

No.: EKR21501644 Date: 02-Jun-2021

TANAKA ELECTRONICS SINGAPORE PTE LTD. 29 PANDAN CRESCENT, SINGAPORE 128473

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

Sample Submitted By : TANAKA ELECTRONICS SINGAPORE PTE LTD.

Sample Name : PD COATED CU BONDING WIRE

Color : SILVER

Sample Receiving Date : 21-May-2021

Testing Period : 21-May-2021 to 02-Jun-2021

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./Departmer Manager Signed for and on behalf SGS TAIWAN LTD.
Chemical Laboratory-Kaohsiung



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IN CODE: 10F417E1



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Test Part Description

No.1 : PD COATED CU BONDING WIRE

Test Result(s)

Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Cadmium (Cd) (CAS No.: 7440-43-9)	With reference to IEC 62321-5: 2013,	mg/kg	2	n.d.	100
Lead (Pb) (CAS No.: 7439-92-1)	analysis was performed by ICP-OES.	mg/kg	2	n.d.	1000
Mercury (Hg) (CAS No.: 7439-97-6)	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) (CAS No.:	With reference to IEC 62321-7-1:	μg/cm²	0.1	n.d.	-
18540-29-9) (#2)	2015, analysis was performed by UV-				
	VIS.				
Monobromobiphenyl		mg/kg	5	n.d.	-
Dibromobiphenyl		mg/kg	5	n.d.	-
Tribromobiphenyl		mg/kg	5	n.d.	-
Tetrabromobipenyl		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 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	-	n.d.	1000

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Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Hexavalent Chromium Cr(VI) (CAS No.:	With reference to IEC 62321-7-2:	mg/kg	8	n.d.	-
18540-29-9)	2017, analysis was performed by UV-				
	VIS.				
Hexavalent Chromium Cr(VI) (CAS No.:	With reference to ISO 3613: 2010,	μg/cm²	0.02	n.d.	-
18540-29-9)	analysis was performed by UV-VIS.				
Chromium VI (CrVI) (CAS No.: 18540-	With reference to US EPA 3060A &	mg/kg	2	n.d.	-
29-9)	7196A. analysis was performed by				
	UV-VIS.				
Dimethyl fumarate (DMFu) (CAS No.:	With reference to US EPA 3550C:	mg/kg	0.1	n.d.	-
624-49-7)	2007, analysis was performed by				
	GC/MS.				
Polyvinyl chloride (PVC)	With reference to ASTM E1252: 2013,	**	-	Negative	-
	analysis was performed by FT-IR and				
	Flame Test.				
Arsenic (As) (CAS No.: 7440-38-2)	With reference to US EPA 3052: 1996,	mg/kg	2	n.d.	-
	analysis was performed by ICP-OES.				
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.				
Perfluorooctanoic acid (PFOA) and it's	With reference to CEN/TS 15968:	mg/kg	0.01	n.d.	-
salt (CAS No.: 335-67-1 and its salts)	2010, analysis was performed by				
	LC/MS/MS.				
Perfluorooctane sulfonate (PFOS) and	With reference to CEN/TS 15968:	mg/kg	0.01	n.d.	-
it's salt (CAS No.: 1763-23-1 and its	2010, analysis was performed by				
salts)	LC/MS/MS.				
Halogen					
Fluorine (F) (CAS No.: 14762-94-8)	With reference to BS EN 14582: 2016,	mg/kg	50	n.d.	-
	analysis was performed by IC.				
Chlorine (Cl) (CAS No.: 22537-15-1)	With reference to BS EN 14582: 2016,	mg/kg	50	n.d.	-
	analysis was performed by IC.				
Bromine (Br) (CAS No.: 10097-32-2)	With reference to BS EN 14582: 2016,	mg/kg	50	n.d.	=
	analysis was performed by IC.				
Iodine (I) (CAS No.: 14362-44-8)	With reference to BS EN 14582: 2016,	mg/kg	50	n.d.	=
	analysis was performed by IC.				

