# Test Report

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

CHECK REPORT
PIN CODE: 10F417E1

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

**Test Part Description**

No.1 : PD COATED CU BONDING WIRE

**Test Result(s)**

| Test Item(s) | Method | Unit | MDL | Result No.1 | Limit |
|---|---|---|---|---|---|
| Cadmium (Cd) (CAS No.: 7440-43-9) | With reference to IEC 62321-5: 2013, analysis was performed by ICP-OES. | mg/kg | 2 | n.d. | 100 |
| Lead (Pb) (CAS No.: 7439-92-1) | | mg/kg | 2 | n.d. | 1000 |
| Mercury (Hg) (CAS No.: 7439-97-6) | With reference to IEC 62321-4: 2013+AMD1: 2017, analysis was performed by ICP-OES. | mg/kg | 2 | n.d. | 1000 |
| Hexavalent Chromium Cr(VI) (CAS No.: 18540-29-9) (#2) | With reference to IEC 62321-7-1: 2015, analysis was performed by UV-VIS. | µg/cm² | 0.1 | n.d. | - |
| Monobromobiphenyl | With reference to IEC 62321-6: 2015, analysis was performed by GC/MS. | 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** | | mg/kg | - | n.d. | 1000 |
| 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. | - |
| **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.: 18540-29-9) | With reference to IEC 62321-7-2: 2017, analysis was performed by UV-VIS. | mg/kg | 8 | n.d. | - |
| Hexavalent Chromium Cr(VI) (CAS No.: 18540-29-9) | With reference to ISO 3613: 2010, analysis was performed by UV-VIS. | μg/cm² | 0.02 | n.d. | - |
| Chromium VI (CrVI) (CAS No.: 18540-29-9) | With reference to US EPA 3060A & 7196A. analysis was performed by UV-VIS. | mg/kg | 2 | n.d. | - |
| Dimethyl fumarate (DMFu) (CAS No.: 624-49-7) | With reference to US EPA 3550C: 2007, analysis was performed by GC/MS. | mg/kg | 0.1 | n.d. | - |
| Polyvinyl chloride (PVC) | With reference to ASTM E1252: 2013, analysis was performed by FT-IR and Flame Test. | ** | - | Negative | - |
| 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. | - |
| Antimony (Sb) (CAS No.: 7440-36-0) | With reference to US EPA 3052: 1996, analysis was performed by ICP-OES. | mg/kg | 2 | n.d. | - |
| Perfluorooctanoic acid (PFOA) and it's salt (CAS No.: 335-67-1 and its salts) | With reference to CEN/TS 15968: 2010, analysis was performed by LC/MS/MS. | mg/kg | 0.01 | n.d. | - |
| Perfluorooctane sulfonate (PFOS) and it's salt (CAS No.: 1763-23-1 and its salts) | With reference to CEN/TS 15968: 2010, analysis was performed by LC/MS/MS. | mg/kg | 0.01 | n.d. | - |
| **Halogen** | | | | | |
| Fluorine (F) (CAS No.: 14762-94-8) | With reference to BS EN 14582: 2016, analysis was performed by IC. | mg/kg | 50 | n.d. | - |
| Chlorine (Cl) (CAS No.: 22537-15-1) | With reference to BS EN 14582: 2016, analysis was performed by IC. | mg/kg | 50 | n.d. | - |
| Bromine (Br) (CAS No.: 10097-32-2) | With reference to BS EN 14582: 2016, analysis was performed by IC. | mg/kg | 50 | n.d. | - |
| Iodine (I) (CAS No.: 14362-44-8) | With reference to BS EN 14582: 2016, analysis was performed by IC. | mg/kg | 50 | n.d. | - |

