

CHEMICAL ANALYSIS TEST REPORT (REACH)

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30351, Taiwan, R.O.C.
Laboratory Address : No.10-1, Lixing 1st Rd., Hsinchu City 30078, Taiwan (R.O.C.)
Sample Name : TOPCon Halfcut solar Cell
Model Name : NA
Date Received : 2024/10/23
Date Tested : 2024/10/24~2024/11/04
Report Issue Date : 2024/11/05

TESTING LABORATORY IS APPROVED BY:

IECQ Certificate of Approval No.: IECQ-L DEKRA 16.0002 For Independent Test Laboratory According to ISO/IEC 17025

ISO 9001 certificate is approved by TUV CERT certification body of TUV NORD Cert GmbH

WE HEREBY CERTIFY THAT:

The test(s) shown in the attachment were conducted according to the indicating procedures. We assume full responsibility for the accuracy and completeness of these tests and vouch for the qualifications of all personnel performing them.

	Name	Signature	Date
Test Engineer	Xiaohu Chen	<i>Xiaohu Chen</i>	Nov 05, 2024
Manager	Wenston Lin	<i>Wenston Lin</i>	Nov 05, 2024

NOTE :

1. This report will be invalid if reproduced in part or altered in any way.
2. This report refers only to the specimen(s) submitted to test, and is invalid if used otherwise.
3. This report is ONLY valid with the examination seal and signature of this institute.
4. The tested specimen(s) will only be preserved for thirty days from the date issued, if not collected by the applicant.



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1. GENERAL INFORMATION

1.1 DESCRIPTION OF SAMPLE

Sample Name : TOPCon Halfcut solar Cell

Model Name : NA

2. CHEMICAL ANALYSIS TEST (REACH)

2.1 TEST CONDITIONS AND RESULTS

Description of test part : TOPCon Halfcut solar Cell						
The published date of REACH 1st all 15 SVHC candidate list was 2008/10/28.						
No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
1	Cobalt dichloride (CAS NO. : 7646-79-9)	Reference : US EPA 3052:1996	ICP-OES	mg/kg	3	N.D.
2	Diarsenic pentaoxide (CAS NO. : 1303-28-2)				8	N.D.
3	Diarsenic trioxide (CAS NO. : 1327-53-3)				8	N.D.
4	Lead hydrogen arsenate (CAS NO. : 7784-40-9)				8	N.D.
5	Sodium dichromate (CAS NO. : 10588-01-9)	Reference: US EPA 3052:1996/ IEC 62321	ICP-OES UV-VIS	mg/kg	2	N.D.
6	Anthracene (CAS NO. : 120-12-7)	Reference : US EPA 3550C:2007	GC-MS-MS	mg/kg	2	N.D.
7	4,4'-Diaminodiphenylmethane (MDA) (CAS NO. : 101-77-9)				5	N.D.
8	Bis (2-ethylhexyl) phthalate (DEHP) (CAS NO. : 117-81-7)				10	N.D.
9	Dibutyl phthalate (DBP) (CAS NO. : 84-74-2)				8	N.D.
10	Benzyl butyl phthalate (BBP) (CAS NO. : 85-68-7)				4	N.D.
11	5-tert-butyl-2,4,6-trinitro- m-Xylene (Musk xylene) (CAS NO. : 000081-15-2) (CAS NO. : 81-15-2)				6	N.D.
12	Hexabromocyclododecane (HBCDD)and all major diastereoisomers identified(-HBCDD,-HBCDD and -HBCDD) (CAS NO. : 25637-99-4 and 3194-55-6 (134237-50-6, 134237-51-7 and 134237-52-8))	Reference : US EPA 3550C:2007	LC-MS-MS	mg/kg	5	N.D.
13	Alkanes, C ₁₀₋₁₃ , chloro (Short chain chlorinated paraffins) (CAS NO. : 85535-84-8)	Reference : US EPA 3550C:2007	GC-MS-MS	mg/kg	10	N.D.
14	Bis(tributyltin)oxide (TBTO) (CAS NO.: 56-35-9)				8	N.D.
15	Triethyl arsenate (CAS NO. : 15606-95-8)	Reference : US EPA 3052:1996	ICP-OES	mg/kg	8	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 2nd all 14 SVHC candidate list was 2010/03/30

