

Test Report

No. AJHL1610011407FB

Date: OCT.27, 2016

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CHANGZHOU JLLISON ADVANCED MATERIAL TECHNOLOGY CO., LTD

ROOM 501, CENTURY JINTIAN BUILDING, NO.593, TONGJIANG CENTER ROAD, XINBEI DISTRICT, CHANGZHOU CITY

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

Sample Description: UNSATURATED POLYESTER RESIN JLS-502PTF(A/B/C/D)

Color: YELLOW

Density: 1.76G/M

Thickness: 4 ± 1MM

Composition: GLASS FIBER REINFORCED PLASTICS (FRP)

Style/Item No.: JLS-502PTF

Manufacturer: CHANGZHOU JLLISON ADVANCED MATERIAL TECHNOLOGY CO.,LTD

Additional Information: CSM (450g/m²) *3, GLASS CONTENT:29%

Test Requested:

1. To determine the performance of the sample when it is subjected to the conditions of test specified in DIN 54837:2007 Testing of materials, small components and component sections for rail vehicles – Determination of burning behaviour using a gas burner
Classification according to DIN 5510-2:2009 Preventive fire protection in railway vehicles Part 2: Fire behaviour and fire side effects of materials and parts; Classification, requirements and test methods
2. To determine of the FED (Fractional effective dose) of toxic fume, as described in Annex C (normative) of DIN 5510-2:2009 Preventive fire protection in railway vehicles Part 2: Fire behaviour and fire side effects of materials and parts; Classification, requirements and test methods

Test Results: -- See attached sheet --

Test Period:

Sample Receiving Date : OCT.18, 2016

Test Performing Date : OCT.18, 2016 TO OCT.25, 2016

Signed for and on behalf of
SGS-CSTC Co., Ltd. Anji Branch

Allen Zou
Technical Manager



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Sample details

| | |
|--------------------|---|
| Sample description | UNSATURATED POLYESTER RESIN JLS-502PTF(A/B/C/D) |
| Color | Tan |
| Thickness | 4.2mm |

1. DIN 54837:2007 Fire behaviour
I. Test conducted

This test was conducted in accordance with the procedure specified in DIN 54837:2007 Testing of materials, small components and component sections for rail vehicles – Determination of burning behaviour using a gas burner.

II. Test details
Conditioning:

Prior to testing, the sample was conditioned,

to constant mass at a temperature of 23 ± 2 °C, and a relative humidity of 50 ± 6 %, and maintained in this condition until required for testing.

Exposed Face: One face of the specimen

Size of specimen: 500mmx190mm

II. Test results

| | | Specimen No. | | | | | Average |
|--------------------|--------------------|--------------|-----|-----|-----|-----|---------|
| | | 1 | 2 | 3 | 4 | 5 | |
| Flaming at | (s) | 12 | 11 | 15 | 12 | 17 | 13 |
| Afterflame | (s) | 0 | 5 | 0 | 0 | 0 | 1 |
| Glowing | Occur (s) | - | - | - | - | - | - |
| | Afterglow (s) | - | - | - | - | - | - |
| Flame Height | Maximum (cm) | 20 | 21 | 18 | 22 | 25 | 21 |
| | Reached at (s) | 160 | 157 | 163 | 168 | 162 | 162 |
| Drop away of parts | Drop Away (Yes/No) | No | No | No | No | No | - |
| | Burning time (s) | - | - | - | - | - | - |
| Smoke Density | Maximum (%) | 7 | 5 | 6 | 8 | 7 | 7 |
| | At Time (s) | 150 | 143 | 149 | 156 | 141 | 148 |
| | Integral (%×min) | 11 | 10 | 12 | 15 | 12 | 12 |
| Charred Length | (cm) | 17 | 17 | 17 | 16 | 16 | 17 |
| Extinguished | (s) | - | - | - | - | - | - |
| Burn through | (Yes/No) | No | No | No | No | No | - |
| Melting | (Yes/No) | No | No | No | No | No | - |

To be continued...



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Remark: “-“Not applicable

Observations during test: None

The classification requirements specified in DIN 5510-2:2009 are given in Appendix 1.