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Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Tetrabromobisphenol A (TBBP-A) (CAS	With reference to RSTS-E&E-121,	mg/kg	10	n.d.	-
No.: 79-94-7)	analysis was performed by LC/MS.				
Phthalates					
Butyl benzyl phthalate (BBP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	1000
85-68-7)	analysis was performed by GC/MS.				
Dibutyl phthalate (DBP) (CAS No.: 84-	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	1000
74-2)	analysis was performed by GC/MS.				
Di-(2-ethylhexyl) phthalate (DEHP)	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	1000
(CAS No.: 117-81-7)	analysis was performed by GC/MS.				
Diisobutyl phthalate (DIBP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	1000
84-69-5)	analysis was performed by GC/MS.				
Diisodecyl phthalate (DIDP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
26761-40-0, 68515-49-1)	analysis was performed by GC/MS.				
Diisononyl phthalate (DINP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
28553-12-0, 68515-48-0)	analysis was performed by GC/MS.				
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.				
1,2-Benzenedicarboxylic acid, di-C7-	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
11-branched and linear alkyl esters	analysis was performed by GC/MS.				
(DHNUP) (CAS No.: 68515-42-4)					
1,2-Benzenedicarboxylic acid, di-C6-8-	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
branched alkyl esters, C7-rich (DIHP)	analysis was performed by GC/MS.				
(CAS No.: 71888-89-6)					
Bis-(2-methoxyethyl) phthalate (DMEP)	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
(CAS No.: 117-82-8)	analysis was performed by GC/MS.				
Di-n-hexyl phthalate (DNHP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
84-75-3)	analysis was performed by GC/MS.				
Di-n-pentyl phthalate (DNPP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
131-18-0)	analysis was performed by GC/MS.				
Di-pentyl phthalate (DPP) (CAS No.:	With reference to IEC 62321-8: 2017,	mg/kg	50	n.d.	-
131-18-0)	analysis was performed by GC/MS.				
Hexabromocyclododecane (HBCDD)	With reference to IEC 62321: 2008,	mg/kg	5	n.d.	-
and all major diastereoisomers	analysis was performed by GC/MS.				
identified (α- HBCDD, β- HBCDD, γ-					
HBCDD) (CAS No.: 25637-99-4, 3194-					
55-6 (134237-51-7, 134237-50-6,					
134237-52-8))					

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Test Item(s)	Method	Unit	MDL	Result	Limit
				No.1	
Perfluorooctane sulfonate (PFOS) and it's salt (CAS No.: 1763-23-1 and its salts)	With reference to US EPA 3550C: 2007, analysis was performed by LC/MS.	mg/kg	10	n.d.	-
Perfluorooctanoic acid (PFOA) and it's salt (CAS No.: 335-67-1 and its salts)	With reference to US EPA 3550C: 2007, analysis was performed by LC/MS.	mg/kg	10	n.d.	-

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. **= Qualitative analysis (No Unit)
- 6. Negative = Undetectable; Positive = Detectable
- 7. PFOS and its salts including:
 - CAS No.: 29081-56-9, 2795-39-3, 29457-72-5, 70225-14-8, 56773-42-3, 251099-16-8, 307-35-7.
- 8. PFOA and its salts including:
 - CAS No.: 3825-26-1, 335-95-5, 2395-00-8, 335-93-3, 335-66-0.
- 9. (#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.
- 10. The statement of compliance conformity is based on comparison of testing results and limits.

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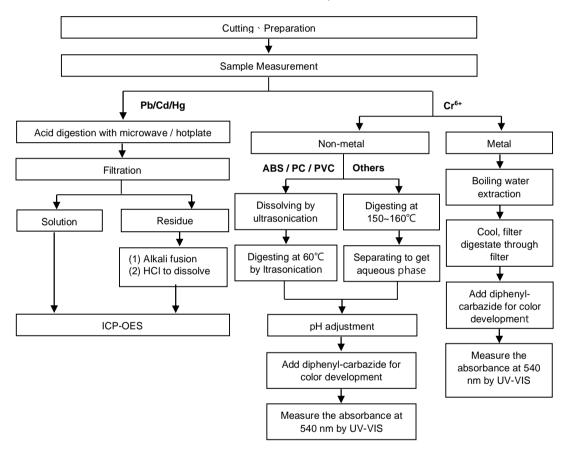


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TANAKA ELECTRONICS SINGAPORE PTE LTD. 29 PANDAN CRESCENT, SINGAPORE 128473

Analytical flow chart of Heavy Metal

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



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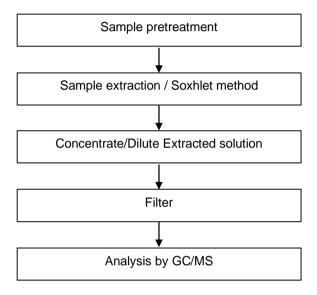
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PBB/PBDE analytical FLOW CHART