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
16	Anthracene oil (CAS NO. : 90640-80-5)	Reference: US EPA 3550C:2007	GC-MS-MS	mg/kg	3	N.D.
17	Anthracene oil, anthracene paste, distn. lights (CAS NO. : 91995-17-4)				3	N.D.
18	Anthracene oil, anthracene paste, anthracene fraction (CAS NO. : 91995-15-2)				3	N.D.
19	Anthracene oil, anthracene-low (CAS NO. : 90640-82-7)				3	N.D.
20	Anthracene oil, anthracene paste (CAS NO.: 90640-81-6)				3	N.D.
21	Coal tar pitch, high temperature (CAS NO. : 65996-93-2)				3	N.D.
22	Zirconia Aluminosilicate, Refractory Ceramic Fibres (CAS NO. : --)	-	FTIR	-	-	Negative
23	2, 4-Dinitrotoluene (2,4-DNT) (CAS NO. : 121-14-2)	Reference: US EPA 3550C:2007	GC-MS-MS	mg/kg	6	N.D.
24	Diisobuty phthalate (DIBP) (CAS NO. : 84-69-5)	Reference: US EPA 3550C:2007	GC-MS-MS	mg/kg	8	N.D.
25	Lead chromate (CAS NO. : 7758-97-6)	Reference: US EPA 3052:1996/ IEC 62321	ICP-OES UV-VIS	mg/kg	2	N.D.
26	Lead chromate molybdate sulphate red (C.I. Pigment Red 104) (CAS NO. : 12656-85-8)				2	N.D.
27	Lead sulfochromate yellow (C.I. Pigment Yellow 34) (CAS NO. : 1344-37-2)				2	N.D.
28	Tris(2-chloroethyl)phosphate (TCEP) (CAS NO. : 115-96-8)	Reference: US EPA 3550C:2007	GC-MS-MS	mg/kg	4	N.D.
29	Acrylamide (CAS NO. : 79-06-1)	Reference: US EPA 3550C:2007	LC-MS-MS	mg/kg	10	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 3rd all 8 SVHC candidate list was 2010/6/18.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
30	Boric acid (CAS No.: 10043-35-3, 11113-50-1)	Reference: US EPA 3052	ICP-OES	%	0.0001	N.D.
31	Disodium tetraborate,anhydrous (CAS No.: 1330-43-4, 12179-04-3, 1303-96-4))				0.0001	N.D.
32	Tetraboron disodium heptaoxide,hydrate (CAS No.: 12267-73-1)				0.0001	N.D.
33	Sodium chromate (CAS No.: 7775-11-3)	Reference: US EPA 3052:1996/ IEC 62321	ICP-OES UV-VIS	mg/kg	2	N.D.
34	Potassium chromate (CAS No.: 7789-00-6)				2	N.D.
35	Ammonium dichromate (CAS No.: 7789-09-5)				2	N.D.
36	Potassium dichromate (CAS No.: 7778-50-9)				2	N.D.
37	Trichloroethylene (CAS No.: 79-01-6)	Reference: EPA 5021	Headspace GC	mg/kg	30	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 4th all 8 SVHC candidate list was 2010/12/15.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
38	Cobalt(II) sulphate (CAS No.: 10124-43-3)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	3	N.D.
39	Cobalt(II) dinitrate (CAS No.: 10141-05-6)				3	N.D.
40	Cobalt(II) carbonate (CAS No.: 513-79-1)				3	N.D.
41	Cobalt(II) diacetate (CAS No.: 71-48-7)				3	N.D.
42	2-Methoxyethanol (CAS No.: 109-86-4)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	3	N.D.
43	2-Ethoxyethanol (CAS No.: 110-80-5)				3	N.D.
44	Chromium trioxide (CAS No.: 1333-82-0)	Reference: US EPA 3052:1996/ IEC 62321	ICP-OES UV-Vis	mg/kg	2	N.D.
45	Acids generate from Chromium trioxide and their oligomers; Group contains: Chromic acid, Dichromic acid, Oligomers of chromic acid and dichromic acid (CAS No.: 7738-94-5 and 13530-68-2)				2	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 5th all 7 SVHC candidate list was 2011/6/20.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
46	2-ethoxyethyl acetate (CAS NO. : 111-15-9)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	5	N.D.
47	strontium chromate (CAS NO. : 7789-06-2)	Reference: US EPA 3052:1996/ IEC 62321	ICP-OES UV-Vis	mg/kg	3	N.D.
48	1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (CAS NO. : 68515-42-4)	Reference: US EPA 3540C	GC-MS	mg/kg	20	N.D.
49	Hydrazine (CAS NO. : 7803-57-8 302-01-2)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	3	N.D.
50	1-methyl-2-pyrrolidone (CAS NO. : 872-50-4)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	7	N.D.
51	1,2,3-trichloropropane (CAS NO. : 96-18-4)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	7	N.D.
52	1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (CAS NO. : 71888-89-6)	Reference: US EPA 3550C:2007	GC-MS-MS	mg/kg	5	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 6th all 19 SVHC candidate list was 2011/12/19.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
53	Lead dipicrate (CAS NO. : 6477-64-1)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	5	N.D.
54	Lead styphnate (CAS NO. : 15245-44-0)				5	N.D.
55	Lead azide Lead diazide (CAS NO. : 13424-46-9)				5	N.D.
56	Phenolphthalein (CAS NO. : 77-09-8)	Reference: US EPA 3550C:2007	LC-MS/MS	mg/kg	10	N.D.
57	2,2'-dichloro-4,4'-methylene dianiline (CAS NO. : 101-14-4)				10	N.D.
58	N,N-dimethylacetamide (DMAC) (CAS NO. : 127-19-5)	Reference: US EPA 3550C:2007	GC/FID	mg/kg	5	N.D.
59	Trilead diarsenate (CAS NO. : 3687-31-8)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	8	N.D.
60	Calcium arsenate (CAS NO. : 7778-44-1)				8	N.D.
61	Arsenic acid (CAS NO. : 7778-39-4)				8	N.D.
62	Bis(2-methoxyethyl) ether (CAS NO. : 111-96-6)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	3	N.D.
63	1,2-Dichloroethane (CAS NO. : 107-06-2)				5	N.D.
64	4-(1,1,3,3-tetramethylbutyl)p henol, (4-tert-Octylphenol) (CAS NO. : 140-66-9)	Reference: US EPA 3550C:2007	GC-MS/MS	mg/kg	5	N.D.
65	2-Methoxyaniline; o-Anisidine (CAS NO. : 90-04-0)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	5	N.D.
66	Bis(2-methoxyethyl) phthalate (CAS NO. : 117-82-8)	Reference: US EPA 3550C:2007	LC-MS/MS	mg/kg	10	N.D.
67	Formaldehyde, oligomeric reaction products with aniline (technical MDA) (CAS NO. : 25214-70-4)	Reference: GB/T 2912.1-2009	UV-VIS	mg/kg	20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 6th all 19 SVHC candidate list was 2011/12/19.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
68	Pentazinc chromate octahydroxide (CAS NO. : 49663-84-5)	Reference: US EPA 3052:1996/ IEC 62321	ICP-OES UV-VIS	mg/kg	2	N.D.
69	Potassium hydroxyoctaoxidizincatedi-c hromate (CAS NO. : 11103-86-9)				2	N.D.
70	Dichromium tris(chromate) (CAS NO. : 24613-89-6)				2	N.D.
71	Aluminosilicate, Refractory Ceramic Fibres (CAS NO. : --)	-	FTIR	-	-	Negative

