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# Test Report
## No. TRSHV03052/18/01

**Performance Measurement**
**about Coated Glass Used in PV Modules**

Applicant: **ZNShine PV-tech Co., Ltd.**
#1 Zhixi Industry Zone
Jintan City, Jiangsu Province, 213251, P.R. China

File No.: SHV03052/18

Designed: May. 23rd. 2018 by: Anderson Ruan

Reviewed: May 23rd. 2018 by: Shanree Wei

| | |
|---|---|
| Applicant ..... : | **ZNShine PV-tech Co., Ltd.**<br>#1 Zhixi Industry Zone<br>Jintan City, Jiangsu Province, 213251, P.R. China |
| Manufacturer ..... : | **ZNShine PV-tech Co., Ltd.**<br>#1 Zhixi Industry Zone<br>Jintan City, Jiangsu Province, 213251, P.R. China |
| Order No. ..... : | QT-SHV03052/18 |
| Date of Application ..... : | 03/13/2018 |
| Product ..... : | Coated glass for PV modules |
| Model type(s) ..... : | 3.2mm |
| Sample quantity ..... : | 21 pcs |
| Type of examination ..... : | Conformity test according to the requirements of coated glass used in PV modules |
| Standards used ..... : | JC/T 2170-2013 |
| Testing Period ..... : | 03/26/2018 - 05/23/2018 |
| Testing Laboratory ..... : | **National Center of Supervision & Inspection on Solar Photovoltaic Products Quality**<br>Suite A-10F, No. 5 Xinhua Road, Wuxi New District<br>Wuxi City, Jiangsu Province, 214028, P.R. China |

Test results listed in this test report refer exclusively to the mentioned test sample.

# List of contents

## 1. Setting of tasks

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|---|
| Performance measurements on 21 pcs of coated glass used in PV modules according to JC/T 2170-2013 |

## 2. General remarks

| **Possible test case verdicts:** | |
|---|---|
| Test case does not apply to the test object.....: | Not Applicable (N/A) |
| Test object does meet the requirement.....: | Pass (P) |
| Test object does not meet the requirement.....: | Fail (F) |

**Other Remarks:**

The test verdicts presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, with the written approval of the issuing testing laboratory.

"(see Annex #)" refers to additional information appended to the report.
"(see Table #)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

