

## Test Report

No. TSNEC1800463203

Date: 28 Mar 2018

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TIANJIN LAIRD LTD.

C3&C4 BUILDING, HONGTAI INDUSTRY PARK, NO.87 TAIFENG ROAD, TEDA, TIANJIN, CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : PHASE CHANGE THERMAL INTERFACE MATERIAL

SGS Job No. : TP18-001872 - TJ  
Main Substance : SYNTHETIC HYDROCARBON RESINS AND FILLERS  
Model No. : Tpcm 580s  
Date of Sample Received : 20 Mar 2018  
Testing Period : 20 Mar 2018 - 28 Mar 2018  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted sample(s), the results of Cadmium, Lead, Mercury, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) do not exceed the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.  
When tested as specified, Dimethyl fumarate (DMF) content of the submitted sample comply with the requirement of Commission Regulation (EU) No 412/2012 and Entry 61 of Annex XVII of REACH Regulation (EC) No 1907/2006.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services (Tianjin) Co., Ltd.



Reabeca Zhou  
Approved Signatory



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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	TSN18-004632.002	gray solid

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

**RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU**

Test Method : With reference to IEC 62321-5:2013, IEC 62321-4:2013+AMD1:2017, IEC 62321-7-2:2017, IEC 62321-6:2015, analyzed by ICP-OES, UV-Vis and GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	7
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	8	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND

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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

### Notes :

(1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.

IEC 62321 series is equivalent to EN 62321 series

[http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP\\_ORG\\_ID,FSP\\_LANG\\_ID:1258637,25](http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25)

(2) On 4 June 2015, Commission Directive (EU) 2015/863 was published in the Official Journal of the European Union (OJEU) to include the phthalates BBP, DBP, DEHP and DIBP into ANNEX II of the Rohs Recast Directive. The new law restricts each phthalate to no more than 0.1% in each homogeneous material of an electrical product.

(3) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.

(4) The restriction of DEHP, BBP, DBP and DIBP shall not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021.

(5) The restriction of DEHP, BBP and DBP shall not apply to toys which are already subject to the restriction of DEHP, BBP and DBP through entry 51 of Annex XVII to Regulation (EC) No 1907/2006.

### Halogen

Test Method : With reference to EN 14582: 2016, analysis was performed by Ion Chromatograph (IC).

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	305
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

### Perfluorooctane Sulfonates (PFOS) and Perfluorooctanoic Acid (PFOA)

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Test Method : With reference to CEN/TS 15968:2010, analysis was performed by LC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Perfluorooctane Sulfonates (PFOS)^	10	mg/kg	10	ND
Perfluorooctanoic Acid (PFOA)	-	mg/kg	10	ND

### Notes :

- (1) Max. limit specified by commission regulation (EU) No. 757/2010 amending Regulation (EC) No 850/2004 (previously restricted under entry 53 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006).
- (2) ^: PFOS refer to Perfluorooctanesulfonic acid and its derivatives including Perfluorooctanesulfonic acid, Perfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamide, N-Ethylperfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamidoethanol and N-Ethylperfluorooctane sulfonamidoethanol.

### Red Phosphorus

Test Method : SGS in house method(SHTC- CHEM- SOP -342-T), Analysis was performed by ICP-OES and Pyrolysis-GC/MS

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Red Phosphorus	mg/kg	500	ND

### Notes :

- (1) For Positive result, the testing result is based on the worst-case scenario, and confirmed by Pyrolysis-GC-MS.
- (2) The test was subcontracted to SGS Shanghai chemical lab.

### Commission Regulation (EU) No 412/2012 and Entry 61 of Annex XVII of REACH Regulation (EC) No 1907/2006 - Dimethyl fumarate(DMF)

Test Method : SGS in house method -TJChemLab-TOP-064 (With reference to US EPA 3550C:2007、 US EPA 8270D:2014), analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND

### Hexabromocyclododecane (HBCDD)

Test Method : SGS in house method-TJChemLab-TOP-059 (With reference to US EPA 3550C:2007、 US EPA 8270D:2014), analyzed by GC-MS.

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<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

### Phthalates

Test Method : With reference to IEC 62321-8:2017, determination of phthalates by GC-MS.