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 7th all 13 SVHC candidate list was 2012/06/18.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
72	1,2-Bis(2-methoxyethoxy) ethane;TEGDME;Triglyme (CAS No.:112-49-2)	Reference: US EPA 3550C:2007	GC/FID	mg/kg	5	N.D.
73	1,2-Dimethoxyethane ; Ethylene glycol dimethyl ether ; EGDME (CAS No.:110-71-4)				10	N.D.
74	Diboron trioxide (CAS No.:1303-86-2)	Reference: US EPA 3052:1996.	ICP-OES	%	0.0008	N.D
75	Formamide (CAS No.:75-12-7)	Reference: US EPA 3550C:2007	GC/FID	mg/kg	5	N.D.
76	Lead(II) bis(methanesulfonate) (CAS No.:17570-76-2)	Reference: US EPA 3052:1996.	ICP-OES	mg/kg	8	N.D
77	(1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione) ; TGIC (CAS No.:2451-62-9)	Reference: US EPA 3550C:2007	LC-MS/MS	mg/kg	10	N.D.
78	β -TGIC (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione) (CAS No.: 59653-74-6)		GC-MS	mg/kg	100	N.D.
79	4,4'-bis(dimethylamino)benzophenone ; Michler's ketone (CAS No.:90-94-8)		LC-MS/MS	mg/kg	10	N.D.
80	N,N,N',N'-tetramethyl-4,4'-methylenedianiline ; Michler's base (CAS No.:101-61-1)		GC-MS/MS	mg/kg	5	N.D.
81	[4-[4,4'-bis(dimethylamino)benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Violet 3) (CAS No.:548-62-9)				-	Negative
82	[4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Blue 26) (CAS No.:2580-56-5)	-	FT-IR.	-	-	Negative
83	α,α -Bis[(dimethylamino)phenyl]-4-(phenylamino)naphthalene-1-methanol (C.I. Solvent Blue 4) (CAS No.:6786-83-0)				-	Negative
84	4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol (CAS No.: 561-41-1)	Reference: US EPA 3550C:2007	LC-MS/MS	mg/kg	100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 8th all 55 SVHC candidate list was 2012/12/19.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
85	Bis(pentabromophenyl) ether(decabromodiphenylether; DecaBDE) (CAS No.: 1163-19-5)	-	FT-IR.	-	-	Negative
86	Pentacosafuorotridecanoic acid (CAS No.: 72629-94-8)				-	Negative
87	Tricosafuorododecanoic acid (CAS No.: 307-55-1)				-	Negative
88	Henicosafuoroundecanoic acid (CAS No.: 2058-94-8)				-	Negative
89	Heptacosafuorotetradecanoic acid (CAS No.: 376-06-7)				-	Negative
90	4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated (CAS No.: -)	Reference: US EPA 3550C:2007	GC/MS/MS	mg/kg	5	N.D.
91	4-Nonylphenol, branched and linear (CAS No.: -)	Reference: US EPA 3550C:2007	LC/MS/MS	mg/kg	10	N.D.
92	Diazene-1,2-dicarboxamide(C,C'-azodi(formamide)) (CAS No.: 123-77-3)	Reference: US EPA 3550C:2007	GC-MS	mg/kg	100	N.D.
93	Cyclohexane-1,2-dicarboxylic anhydride (Hexahydrophthalic anhydride - HHPA) (CAS No.: 85-42-7, 13149-00-3, 14166-21-3)	Reference: US EPA 3550C:2007	LC/MS/MS	mg/kg	6	N.D.
94	Hexahydro-4-methylphthalic anhydride, Hexahydromethylphthalic anhydride, Hexahydro-1-methylphthalic anhydride, Hexahydro-3-methylphthalic anhydride (CASNo.: 25550-51-0, 19438-60-9, 48122-14-1 57110-29-9)	Reference: US EPA 3550C:2007	LC/MS/MS	mg/kg	6	N.D.
95	Methoxy acetic acid (CAS No.: 625-45-6)	-	FTIR	-	-	Negative
96	1,2-Benzenedicarboxylic acid, dipentylester, branched and linear (CAS No.: 84777-06-0)	Reference: US EPA 3550C:2007	LC/MS/MS	-	-	Negative
97	Diisopentylphthalate(DIPP) (CAS No.: 605-50-5)				-	Negative
98	N-pentyl-isopentylphthalate (CAS No.: 776297-69-9)				-	Negative