Appendix 1 Classification according to DIN 5510-2:2009

| Burning Class | | Smoke class | | Dripping Class | |
|---------------|---|------------------|------------------|----------------|--|
| Class | Requirements | Class | Requirements | Class | Requirements |
| S-1 | Test according to DIN 53438-2/3 required | -- | -- | -- | -- |
| S-2 | Damaged length≤30 cm | Not reached SR-1 | Int. > 100 %×min | ST-1 | Burning / falling drops, afterflame of drops>20 s |
| S-3 | Damaged length≤25 cm, afterflame≤100 s (No individual value ≥ 120s) | SR-1 | Int. ≤ 100 %×min | ST-2 | No dripping / No falling drops, afterflame of drops<20 s |
| S-4 | Damaged length≤20cm, afterflame≤10s | SR-2 | Int. ≤ 50 %×min | | |
| S-5 | Damaged length=0cm Afterflame=0s | | | | |

Classification: In accordance with the class definitions given in DIN 5510-2:2009, the tested sample is classified as following:

Burning Class: S4

Smoke Class: SR2

Dripping Class: ST2

To be continued...



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2. DIN 5510-2:2009 Annex C

I. Test conducted

This test was conducted in accordance with the procedure specified in DIN 5510-2:2009 Preventive fire protection in railway vehicles Part 2: Fire behaviour and fire side effects of materials and parts; Classification, requirements and test methods, Annex C (normative), Examination of the toxic of the smoke and Annex D (informative), Analysis methods of gaseous toxic.

This standard recommends that the test is carried out using the apparatus detailed in DIN EN ISO 5659-2 and that the quantitative determination of the gases emitted should be carried out in accordance with the procedure specified in Annex D (informative), Analysis methods of gaseous toxic of DIN 5510-2:2009.

II. Test details

Conditioning

Prior to testing, the sample was conditioned,

To constant mass at temperatures of 23±2°C and at a relative humidity of 50±5%

At time to testing, Temperature between 15°C ~ 35°C and Relative humidity between 20% ~ 80%

Exposed Face: One face of the specimen

Size of specimen: 76mmx76mm

III. Test results

1) 4 min after the test start

| Gas | Sample 1 | Sample 2 | Sample 3 | Average |
|------------------------------------|----------|----------|----------|----------|
| Carbon Dioxide (CO ₂) | 11443.95 | 11796.07 | 10915.77 | 11385.26 |
| Carbon Monoxide (CO) | 134.45 | 168.06 | 123.24 | 141.92 |
| Hydrogen Fluoride (HF) | ND | ND | ND | - |
| Hydrogen Chloride (HCl) | ND | ND | ND | - |
| Hydrogen Bromide (HBr) | ND | ND | ND | - |
| Hydrogen Cyanide (HCN) | ND | ND | ND | - |
| Nitrogen Oxides (NO ₂) | 3.68 | 7.36 | 7.36 | 6.13 |
| Sulphur Dioxide (SO ₂) | ND | ND | ND | - |

To be continued...



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2) 8 min after the test start

| Gas | Sample 1 | Sample 2 | Sample 3 | Average |
|------------------------------------|----------|----------|----------|----------|
| Carbon Dioxide (CO ₂) | 22007.59 | 22359.72 | 21831.53 | 22066.28 |
| Carbon Monoxide (CO) | 235.28 | 268.89 | 257.69 | 253.95 |
| Hydrogen Fluoride (HF) | ND | ND | ND | - |
| Hydrogen Chloride (HCl) | ND | ND | ND | - |
| Hydrogen Bromide (HBr) | ND | ND | ND | - |
| Hydrogen Cyanide (HCN) | ND | ND | ND | - |
| Nitrogen Oxides (NO ₂) | 9.20 | 12.88 | 12.88 | 11.65 |
| Sulphur Dioxide (SO ₂) | ND | ND | ND | - |

Where, ND indicates Non-detected.

Note: All values given are in mg/m³.

Calculate the Fractional effective dose FED

The test results obtained for toxicity measurements were used to calculate the *FED*, as described in DIN 5510-2:2009, clause C.3.4 and the reference values for gases is showed in following table.

| Gas | Reference concentration; mg/m ³ |
|------------------------------------|---|
| Carbon Dioxide (CO ₂) | 72000 |
| Carbon Monoxide (CO) | 1380 |
| Hydrogen Fluoride (HF) | 25 |
| Hydrogen Chloride (HCl) | 75 |
| Hydrogen Bromide (HBr) | 99 |
| Hydrogen Cyanide (HCN) | 55 |
| Nitrogen Oxides (NO ₂) | 38 |
| Sulphur Dioxide (SO ₂) | 262 |

$$CIT = 0.0805 \cdot \sum_{i=1}^{i=8} \frac{C_i}{C_i}$$

Where,

- CIT* — Conventional Index of Toxicity;
- c_i* — Concentration of the *i*th gas;
- C_i* — Reference concentration of the *i*th gas.

