

Test Report

No. : CE/2019/C0186

Date : 2019/12/09

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HITACHI CHEMICAL DUPONT MICROSYSTEMS
250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

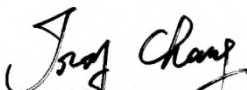
The following samples was/were submitted and identified by/on behalf of the applicant as :

Sample Submitted By : HITACHI CHEMICAL DUPONT MICROSYSTEMS LTD.
Sample Description : POLYIMIDE PRECURSOR
Style/Item No. : HD4104
Sample Receiving Date : 2019/12/03
Testing Period : 2019/12/03 to 2019/12/09

=====
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 behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei



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HITACHI CHEMICAL DUPONT MICROSYSTEMS
250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Test Result(s)

PART NAME No.1 : TRANSPARENT BROWN GLUE

Test Item(s)	Unit	Method	MDL	Result
				No.1
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-OES.	2	n.d.
Lead (Pb)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-OES.	2	n.d.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+AMD1:2017 and performed by ICP-OES.	2	n.d.
Hexavalent Chromium Cr(VI)	mg/kg	With reference to IEC 62321-7-2 (2017) and performed by UV-VIS.	8	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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HITACHI CHEMICAL DUPONT MICROSYSTEMS

250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

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	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
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.
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
DIDP (Di-isodecyl phthalate) (CAS No.: 26761-40-0; 68515-49- 1)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
DINP (Di-isononyl phthalate) (CAS No.: 28553-12-0; 68515-48- 0)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
DNPP (Di-n-pentyl phthalate) (CAS No.: 131-18-0)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
DNHP (Di-n-hexyl phthalate) (CAS No.: 84-75-3)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	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	142
Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.
Halogen-Iodine (I) (CAS No.: 14362-44-8)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.
Perfluorooctane sulfonates (PFOS-Acid, Metal Salt, Amide)	mg/kg	With reference to CEN/TS 15968 (2010). Analysis was performed by LC/MS.	0.01	n.d.
PFOA (CAS No.: 335-67-1)	mg/kg	With reference to CEN/TS 15968 (2010). Analysis was performed by LC/MS.	0.01	n.d.

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Test Item(s)	Unit	Method	MDL	Result
				No.1
Antimony (Sb)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-OES.	2	n.d.
Beryllium (Be)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-OES.	2	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.
Formaldehyde (CAS No.: 50-00-0)	mg/kg	With reference to ISO 17226-1 (2018). Analysis was performed by HPLC/DAD.	3	n.d.
Phosphine (CAS No.: 7803-51-2)	ppmV	Analysis was performed by gas detector tube. (Test Condition: 40°C, 30mins)	0.08	n.d.
Toluene (CAS No.: 108-88-3)	mg/kg	With reference to US EPA 5021A (2014). Analysis was performed by GC/MS.	1	n.d.
Benzene (CAS No.: 71-43-2)	mg/kg	With reference to US EPA 5021A (2014). Analysis was performed by GC/MS.	1	n.d.
Sulfur (S)	%	Element Analyzer	0.1	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. ppmV = Part Per Million by Volume

Tedlar bag size / Sampling Volume :

Phosphine	5L/0.5L
Formaldehyde	5L/0.5L

Gas detecting tube test can be interfered by certain substances especially;

Formaldehyde - Aldehydes and Ketones

Phosphine - Arsine, etc.

6. Date: YYYY/MM/DD

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PFOS Reference Information : POPs - (EU) 2019/1021