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 8th all 55 SVHC candidate list was 2012/12/19.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
99	1,2-diethoxyethane (CAS No.: 629-14-1)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	10	N.D.
100	N,N-dimethylformamide (CAS No.: 68-12-2)			mg/kg	10	N.D.
101	Dibutyltin dichloride (DBTC) (CAS No.: 683-18-1)		GC/MS/MS	mg/kg	8	N.D.
102	Acetic acid,lead salt,basic (CAS No.: 51404-69-4)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	5	N.D.
103	Trilead bis(carbonate)dihydroxide (CAS No.: 1319-46-6)				5	N.D.
104	Lead oxide sulfate (CAS No.: 12036-76-9)				5	N.D.
105	[Phthalato(2-)]dioxotrilead (CAS No.: 69011-06-9)				5	N.D.
106	Dioxobis(stearato)trilead (CAS No.: 12578-12-0)				5	N.D.
107	Fatty acids,C16-18,lead salts (CAS No.: 91031-62-8)				5	N.D.
108	Lead bis(tetrafluoroborate) (CAS No.: 13814-96-5)				5	N.D.
109	Lead cyanamidate (CAS No.: 20837-86-9)				5	N.D.
110	Lead dinitrate (CAS No.: 10099-74-8)				5	N.D.
111	Lead monoxide(Lead oxide) (CAS No.: 1317-36-8)				5	N.D.
112	Orange lead(Lead tetroxide) (CAS No.: 1314-41-6)				Reference: US EPA 3052:1996	ICP-OES
113	Lead titanium trioxide (CAS No.: 12060-00-3)	5	N.D.			
114	Lead titanium zirconium oxide (CAS No.: 12626-81-2)	5	N.D.			
115	Pentalead tetraoxide sulphate (CAS No.: 12065-90-6)	5	N.D.			
116	Pyrochlore,antimony lead yellow (CAS No.: 8012-00-8)	5	N.D.			
117	Silicic acid(H ₂ Si ₂ O ₅),barium salt(1 :1),lead-doped (CAS No.: 68784-75-8)	5	N.D.			
118	Silicic acid, lead salt (CAS No.: 11120-22-2)	5	N.D.			
119	Sulfurous acid,lead salt,dibasic (CAS No.: 62229-08-7)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	5	N.D.
120	Tetraethyllead (CAS No.: 78-00-2)				5	N.D.
121	Tetralead trioxide sulphate (CAS No.: 12202-17-4)				5	N.D.
122	Trilead dioxide phosphonate (CAS No.: 12141-20-7)				5	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 8th all 55 SVHC candidate list was 2012/12/19.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
123	Furan (CAS No.: 110-00-9)	-	FTIR	-	-	Negative
124	Methyloxirane(Propylene oxide) (CAS No.: 75-56-9)			-	Negative	
125	Diethyl sulphate (CAS No.: 64-67-5)	Reference: US EPA 3540C	GC-MS	mg/kg	100	N.D.
126	Dimethyl sulphate (CAS No.: 77-78-1)			mg/kg	100	N.D.
127	3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine (CAS No.: 143860-04-2)	Reference: US EPA 3550C:2007	GC-MS	mg/kg	100	N.D.
128	Dinoseb (6-sec-butyl-2,4-dinitrophenol) (CAS No.: 88-85-7)	Reference: 3550C:2007	GC-MS	mg/kg	100	N.D.
129	4,4'-methylenedi-o-toluidine (CAS No.: 838-88-0)	Reference: US EPA 3550C:2007	LC/MS/MS	mg/kg	10	N.D.
130	4,4'-oxydianiline and its salts (CAS No.: 101-80-4)			mg/kg	6	N.D.
131	4-aminoazobenzene (CAS No.: 60-09-3)	-	FTIR	-	-	Negative
132	4-methyl-m-phenylenediamine (2,4-toluene-diamine) (CAS No.: 95-80-7)	Reference: US EPA 3540C	GC-MS	mg/kg	100	N.D.
133	6-methoxy-m-toluidine (p-cresidine) (CAS No.: 120-71-8)	Reference: US EPA 3550C:2007	LC/MS/MS	mg/kg	6	N.D.
134	Biphenyl-4-ylamine (CAS No.: 92-67-1)	Reference: US EPA 3540C	GC-MS	mg/kg	100	N.D.
135	o-aminoazotoluene [(4-o-tolylazo-o-toluidine)] (CAS No.: 97-56-3)	-	FTIR	-	-	Negative
136	o-toluidine (CAS No.: 95-53-4)	Reference: US EPA 3540C	GC-MS	mg/kg	100	N.D.
137	N-methylacetamide (CAS No.: 79-16-3)	Reference: US EPA 3550C:2007	GC-FID	mg/kg	4	N.D.
138	1- bromopropane (n-propyl bromide) (CAS No.: 106-94-5)	-	FTIR	-	-	Negative
139	4-Nonylphenol, branched and linear, ethoxylated [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, ethoxylated covering UVCB- and well-defined substances, polymers and homologues, which include any of the individual isomers and/or combinations thereof] (CAS No.: --)	Reference: Journal of Water Resource and Protection , 2010,2,818-829	LC/MS/MS	mg/kg	1	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 9th all 6 SVHC candidate list was 2013/06/20.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
140	Cadmium (CAS No.: 7440-43-9)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	8	N.D.
141	Dipentyl phthalate (CAS No.: 131-18-0)	Reference: US EPA 3550C:2007	GC/MS/MS	-	-	Negative
142	Cadmium oxide (CAS No.: 1306-19-0)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	8	N.D.
143	Ammoniumpentadecafluorooctanoate (APFO) (CAS No.: 3825-26-1)	-	FT-IR	-	-	Negative
144	Pentadecafluorooctanoic acid (PFOA) (CAS No.: 335-67-1)	-	FT-IR	-	-	Negative

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 10th all 7 SVHC candidate list was 2013/12/16

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
145	Cadmium sulphide (CAS No. 1306-23-6)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	8	N.D.
146	Dihexyl phthalate (CAS No.84-75-3)	Reference: US EPA 3550C:2007	GC/MS/MS	-	-	Negative
147	Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis (azo)]bis(4-aminonaphthalene- 1-sulphonate) (CAS No. 573-58-0)	Reference: US EPA 3550C:2007	LC/MS/MS.	-	-	Negative
148	Disodium 4-amino-3- [[4'-[(2,4-diaminophenyl)azo] [1,1'-biphenyl]-4-yl]azo] -5-hydroxy-6-(phenylazo) naphthalene-2,7-disulphonate (CAS No. 1937-37-7)	-	FT-IR	-	-	Negative
149	Imidazolidine-2-thione; 2-imidazoline-2-thiol (CAS No. 96-45-7)	-	-	-	-	Negative
150	Lead di(acetate) (CAS No. 301-04-2)	Reference: US EPA 3052:1996	ICP-OES	mg/kg	5	N.D.
151	Trixylyl phosphate (CAS No. 25155-23-1)	Reference: US EPA 3550C:2007	GC/FID.	-	-	Negative

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 11th all 4 SVHC candidate list was 2014/06/17

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
152	Cadmium chloride (CAS No. 10108-64-2)	Reference: EPA 3050B	ICP-OES	mg/kg	10	N.D.
153	1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear (CAS No. 68515-50-4)	Reference: EPA 3540C	GC-MS	mg/kg	100	N.D.
154	Sodium peroxometaborate (CAS No. 7632-04-4)	Reference: EPA 3050B	ICP-OES	mg/kg	10	N.D.
155	Sodium perborate; perboric acid, sodium salt (CAS No. -)				10	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 12th all 6 SVHC candidate list was 2014/12/17.

