

Test Report

No. CRSSA/15144-1/17
CRS Ref. CRSSA/17/3145/Hitachi

Date : 29/12/2017

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HITACHI CHEMICAL (MALAYSIA) SDN. BHD.
PLOT 501, PRAI INDUSTRIAL ESTATE, 13600 PRAI, PENANG, MALAYSIA

The following merchandise was (were) submitted and identified by the client as:

| | | |
|-----------------------|---|--------------------------|
| Sample Description | : | DIE Bonding Paste |
| Sample Name | : | EN4088Z |
| Sample Receiving Date | : | 12/12/2017 |
| Testing Period | : | 12/12/2017 to 20/12/2017 |
| Date Completed | : | 20/12/2017 |
| Reporting Date | : | 29/12/2017 |

| | | |
|----------------|---|---|
| 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). |
| Analysts | : | Tan Mei Ann & Ling Yii Ming |

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Lot 4, Persiaran Jubli Perak, Seksyen 22, 40300 Shah Alam, Selangor, Malaysia
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Test results:

Test Part Description :

Sample Description : DIE Bonding Paste
Sample Name : EN4088Z

RoHS Directive 2011/65/EU Annex II

| Test Item(s): | Unit | Test Method | Results | MDL | Limit |
|----------------------------|------|---|---------|-----|-------|
| Cadmium (Cd) | ppm | With reference to IEC 62321-5:2013 (Determination of Cd by ICP-OES) | N.D. | 2 | 100 |
| Lead (Pb) | ppm | With reference to IEC 62321-5:2013 (Determination of Pb by ICP-OES) | N.D. | 2 | 1000 |
| Mercury (Hg) | ppm | With reference to IEC 62321-4:2013/AMD 1:2017 (Determination of Hg by ICP-OES) | N.D. | 2 | 1000 |
| Hexavalent Chromium (CrVI) | ppm | With reference to IEC 62321-7-2:2017 (Determination of CrVI by UV-Vis) | N.D. | 8 | 1000 |
| Sum of PBBs | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | - | 1000 |
| Monobromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Dibromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Tribromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Tetrabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Pentabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Hexabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Heptabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Octabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Nonabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |
| Decabromobiphenyl | ppm | With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS) | N.D. | 5 | - |

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| | | | | | |
|--------------------------|-----|--|------|---|------|
| Sum of PBDEs | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | - | 1000 |
| Monobromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Dibromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Tribromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Tetrabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Pentabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Hexabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Heptabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Octabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Nonabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |
| Decabromodiphenyl ether | ppm | With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS) | N.D. | 5 | - |

Note : (a) mg/kg = ppm ; (0.1wt% = 1000ppm)

(b) N.D. = Not Detected

(c) MDL = Method Detection Limit

(d) The result of Hexavalent Chromium (Cr(VI)) is "ND" as the result of Chromium (Cr) is "ND", and confirmation test of Hexavalent Chromium (Cr(VI)) is not required.

(e) If the Chromium (Cr) content is greater than the MDL, IN result will be shown in the report. And confirmation test of Hexavalent Chromium (Cr(VI)) is required.

(f) - = not regulated

(g) Testing is based on dry basis for PBBs and PBDEs

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Test Part Description :

Sample Description : DIE Bonding Paste
Sample Name : EN4088Z

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1. DETERMINATION OF CADMIUM CONTENT BY

IEC 62321-5 2013

Sample Receiving and Registration
↓
Sample Preparation
↓
Weight sample (0.2-0.5g) into digestion vessel
↓
Acid digestion (Microwave)
↓
"Totally Dissolved"
↓
Filtration
↓
Analyses by ICP

2. DETERMINATION OF LEAD CONTENT BY

IEC 62321-5 2013

Sample Receiving and Registration
↓
Sample Preparation
↓
Weight sample (0.2-0.5g) into digestion vessel
↓
Acid digestion (Microwave)
↓
"Totally Dissolved"
↓
Filtration
↓
Analyses by ICP

3. DETERMINATION OF MERCURY CONTENT BY

IEC 62321-4 2013/AMD 1 2017

Sample Receiving and Registration
↓
Sample Preparation
↓
Weight sample (0.1-0.5g) into digestion vessel
↓
Acid digestion (Microwave)
↓
"Totally Dissolved"
↓
Filtration
↓
Analyses by ICP

4a. DETERMINATION OF HEXAVALENT CHROMIUM

BY IEC 62321-7-2 2017 (Other Materials)

Sample Preparation
↓
Digestion at 150~160 °C
↓
Separating To Obtain Aqueous Phase
↓
pH Adjustment
↓
Add Diphenyl-Carbazide for Color Development
↓
Analyses by UV- Spectrophotometer (540 nm)

4b. DETERMINATION OF HEXAVALENT CHROMIUM

BY IEC 62321-7-2 2017 (Soluble Polymers)

Sample Preparation
↓
Add Digestion Solution
↓
Ultrasonicate Sample
↓
pH Adjustment
↓
Add Diphenyl-Carbazide for Color Development
↓
Analyses by UV- Spectrophotometer (540 nm)

5. DETERMINATION OF PBB/PBDE WITH GC-MS

BY IEC 62321-6 2015

Sample Preparation
↓
Weight sample (0.5-4.0g) into extraction thimble
↓
Soxhlet Extraction with Toluene
↓
Filter through 0.45 µm membrane filter
↓
Analyses by GC-MS (with appropriate dilution)

**** End of Report ****

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