Test Report

No. : CE/2020/11780  Date : 2020/01/14

HITACHI CHEMICAL CO., LTD.
1500 OGAWA, CHIKUSEI-SHI IBARAKI, 308-8521, JAPAN

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

Sample Submitted By : HITACHI CHEMICAL CO., LTD.
Sample Description : COPPER CLAD LAMINATES WITHOUT COPPER (PLASTIC PART OF MCL) / GLASS EPOXY PREPREG
Sample Receiving Date : 2020/01/07
Testing Period : 2020/01/07 to 2020/01/14

Test Requested : As specified by client, with reference to RoHS Directive 2011/65/EU Annex II to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs contents in the submitted sample(s).

Test Method : Please refer to following pages.
Test Result(s) : Please refer to following pages.
Test Result(s)

<table>
<thead>
<tr>
<th>PART NAME No.1</th>
<th>BLACK SHEET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test Item(s)</strong></td>
<td><strong>Unit</strong></td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Hexavalent Chromium Cr(VI)</td>
<td>mg/kg</td>
</tr>
</tbody>
</table>

**Sum of PBBs**

| Monobromobiphenyl | mg/kg | - | 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**

| 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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**Note :**

1. mg/kg = ppm : 0.1wt% = 1000ppm
2. MDL = Method Detection Limit
3. n.d. = Not Detected = below MDL
4. " - " = Not Regulated
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

1. Cutting · Preparation
2. Sample Measurement
   - Pb/Cd/Hg
     - Acid digestion with microwave / hotplate
       - Filtration
       - Solution
         - 1) Alkali fusion
         - 2) HCl to dissolve
       - Residue
     - ICP-OES
   - Cr⁶⁺
     - Non-metal
     - ABS / PC / PVC
       - Digesting by ultrasonication
       - Digesting at 150~160°C
       - Separating to get aqueous phase
     - Metal
       - Boiling water extraction
       - Cool, filter digestate through filter
       - Add diphenyl-carbazide for color development
       - Measure the absorbance at 540 nm by UV-VIS

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Analytical flow chart – PBB / PBDE

First testing process →

Option screen process ----

Confirmation process →

Sample

Sample pretreatment

Screen analysis

Sample extraction / Soxhlet method

Concentrate/Dilute

Extracted solution

Filter

GC/MS

Technician : Yaling Tu
Supervisor: Troy Chang
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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 **