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
156	Cadmium fluoride (CAS No.: 7790-79-6)	Reference: US EPA 3050B	ICP-OES	mg/kg	10	N.D.
157	Cadmium sulphate (CAS No.: 10124-36-4; 31119-53-6)				10	N.D.
158	2-benzotriazol-2-yl-4,6-di-tert- butylphenol (UV-320) (CAS No.: 3846-71-7)	Reference: US EPA 3550C:2007	LC-MS		100	N.D.
159	2-(2H-benzotriazol-2-yl)-4,6- ditertpentylphenol (UV-328) (CAS No.: 25973-55-1)				100	N.D.
160	2-ethylhexyl10-ethyl-4,4-dioctyl- 7-oxo-8-oxa-3,5-dithia-4- stannatetradecanoate (DOTE) (CAS No.: 15571-58-1)	Reference: US EPA 3540C	GC-MS		100	N.D.
161	reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa -3,5-dithia-4- stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy] -2-oxoethyl]thio]-4-octyl-7-oxo-8 -oxa-3,5-dithia-4- stannatetradecanoate (reaction mass of DOTE and MOTE) (CAS No.: -)				100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 13th all 2 SVHC candidate list was 2015/06/15

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
162	1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters; 1,2-benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters with $\geq 0.3\%$ of dihexyl phthalate (CAS NO. : 68515-51-5 68648-93-1)	Reference: US EPA 3550C	GC-MS	mg/kg	20	N.D.
163	5-sec-butyl-2-(2,4-dimethylcyclo hex-3-en-1-yl)-5-methyl-1,3-diox ane; 5-sec-butyl-2-(4,6-dimethylcyclo hex-3-en-1-yl)-5-methyl-1,3-diox ane (CAS NO. : -)	Reference: US EPA 3550C	GC-MS		20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 14th all 5 SVHC candidate list was 2015/12/17

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
164	1,3-propanesultone (CAS No. 1120-71-4)	EPA 3550C	GC-MS	mg/kg	100	N.D.
165	2,4-di-tert-butyl-6-(5-chloroben zotriazol-2-yl)phenol(UV-327) (CAS No. 3864-99-1)	US EPA 3550C:2007	LC-MS	mg/kg	100	N.D.
166	2-(2H-benzotriazol-2-yl)-4-(tert -butyl)-6-(see-butyl)phenol (UV-350) (CAS No. 36437-37-3)				100	N.D.
167	Nitrobenzene (CAS No. 98-95-3)	EPA 3540C	GC-MS	mg/kg	100	N.D.
168	Perfluorononan-1-oic acid (2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9, 9—heptadecafluorononanoic acid and its sodium and ammonium salts) (CAS No. 375-95-1/ 21049-39-8/ 4149-60-4)	US EPA 3550C:2007	LC-MS	mg/kg	100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 15th all 1 SVHC candidate list was 2016/6/20

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
169	Benzo[a]pyrene (CAS NO. : 50-32-8)	Reference: EPA 3540C	GC-MS	mg/kg	100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 16th all 4 SVHC candidate list was 2017/1/12

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
170	4,4'-isopropylidenediphenol (bisphenol A) (CAS NO. : 80-05-7)	Reference: EPA 3540C	GC-MS	mg/kg	20	N.D.
171	4-Heptylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 7 covalently bound predominantly in position 4 to phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof] (CAS NO. : -)				100	N.D.
172	Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts (CAS NO. : 3108-42-7 335-76-2 3830-45-3)	Reference: EPA 3550C	LC-MS	mg/kg	100	N.D.
173	p-(1,1-dimethylpropyl)phenol (CAS NO. : 80-46-6)	Reference: EPA 3540C	GC-MS	mg/kg	20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 17th all 1 SVHC candidate list was 2017/6/16

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
174	Perfluorohexane-1-sulphonic acid and its salts (PFHxS) (CAS NO. : 355-46-4)	Reference: US EPA 3550C:2007	LC-MS	mg/kg	100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 18th all 7 SVHC candidate list was 2018/1/15

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
175	Dechlorane plus (including any of its individual anti- and syn-isomers or any combination thereof) (CAS NO. : 13560-89-9 135821-74-8 135821-03-3)	Reference: EPA 3540C	GC-MS	mg/kg	20	N.D.
176	Benz[a]anthracene (CAS NO. : 56-55-3)				20	N.D.
177	Cadmium nitrate (CAS NO. : 10325-94-7)	Reference: EPA 3052	ICP-OES	mg/kg	10	N.D.
178	Cadmium carbonate (CAS NO. : 513-78-0)				10	N.D.
179	Cadmium hydroxide (CAS NO. : 21041-95-2)				10	N.D.
180	Chrysene (CAS NO. : 218-01-9)				20	N.D.
181	Reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP) [with ≥0.1% w/w 4-heptylphenol, branched and linear] (CAS NO. : -)	Reference: EPA 3540C	GC-MS	mg/kg	20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 19th all 10 SVHC candidate list was 2018/6/27

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
182	Octamethylcyclotetrasiloxane (D4) (CAS NO. : 556-67-2)	Reference: EPA 3550C	GC-MS	mg/kg	100	N.D.
183	Decamethylcyclopentasiloxane (D5) (CAS NO. : 541-02-6)				100	N.D.
184	Dodecamethylcyclohexasiloxane (D6) (CAS NO. : 540-97-6)				100	N.D.
185	Lead (CAS NO. : 7439-92-1)	Reference: EPA 3052	ICP-OES	mg/kg	10	83.2
186	Disodium octaborate (CAS NO. : 12008-41-2)				10	N.D.
187	Benzo[ghi]perylene (CAS NO. : 191-24-2)	Reference: EPA 3540C	GC-MS	mg/kg	100	N.D.
188	Terphenyl hydrogenated (CAS NO. : 61788-32-7)				100	N.D.
189	Ethylenediamine (EDA) (CAS NO. : 107-15-3)				20	N.D.
190	Benzene-1,2,4-tricarboxylic acid 1,2anhydride (trimellitic anhydride) (TMA) (CAS NO. : 552-30-7)				100	N.D.
191	Dicyclohexyl phthalate (DCHP) (CAS NO. : 84-61-7)				20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 20th all 6 SVHC candidate list was 2019/1/15