To be continued...



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$$FED(t_{zul}) = \frac{(CIT_4 + 0.5CIT_8) \times 4\text{min} + CIT_8 \times (t_{zul} - 8\text{min})}{30\text{min}}$$

Where,

CIT_4 , CIT_8 — the value of CIT 4 min or 8 min after the test started;

t_{zul} — Allowed exposure duration in vehicle refer to Table C.2 of DIN 5510-2:2009.

According to the Table C.2, $t_{zul} = 30\text{min}$

Then, **FED=0.06**

Requirement: FED ≤ 1

Sub-Conclusion: According to test results, the smoke-gas toxicity of the submitted sample **meets** the requirements specified in DIN 5510-2:2009.

STATEMENTS:

The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test. They are not intended to be the sole criterion for assessing the potential fire, smoke and toxicity hazard of the product in use.

The test results relate only to the specimens of the product in the form in which were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product, which is supplied or used, is fully represented by the specimens, which were tested.

The specimen was supplied by the sponsor and SGS-CSTC ANJI Branch was not involved in any selection or sampling procedure.

To be continued....

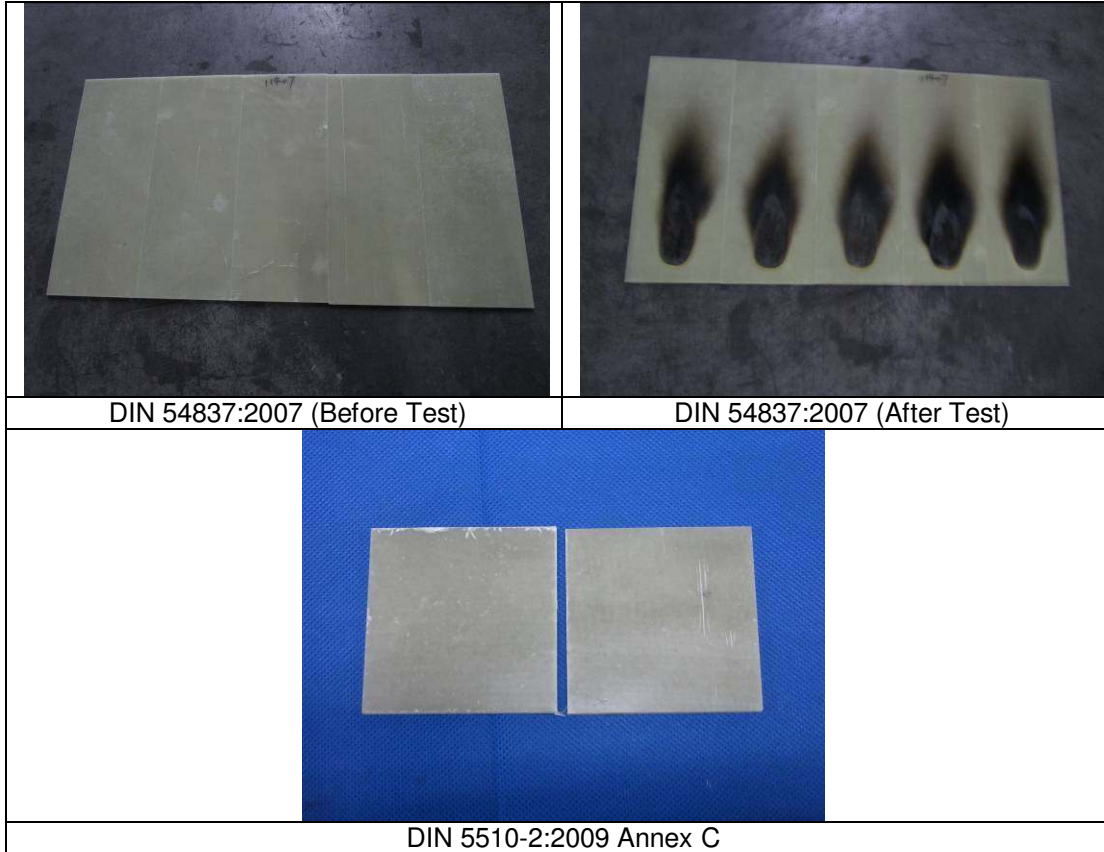


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Photo Appendix:



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End of Report



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