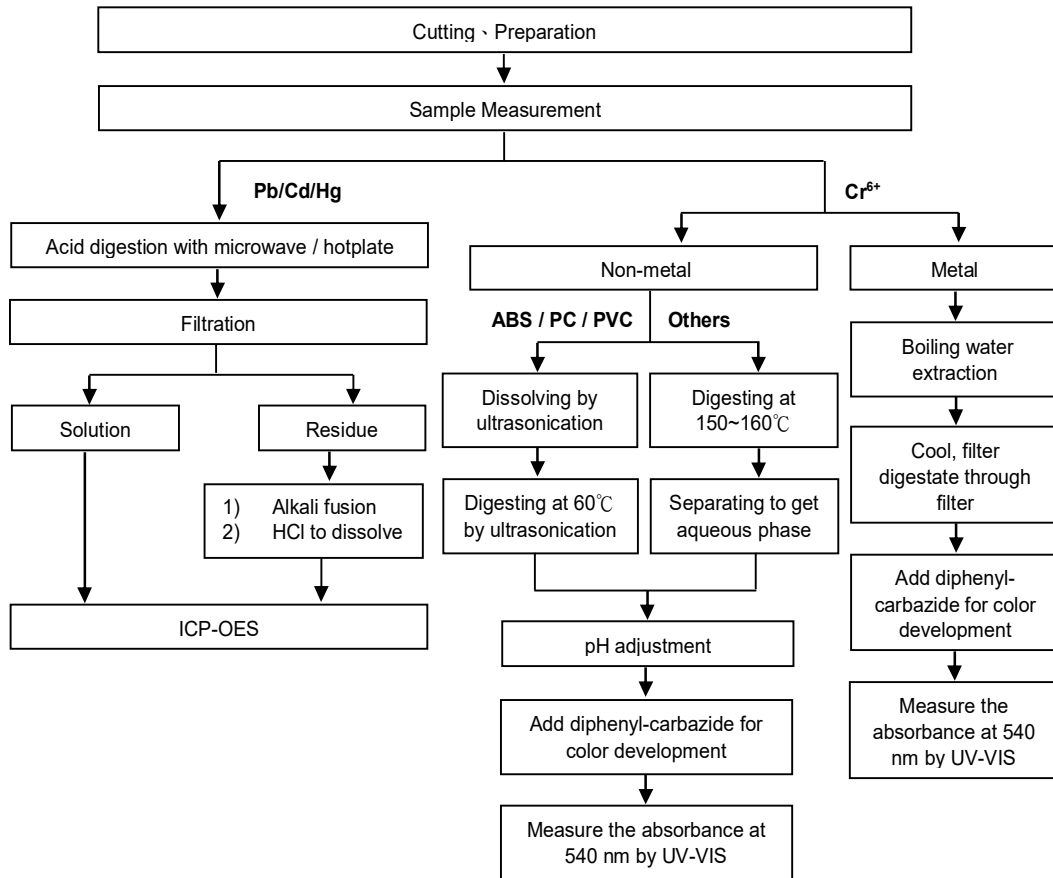
Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1%(1000ppm), in textiles or other coated materials above 1µg/m².

HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

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

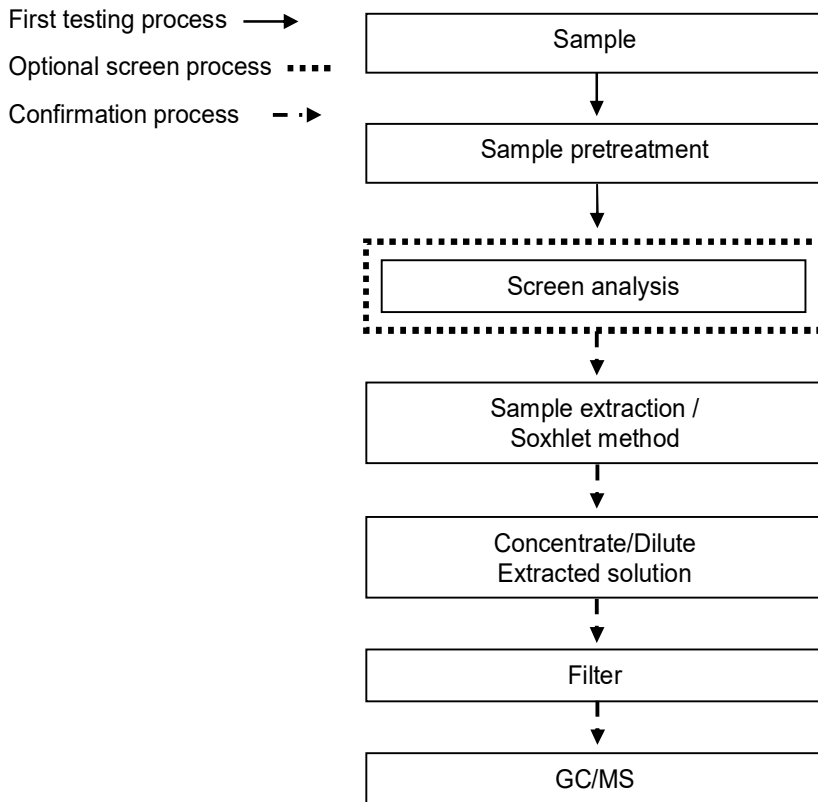


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HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart – PBB / PBDE