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
192	2,2-bis(4'-hydroxyphenyl)-4-methylpentane (CAS NO. : 6807-17-6)	Reference: EPA 3540C	GC-MS	mg/kg	100	N.D.
193	Benzo[k]fluoranthene (CAS NO. : 207-08-9)				100	N.D.
194	Fluoranthene (CAS NO. : 206-44-0 93951-69-0)				100	N.D.
195	Phenanthrene (CAS NO. : 85-01-8)				100	N.D.
196	Pyrene (CAS NO. : 129-00-0 1718-52-1)				100	N.D.
197	1,7,7-trimethyl-3-(phenylmethylenebicyclo[2.2.1]heptan-2-one) (CAS NO. : 15087-24-8)	Reference: EPA 3550C	GC-MS	mg/kg	100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 21th all 4 SVHC candidate list was 2019/7/16

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
198	2-methoxyethyl acetate (CAS NO. : 110-49-6)	Reference: EPA 3550C	GC-MS	mg/kg	100	N.D.
199	Tris (4-nonylphenyl, branched and linear) phosphite (TNPP) with $\geq 0.1\%$ w/w of 4-nonylphenol, branched and linear (4-NP) (CAS NO. : -)				100	N.D.
200	2,3,3,3-tetrafluoro-2-(heptafluoro propoxy) propionic acid, its salts and its acyl halides (covering any of their individual isomers and combinations thereof) (CAS NO. : -)				100	N.D.
201	4-tert-butylphenol (CAS NO. : 98-54-4)				100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 22th all 4 SVHC candidate list was 2020/1/16

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
202	2-benzyl-2-dimethylamino-4'-morpholinobutyrophenone (CAS NO. : 119313-12-1)	Reference: EPA 3550C	GC-MS	mg/kg	100	N.D.
203	2-methyl-1-(4-methylthiophenyl)-2-morpholino propan-1-one (CAS NO. : 71868-10-5)				100	N.D.
204	Diisohexyl phthalate (CAS NO. : 71850-09-4)				100	N.D.
205	Perfluorobutane sulfonic acid (PFBS) and its salts (CAS NO. : -)				100	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 23th all 4 SVHC candidate list was 2020/6/25

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
206	1-vinylimidazole (CAS NO. :1072-63-5)	Reference: EPA 3550C	LC-MS	mg/kg	50	N.D.
207	2-methylimidazole (CAS NO. :693-98-1)				50	N.D.
208	Dibutylbis(pentane-2,4-dionato -O,O')tin (CAS NO. :22673-19-4)	Reference: EPA 3540C	GC-MS		100	N.D.
209	Butyl 4-hydroxybenzoate (CAS NO. :94-26-8)				20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 24th all 2 SVHC candidate list was 2021/1/19

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
210	Bis(2-(2-methoxyethoxy)ethyl)ether (CAS NO. :143-24-8)	Reference: EPA 3550C	GC-MS	mg/kg	10	N.D.
211	Diocetyl tin dilaurate, stannane, dioctyl-, bis(coco acyloxy) derivs., and any other stannane, dioctyl-, bis(fatty acyloxy) derivs. wherein C12 is the predominant carbon number of the fatty acyloxy moiety (CAS NO. :-)	Reference: EPA 3540C	GC-MS	mg/kg	20	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 25th all 8 SVHC candidate list was 2021/7/8

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
212	1,4-dioxane (CAS NO. : 123-91-1)	Reference: EPA 3550C	GC-MS	mg/kg	10	N.D.
213	(1)2,2-bis(bromomethyl)propane 1,3-diol (BMP) (CAS NO. : 3296-90-0) (2)2,2-dimethylpropan-1-ol, tribromo derivative/3-bromo-2,2-bis(bromomethyl)-1-propanol (TBNPA) (CAS NO. : 36483-57-5 1522-92-5) (3)2,3-dibromo-1-propanol (2,3-DBPA) (CAS NO. : 96-13-9)	Reference: EPA 3540C	GC-MS	mg/kg	10	N.D.
214	2-(4-tert-butylbenzyl)propionalde hyde and its individual stereoisomers (1)(2R)-3-(4-tert-butylphenyl)-2- methylpropanal (2)2-(4-tert-butylbenzyl)propiona ldehyde; (3)(2S)-3-(4-tert-butylphenyl)-2- methylpropanal (CAS NO. : 75166-31-3; 80-54-6; 75166-30-2)	Reference: EPA 3550C	LC-MS	mg/kg	50	N.D.
215	4,4'-(1-methylpropylidene)bisph enol; (bisphenol B) (CAS NO. : 77-40-7)	Reference: EPA 3540C	GC-MS	mg/kg	10	N.D.
216	Glutaral (CAS NO. : 111-30-8)	Reference: EPA 3540C	GC-MS	mg/kg	10	N.D.
217	Medium-chain chlorinated paraffins (MCCP) [UVCB substances consisting of more than or equal to 80% linear chloroalkanes with carbon chain lengths within the range from C14 to C17] (1)Alkanes, C14-17, chloro; (2)di-, tri- and tetrachlorotetradecane; (3)Alkanes, C14-16, chloro; (4)Tetradecane, chloro derivs (CAS NO. : 85535-85-9; 1372804-76-6 ; 198840-65-2)	Reference: EPA 3550C	GC-FID	mg/kg	50	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 25th all 8 SVHC candidate list was 2021/7/8