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Dibutyl Phthalate (DBP)	84-74-2	% (w/w)	0.005	ND
Benzylbutyl Phthalate (BBP)	85-68-7	% (w/w)	0.005	ND
Bis-(2-ethylhexyl) Phthalate (DEHP)	117-81-7	% (w/w)	0.005	ND
Diisononyl Phthalate (DINP)	28553-12-0/ 68515-48-0	% (w/w)	0.005	ND
Di-n-octyl Phthalate (DNOP)	117-84-0	% (w/w)	0.005	ND
Diisodecyl Phthalate (DIDP)	26761-40-0/ 68515-49-1	% (w/w)	0.005	ND
Dimethyl Phthalate (DMP)	131-11-3	% (w/w)	0.005	ND
Diethyl Phthalate (DEP)	84-66-2	% (w/w)	0.005	ND
Diisobutyl Phthalate (DIBP)	84-69-5	% (w/w)	0.005	ND
Diisooctyl Phthalate (DIOP)	27554-26-3	% (w/w)	0.005	ND
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	% (w/w)	0.005	ND
Diisopentyl Phthalate (DIPP)	605-50-5	% (w/w)	0.005	ND
n-pentyl Isopentyl phthalate (nPIPP)	776297-69-9	% (w/w)	0.005	ND
Di-n-hexyl Phthalate (DnHP)	84-75-3	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, dipentylester, branched and linear (DPP)	84777-06-0	% (w/w)	0.005	ND

### Notes :

- (1) DBP, BBP, DEHP Reference information: Entry 51 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2005/84/EC):
- Shall not be used as substances or in mixtures, in concentrations greater than 0.1% by weight of the plasticised material, in toys and childcare articles.
  - Toys and childcare articles containing these phthalates in a concentration greater than 0.1% by weight of the plasticised material shall not be placed on the market.
- Please refer to Regulation (EC) No 552/2009 to get more detail information

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(2) DINP, DNOP, DIDP Reference information: Entry 52 of Regulation (EC) No 552/2009 amending Annex

XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2005/84/EC):

- i) Shall not be used as substances or in mixtures, in concentrations greater than 0.1% by weight of the plasticised material, in toys and childcare articles which can be placed in the mouth by children.
- ii) Such toys and childcare articles containing these phthalates in a concentration greater than 0.1% by weight of the plasticised material shall not be placed on the market.

Please refer to Regulation (EC) No 552/2009 to get more detail information.

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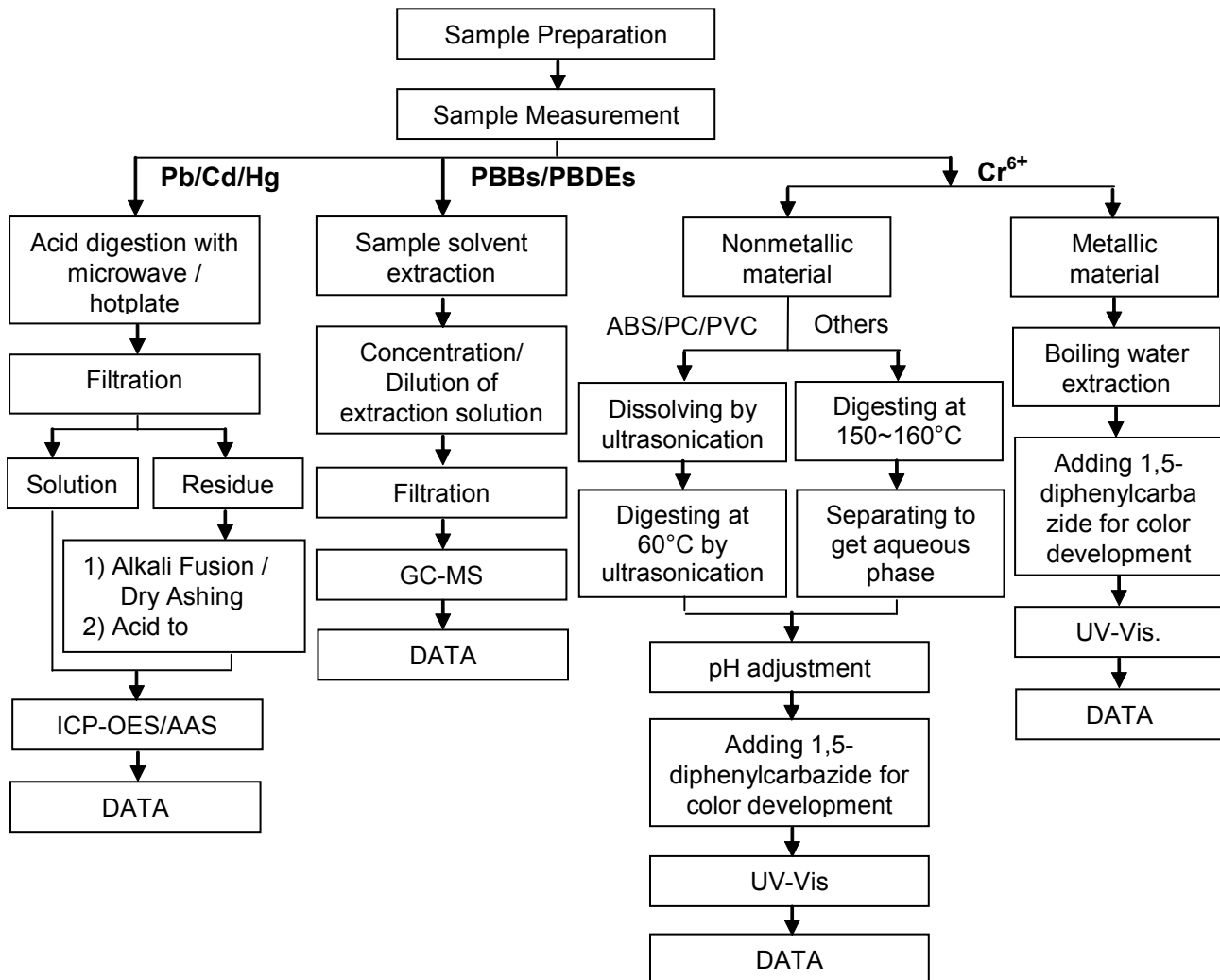
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**Pb/Cd/Hg/Cr<sup>6+</sup>/PBBs/PBDEs Testing Flow Chart**