- Technician : Yaling Tu
- Supervisor: Troy Chang



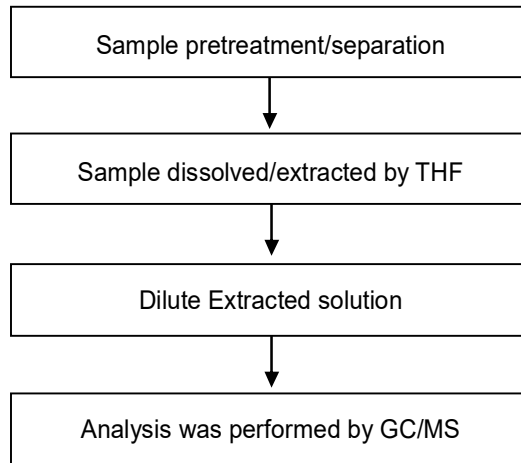
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HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - Phthalate

- Technician: Yaling Tu
- Supervisor: Troy Chang

【Test method: IEC 62321-8】

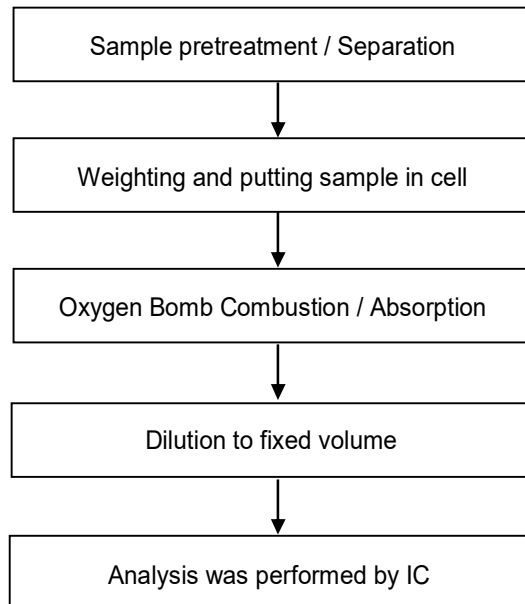


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HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - Halogen

- Technician: Rita Chen
- Supervisor: Troy Chang

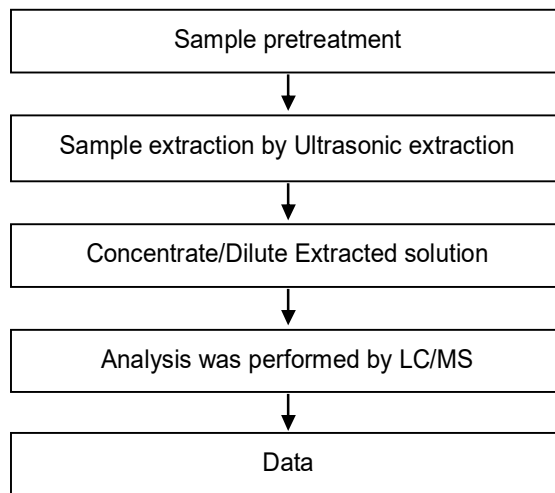


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HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - PFOA/PFOS