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
218	Orthoboric acid, sodium salt (1)boric acid (H3BO3), sodium salt, hydrate; (2)Boric acid (H3BO3), disodium salt; (3)Trisodium orthoborate; (4)Boric acid, sodium salt; (5)orthoboric acid, sodium salt; (6)Boric acid (H3BO3), sodium salt (1:1) (CAS NO. : 25747-83-5; 22454-04-02; 14312-40-4 ; 1333-73-9; 13840-56-7 ; 14890-53-0.)	Reference: EPA 3050B	ICP-OES	mg/kg	10	N.D.
219	Phenol, alkylation products (mainly in para position) with C12-rich branched or linear alkyl chains from oligomerisation, covering any individual isomers and/ or combinations thereof (PDDP) (1)Phenol, 4-dodecyl, branched; (2)4-isododecylphenol; (3)Phenol, 4-isododecyl-; (4)Phenol, dodecyl-, branched; (5)Phenol, (tetrapropenyl) derivatives; (6)Phenol, tetrapropylene- (CAS NO. : 210555-94-5; 27459-10-5; 27147-75-7; 121158-58-5 ; 74499-35-7 ; 57427-55-1)	Reference: EPA 3550C	GC-MS	mg/kg	50	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 26th all 4 SVHC candidate list was 2022/1/17

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
220	(±)-1,7,7-trimethyl-3-[(4-methylphenyl)methylene]bicyclo[2.2.1]heptan-2-one covering any of the individual isomers and/or combinations thereof (4-MBC) (CAS NO. : NA)	Reference: EPA 3540C	LC-MS	mg/kg	50	N.D.
221	6,6'-di-tert-butyl-2,2'-methylenedi-p-cresol (DBMC) (CAS NO. : 119-47-1)				50	N.D.
222	S-(tricyclo[5.2.1.0 ^{2,6}]deca-3-en-8(or 9)-yl) O-(isopropyl or isobutyl or 2-ethylhexyl) O-(isopropyl or isobutyl or 2-ethylhexyl) phosphorodithioate (CAS NO. : 255881-94-8)	Reference: EPA 3540C	GC-MS	mg/kg	50	N.D.
223	tris(2-methoxyethoxy)vinylsilane (CAS NO. : 1067-53-4)				50	N.D.



Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 27th all 1 SVHC candidate list was 2022/6/10

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
224	N-(hydroxymethyl)acrylamide (CAS NO. : 924-42-5)	Reference: EPA 3540C	HPLC	mg/kg	50	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 28th all 9 SVHC candidate list was 2023/1/19

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
225	1,1'-[ethane-1,2-diylbisoxy]bis[2,4,6-tribromobenzene] (CAS NO. : 37853-59-1)	Reference: EPA 3540C	LC-MS	mg/kg	10	N.D.
226	2,2',6,6'-tetrabromo-4,4'-isopropylidenediphenol (CAS NO. : 79-94-7)				10	N.D.
227	4,4'-sulphonyldiphenol (CAS NO. : 80-09-1)				10	N.D.
228	Barium diboron tetraoxide (CAS NO. : 13701-59-2)	Reference: EPA 3050B	ICP-OES	mg/kg	10	N.D.
229	Bis(2-ethylhexyl) tetrabromophthalate covering any of the individual isomers and/or combinations thereof (CAS NO. : -)	Reference: EPA 3540C	LC-MS	mg/kg	10	N.D.
230	Isobutyl 4-hydroxybenzoate (CAS NO. : 4247-02-3)				10	N.D.
231	Melamine (CAS NO. : 108-78-1)				10	N.D.
232	Perfluoroheptanoic acid and its salts (CAS NO. : -)				10	N.D.
233	reaction mass of 2,2,3,3,5,5,6,6-octafluoro-4-(1,1, 1,2,3,3,3-heptafluoropropan-2-yl)morpholine and 2,2,3,3,5,5,6,6-octafluoro-4- (heptafluoropropyl) morpholine (CAS NO. : -)				10	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 29th all 2 SVHC candidate list was 2023/6/14

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
234	Bis(4-chlorophenyl) sulphone (CAS NO. : 80-07-9)	Reference: EPA 3540C	GC-MS	mg/kg	10	N.D.
235	Diphenyl(2,4,6-trimethylbenzoyl) phosphine oxide (CAS NO. : 75980-60-8)				10	N.D.

Description of test part : TOPCon Halfcut solar Cell

The published date of REACH 30th all 5 SVHC candidate list was 2024/1/23

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
236	2,4,6-tri-tert-butylphenol (CAS NO. : 732-26-3)	Reference: EPA 3540C	GC-MS	mg/kg	10	N.D.
237	2-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl) phenol (UV-329) (CAS NO. : 3147-75-9)				50	N.D.
238	2-(dimethylamino)-2-[(4-methylphenyl)methyl]-1-[4-(morpholin-4-yl)phenyl] butan-1-one (CAS NO. : 119344-86-4)		LC-MS		50	N.D.
239	Bumetrizole (UV-326);2-tert-butyl-6-(5-chloro-2H-benzotriazol-2-yl)-4-methylphenol (CAS NO. :3896-11-5)				50	N.D.
240	Oligomerisation and alkylation reaction products of 2-phenylpropene and phenol (CAS NO. : -)		GC-MS		10	N.D.

Description of test part : TOPCon Halfcut solar Cell

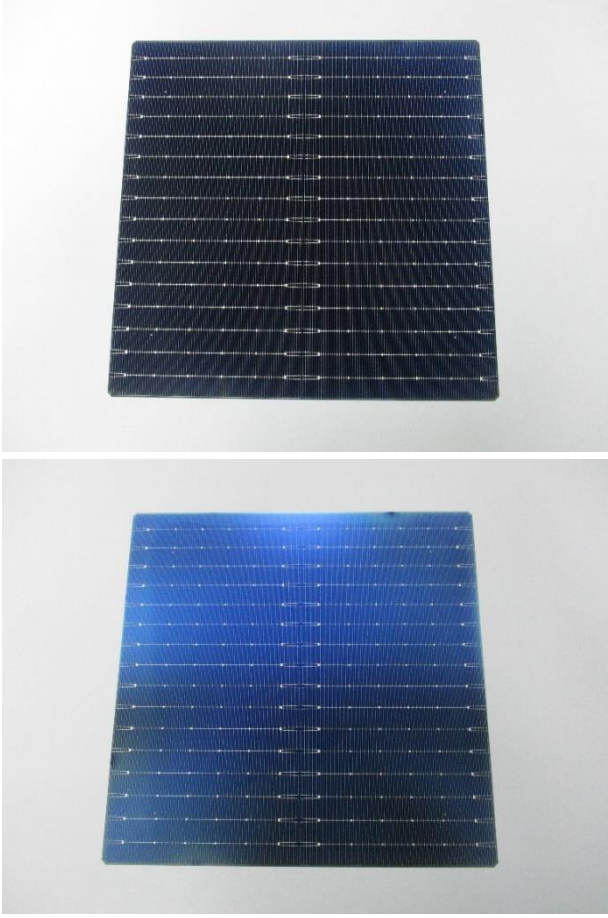
The published date of REACH 31th all 1 SVHC candidate list was 2024/6/27