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| Test Item(s) | Method | Unit | MDL | Result No.1 | Limit |
|---|---|---|---|---|---|
| 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. | - |
| **Phthalates** | | | | | |
| Butyl benzyl phthalate (BBP) (CAS No.: 85-68-7) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | 1000 |
| Dibutyl phthalate (DBP) (CAS No.: 84-74-2) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | 1000 |
| Di-(2-ethylhexyl) phthalate (DEHP) (CAS No.: 117-81-7) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | 1000 |
| Diisobutyl phthalate (DIBP) (CAS No.: 84-69-5) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | 1000 |
| Diisodecyl phthalate (DIDP) (CAS No.: 26761-40-0, 68515-49-1) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | - |
| Diisononyl phthalate (DINP) (CAS No.: 28553-12-0, 68515-48-0) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | - |
| Di-n-octyl phthalate (DNOP) (CAS No.: 117-84-0) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | 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) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | - |
| Bis-(2-methoxyethyl) phthalate (DMEP) (CAS No.: 117-82-8) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | - |
| Di-n-hexyl phthalate (DNHP) (CAS No.: 84-75-3) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | - |
| Di-n-pentyl phthalate (DNPP) (CAS No.: 131-18-0) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | n.d. | - |
| Di-pentyl phthalate (DPP) (CAS No.: 131-18-0) | With reference to IEC 62321-8: 2017, analysis was performed by GC/MS. | mg/kg | 50 | 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. | - |

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| Test Item(s) | Method | Unit | MDL | Result No.1 | Limit |
|---|---|---|---|---|---|
| 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 μg/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 μg/cm²). The coating is considered a non-Cr(VI) based coating
   c. The result between 0.10 μg/cm² and 0.13 μg/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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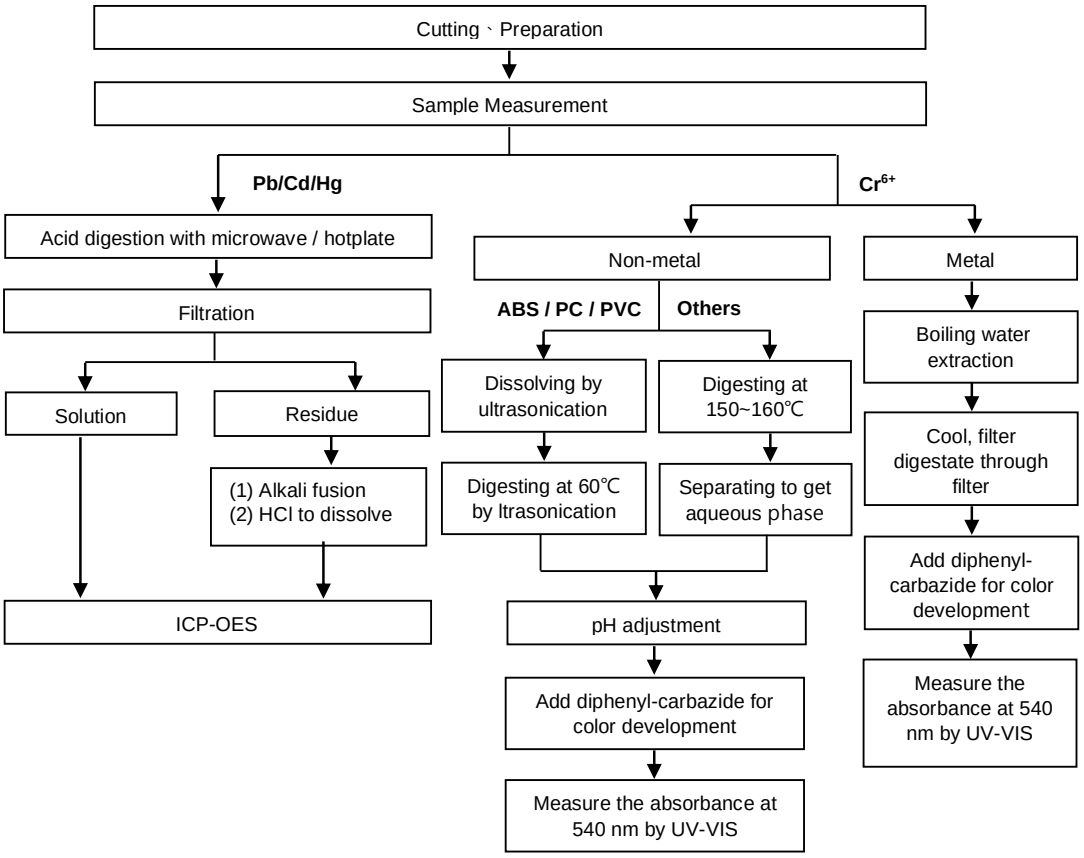
**Analytical flow chart of Heavy Metal**