- Technician: Yaling Tu
- Supervisor: Troy Chang



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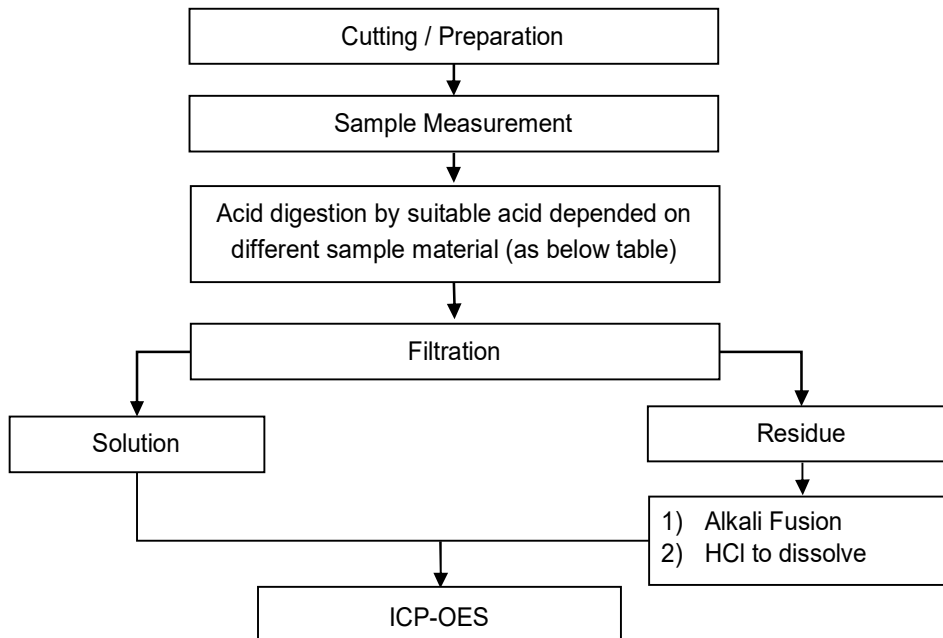
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HITACHI CHEMICAL DUPONT MICROSYSTEMS
250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

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-OES

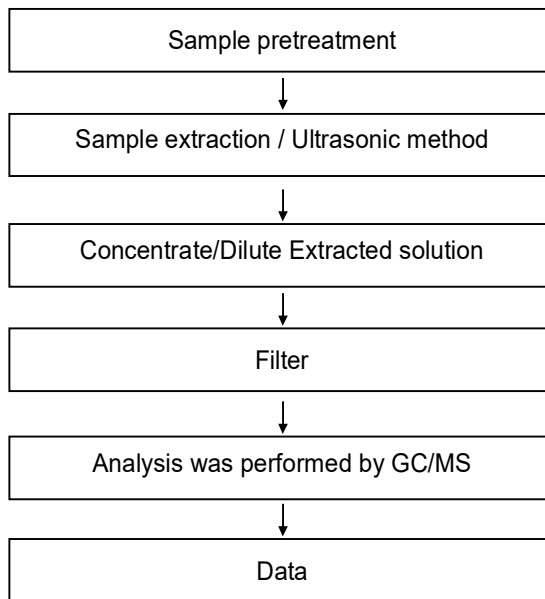


Steel, copper, aluminum, solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Glass	HNO ₃ /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO ₃
Plastic	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Others	Added appropriate reagent to total digestion

HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - HBCDD

- Technician: Yaling Tu
- Supervisor: Troy Chang

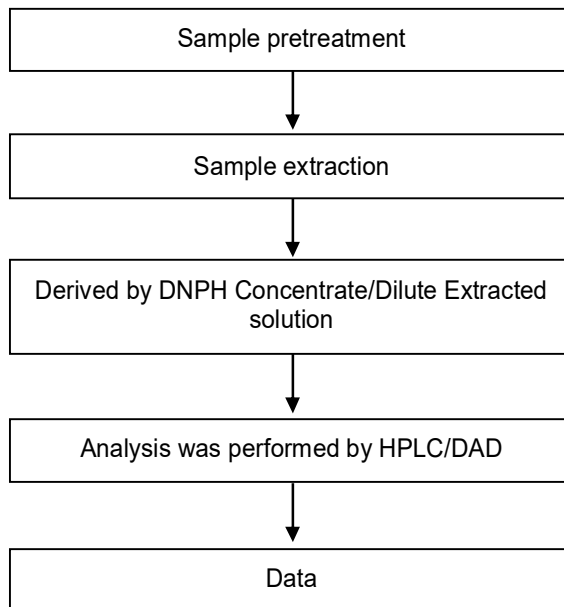


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HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - Formaldehyde