- 1) Name of the person who made testing: Cathy Zhang/Crystal Wang/Ann Wang
- 2) Name of the person in charge of testing: Aaron Wang/Rex Zhu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



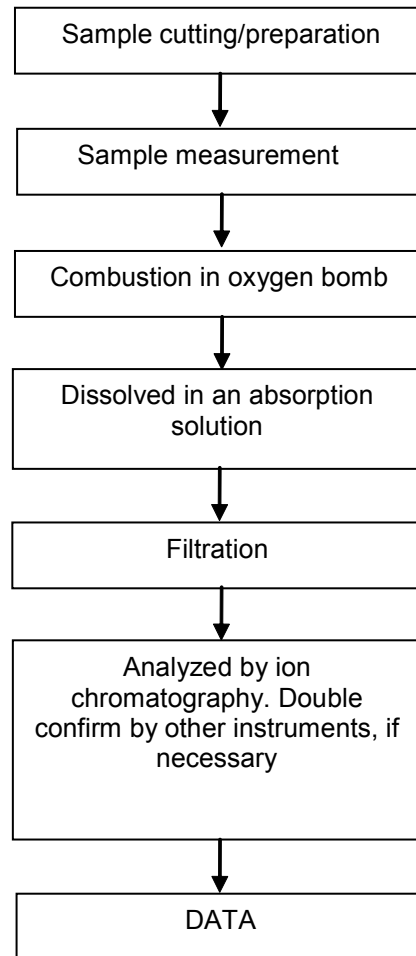
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**Halogen Testing Flow Chart**

- 1) Name of the person who made testing: Carson Fang
- 2) Name of the person in charge of testing: Rex Zhu



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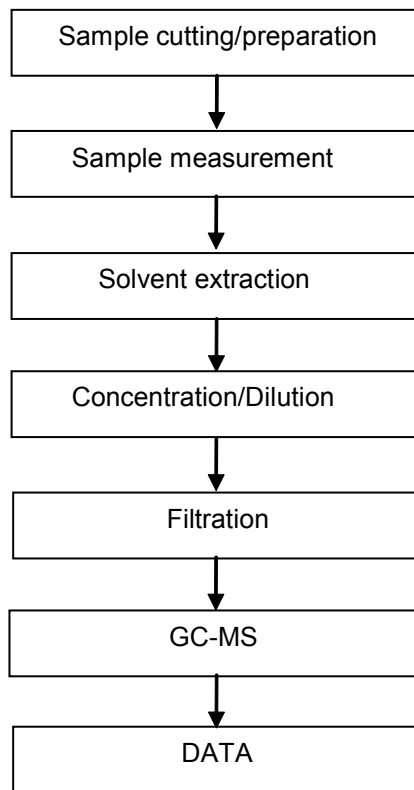
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**Phthalate Testing Flow Chart**