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



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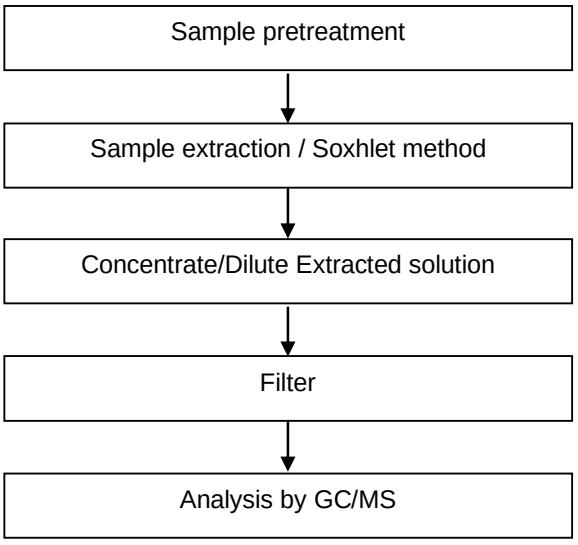
**PBB/PBDE analytical FLOW CHART**



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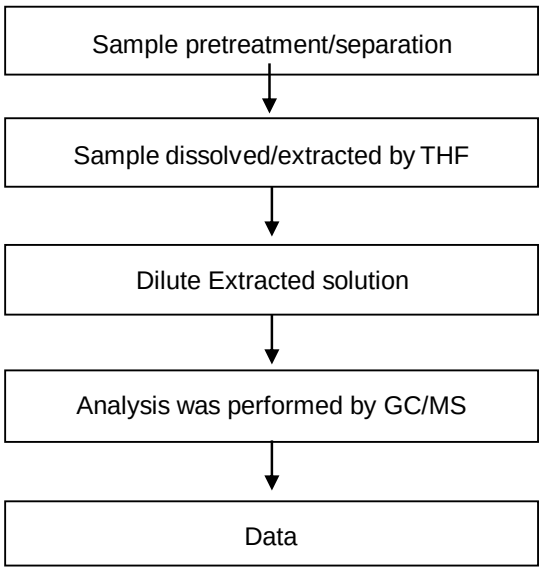
**Analytical flow chart of phthalate content**

【Test method: IEC 62321-8】



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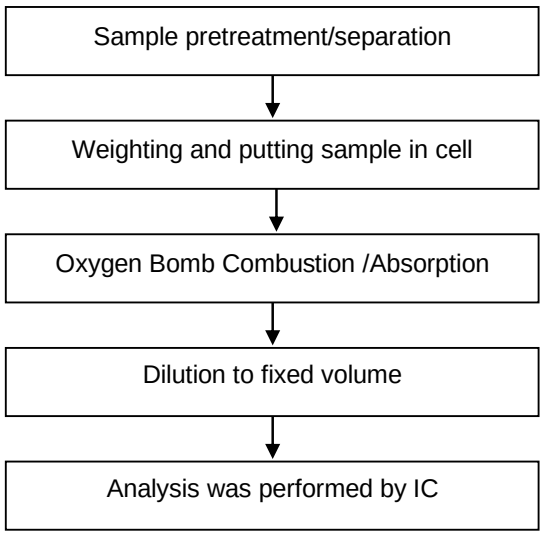
**Analytical flow chart of Halogen**



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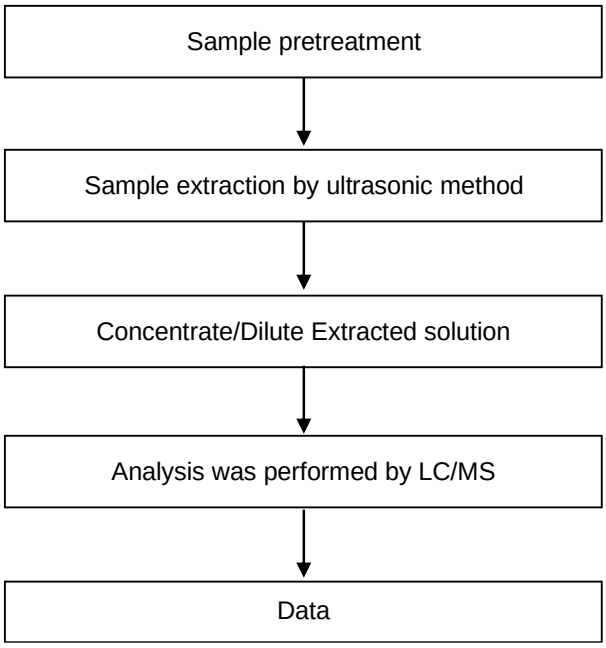
**Analytical flow chart of PFOA/PFOS**



