthalate content

【Test method: IEC 62321-8】



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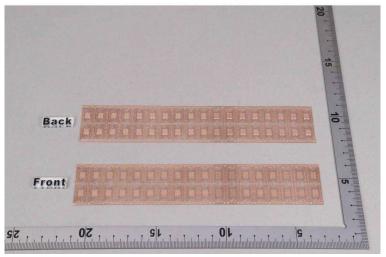


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* The tested sample / part is marked by an arrow if it's shown on the photo. *

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** End of Report **