No.	Test Item(s)	Method	Instrument	Unit	MDL	Result
241	Bis(α,α -dimethylbenzyl) peroxide (CAS NO. : 80-43-3)	Reference: EPA 3540C	GC-MS	mg/kg	10	N.D.

Note :

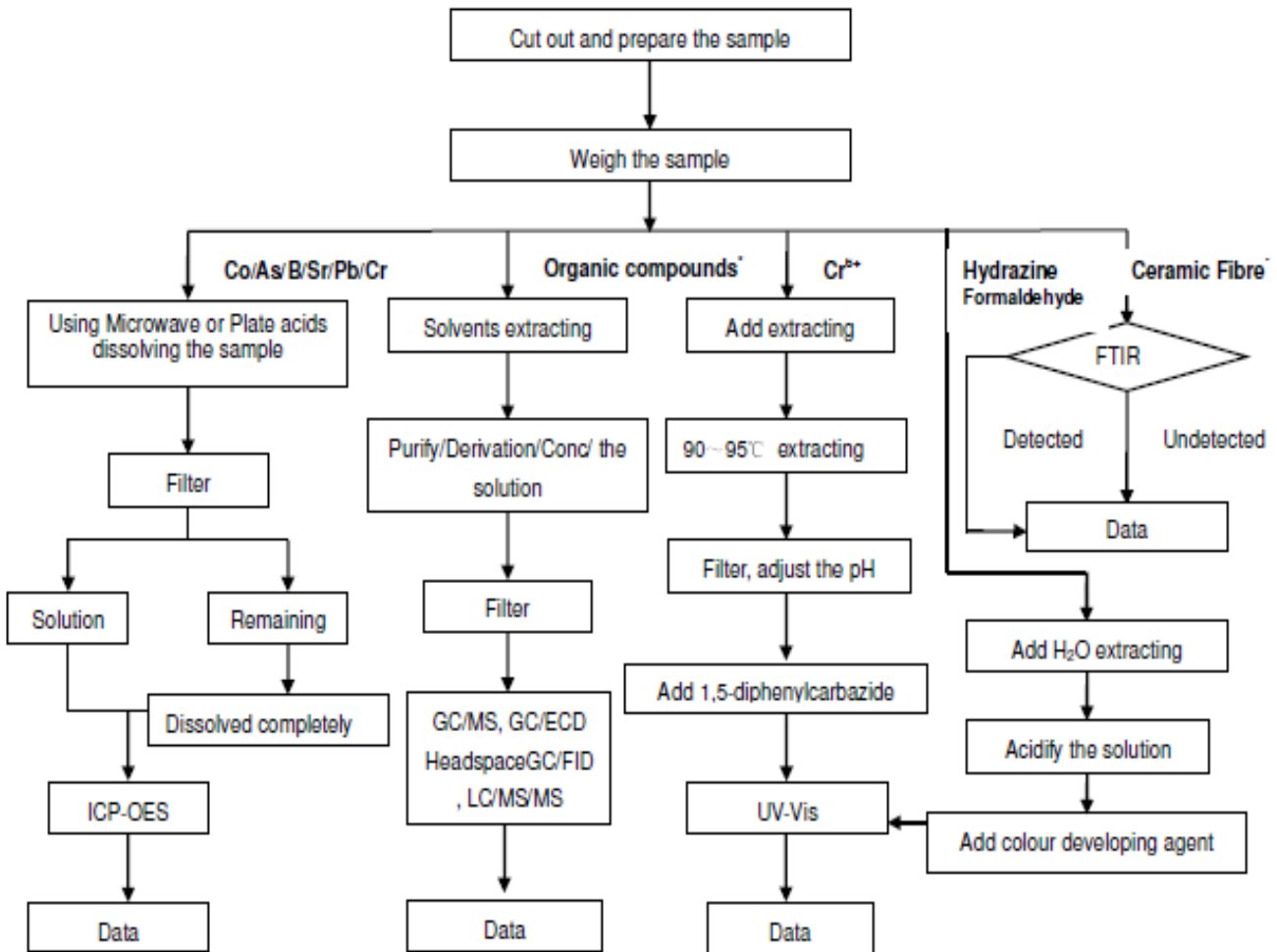
1. MDL = Method Detection Limit.
2. mg/kg = ppm.
3. N.D. = Not Detected. (The result is below the MDL.)
4. Negative = Undetectable.
5. GC-MS = Gas Chromatograph-Mass Spectrometer.
6. GC-MS/MS = Gas Chromatograph-tandem mass spectrometer.
7. GC-FID = Gas Chromatograph-flame ionization detector.
8. LC-MS/MS = Liquid Chromatograph-tandem mass spectrometer.
9. OM = Optical Microscope .
10. XRF = X-ray Fluorescence Spectrometer
11. FTIR = Fourier-Transform Infrared Spectrometer
12. ICP-OES = Inductively Coupled Plasma-Optical Emission Spectrometer.
13. UV-VIS = Ultraviolet-Visible Spectrophotometer.

2.2 PHOTO OF SAMPLE

Sample NO.	Description of test part	Photo
-	TOPCon Halfcut solar Cell	

2.3 MEASUREMENT FLOW CHART

Measurement Flowchart REACH SVHC 241 Items



-----End of Report-----