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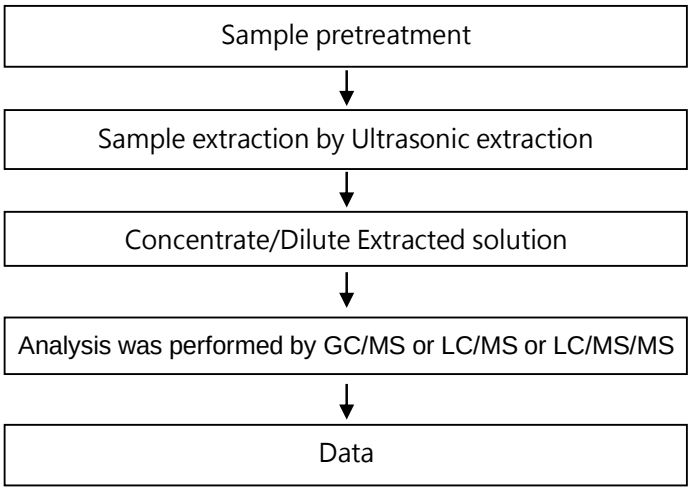
**Analytical flow chart – PFAS (including PFOA/PFOS/its related compound, etc.)**



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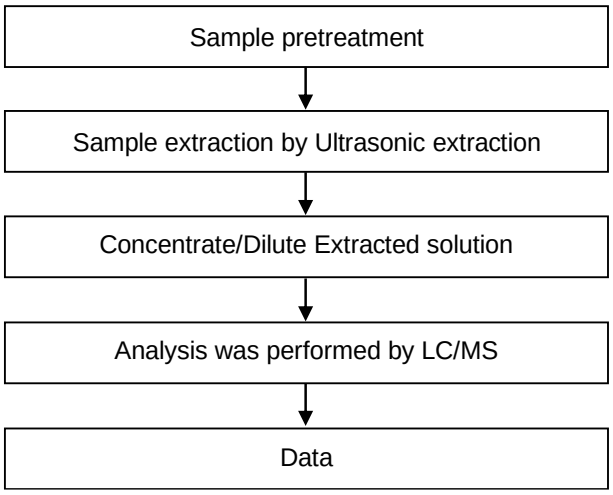
**TBBP-A analytical flow chart**



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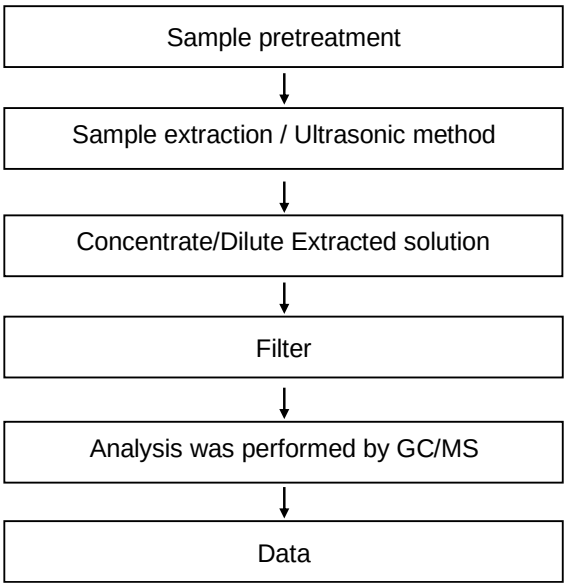
**Analytical flow chart - HBCDD**