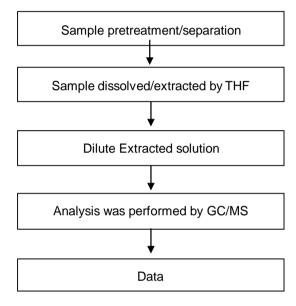


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TANAKA ELECTRONICS SINGAPORE PTE LTD. 29 PANDAN CRESCENT, SINGAPORE 128473

Analytical flow chart of phthalate content

[Test method: IEC 62321-8]



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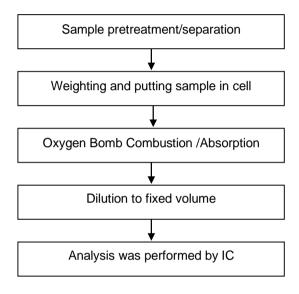
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Analytical flow chart of Halogen





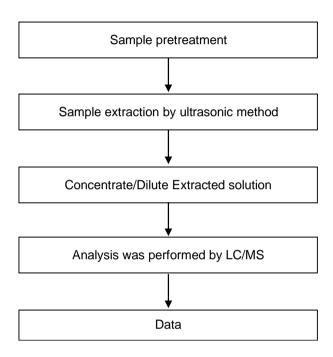
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Analytical flow chart of PFOA/PFOS





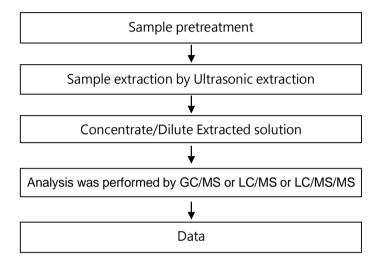
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Analytical flow chart – PFAS (including PFOA/PFOS/its related compound, etc.)





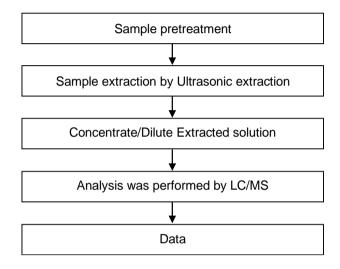
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TBBP-A analytical flow chart

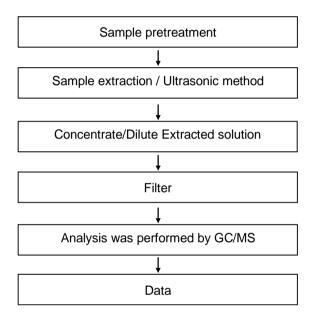




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Analytical flow chart - HBCDD



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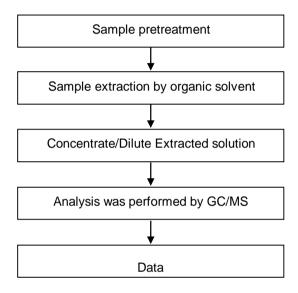
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Analytical flow chart of Dimethyl Fumarate





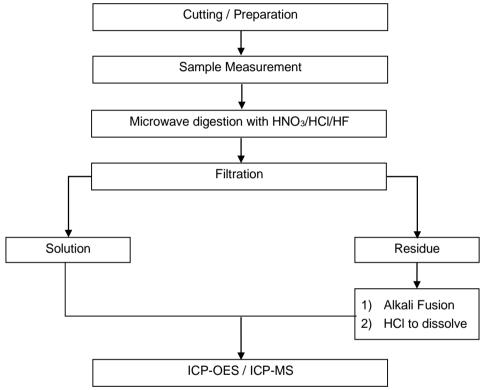
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TANAKA ELECTRONICS SINGAPORE PTE LTD. 29 PANDAN CRESCENT, SINGAPORE 128473

Analytical flow chart of Heavy Metal

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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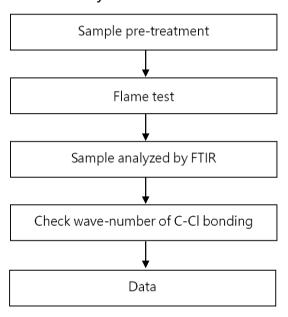
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Analysis flow chart - PVC





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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 **