- Technician: Yaling Tu
- Supervisor: Troy Chang

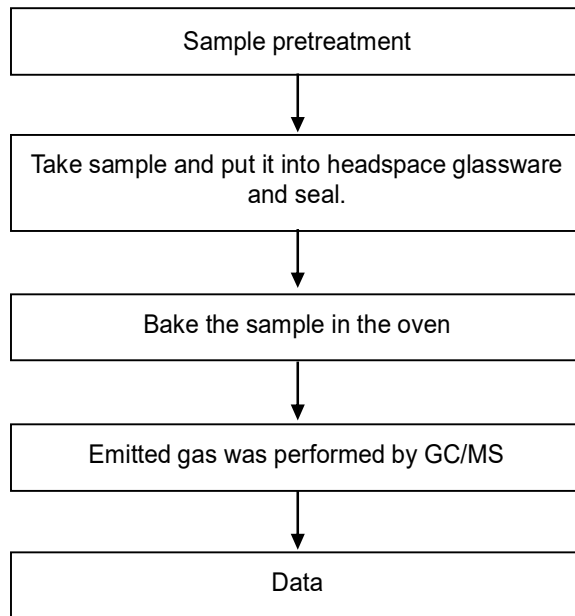


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HITACHI CHEMICAL DUPONT MICROSYSTEMS
 250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - volatile organic compounds (VOCs)

- Technician : Chun Wu
 - Supervisor : Shinjyh Chen
- 【Reference method : US EPA 5021, 5021A】



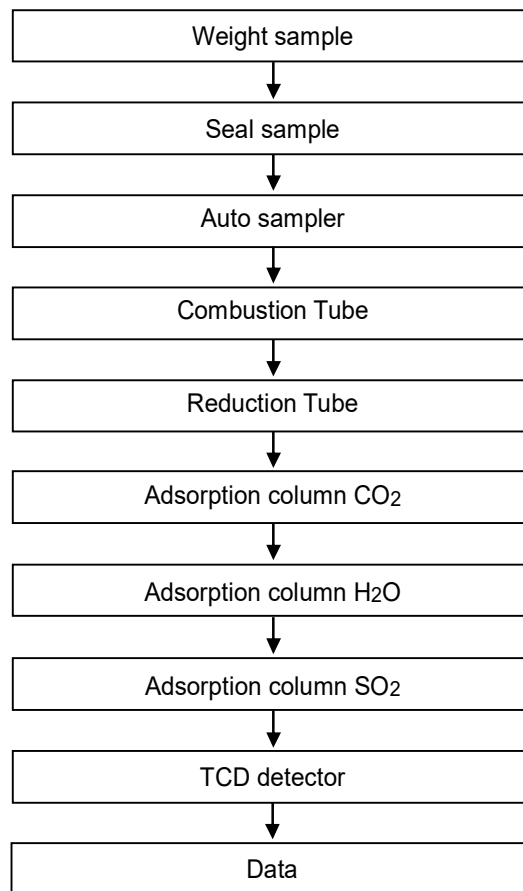
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HITACHI CHEMICAL DUPONT MICROSYSTEMS

250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

Analytical flow chart - elements analyzer

- Technician: Victor Kao
- Supervisor: Rachel Yang



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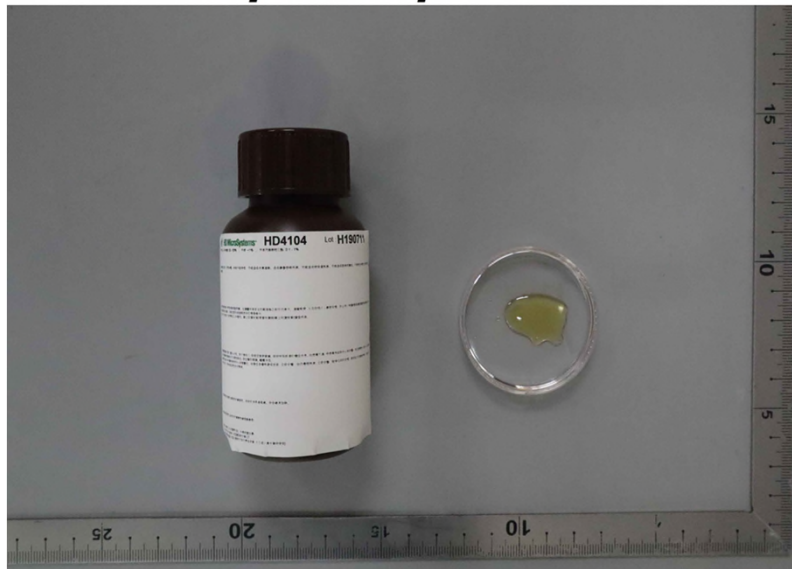
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250 CHEESEQUAKE ROAD-BLDG. 424, PARLIN, NJ 08859-1241

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

CE/2019/C0186



** End of Report **

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