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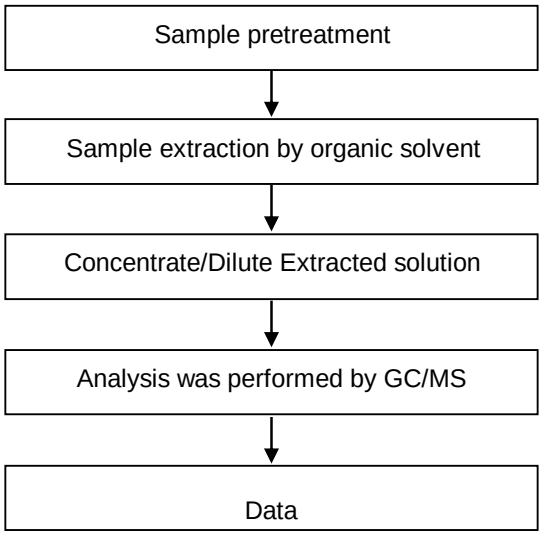
**Analytical flow chart of Dimethyl Fumarate**



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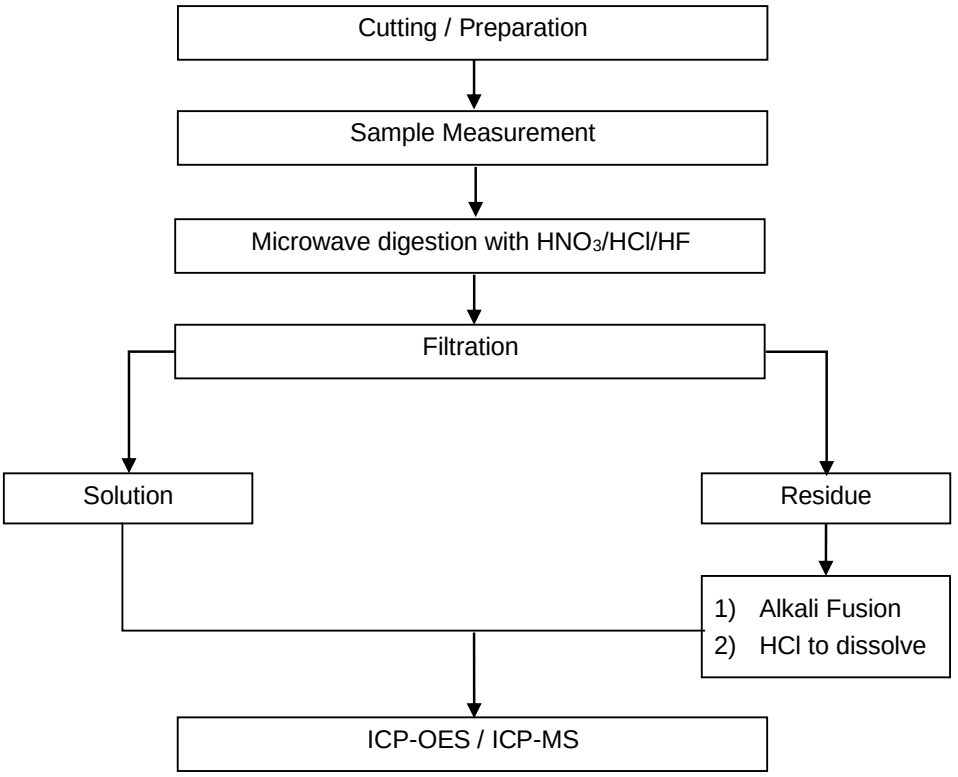
**Analytical flow chart of Heavy Metal**

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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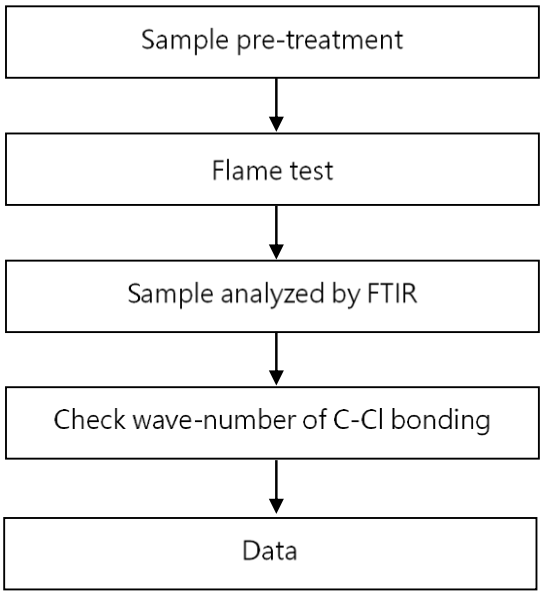
**Analysis flow chart - PVC**



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

# EKR21501644

** End of Report **