- 1) Name of the person who made testing: Allen Xiong
- 2) Name of the person in charge of testing: Rex Zhu



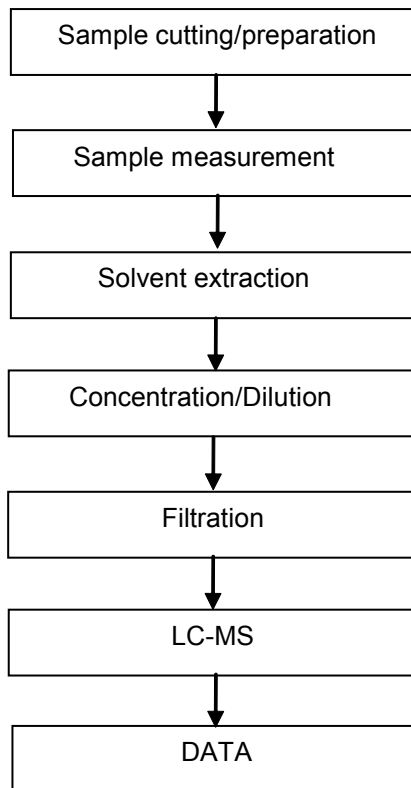
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**PFOS/PFOA Testing Flow Chart**

- 1) Name of the person who made testing: Jin Wang
- 2) Name of the person in charge of testing: Rex Zhu



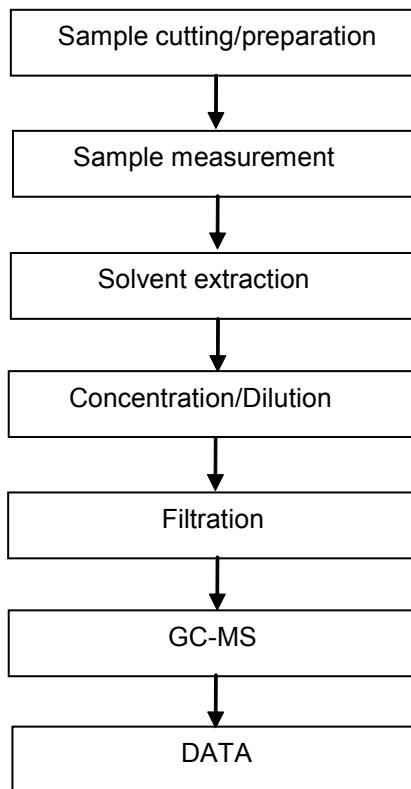
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**HBCDD Testing Flow Chart**

- 1) Name of the person who made testing: Ann Wang
- 2) Name of the person in charge of testing: Rex Zhu



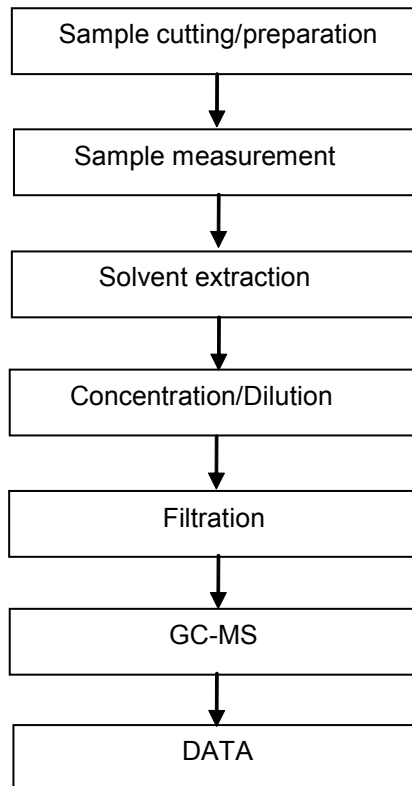
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**ATTACHMENTS**

**DMF Testing Flow Chart**

- 1) Name of the person who made testing: Jin Wang
- 2) Name of the person in charge of testing: Rex Zhu



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