| THE REQUIREMENTS OF COATED GLASS USED IN PV MODULES | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

## 3. Test results

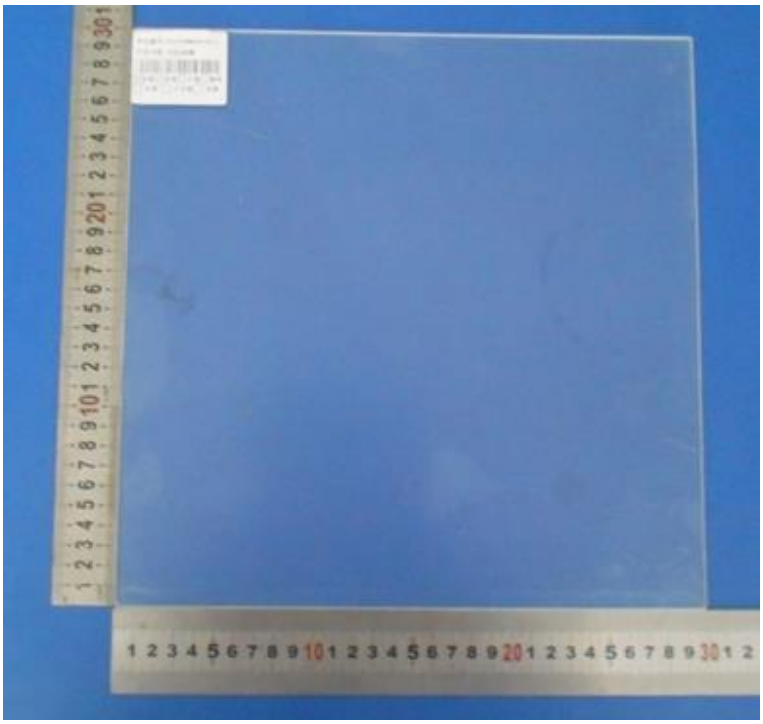
| | | | |
|---|---|---|---|
| 6.2 | Appearance:<br>Coating should be uniform, with no stains, no scratches, no spots, no clusters or pinholes. | All samples: No visual defects | P |
| 6.7 | Scrub resistance test:<br>400 cycles of scrub resistance test are applied with 0.5% mass concentration and pH 9.5-11.0 of washing powder solution. The transmittance degradation after scrub resistance test (ΔT) should be no more than 1.00%. | 1#: Before: $T_{b1}$: 94.13%<br>After: $T_{a1}$: 93.72%<br>$\Delta T_1$: -0.44%<br>2#: Before: $T_{b2}$: 94.06%<br>After: $T_{a2}$: 93.66%<br>$\Delta T_2$: -0.43%<br>3#: Before: $T_{b3}$: 94.09%<br>After: $T_{a3}$: 93.66%<br>$\Delta T_3$: -0.46% | P |
| 6.8 | Acid resistance test:<br>24 hours of acid soak are applied with 1 mol/L HCl solution at 23±2°C. The transmittance degradation after acid resistance test (ΔT) should be no more than 1.00%. | 4#: Before: $T_{b4}$: 93.50%<br>After: $T_{a4}$: 93.66%<br>$\Delta T_4$: -0.17%<br>5#: Before: $T_{b5}$: 93.90%<br>After: $T_{a5}$: 93.81%<br>$\Delta T_5$: -0.10%<br>6#: Before: $T_{b6}$: 93.80%<br>After: $T_{a6}$: 93.67%<br>$\Delta T_6$: -0.14% | P |
| 6.9 | Salt-mist spray test:<br>96 hours of salt-mist spray are applied with 5±1% NaCl solution. The transmittance degradation after salt-mist spray test (ΔT) should be no more than 1.00%. | 7#: Before: $T_{b7}$: 93.80%<br>After: $T_{a7}$: 93.54%<br>$\Delta T_7$: -0.28%<br>8#: Before: $T_{b8}$: 93.71%<br>After: $T_{a8}$: 93.37%<br>$\Delta T_8$: -0.36%<br>9#: Before: $T_{b9}$: 93.86%<br>After: $T_{a9}$: 93.45%<br>$\Delta T_9$: -0.44% | P |
| 6.10 | Thermal cycling test:<br>200 cycles of thermal cycling test are applied. The transmittance degradation after thermal cycling test (ΔT) should be no more than 1.00%. | 10#: Before: $T_{b10}$: 93.85%<br>After: $T_{a10}$: 93.45%<br>$\Delta T_{10}$: -0.43%<br>11#: Before: $T_{b11}$: 93.75%<br>After: $T_{a11}$: 93.25%<br>$\Delta T_{11}$: -0.53%<br>12#: Before: $T_{b12}$: 93.80%<br>After: $T_{a12}$: 93.38%<br>$\Delta T_{12}$: -0.43% | P |

| THE REQUIREMENTS OF COATED GLASS USED IN PV MODULES | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 6.11 | Humidity-freeze test:<br>10 cycles of humidity-freeze test are applied. The transmittance degradation after humidity-freeze test (ΔT) should be no more than 1.00%. | 13#: Before: $T_{b13}$: 93.85%<br>After: $T_{a13}$: 93.23%<br>$\Delta T_{13}$: -0.66%<br>14#: Before: $T_{b14}$: 93.68%<br>After: $T_{a14}$: 93.16%<br>$\Delta T_{14}$: -0.56%<br>15#: Before: $T_{b15}$: 93.85%<br>After: $T_{a15}$: 93.17%<br>$\Delta T_{15}$: -0.72% | P |
| 6.13 | UV irradiance test:<br>15kWh/m$^2$ of UV irradiance (280nm - 400nm) is applied with 3%-10% of UVB (280nm - 320nm) at 60±5°C. The transmittance degradation after UV irradiance test (ΔT) should be no more than 1.00%. | 16#: Before: $T_{b19}$: 93.86%<br>After: $T_{a19}$: 93.47%<br>$\Delta T_{19}$: -0.42%<br>17#: Before: $T_{b20}$: 93.84%<br>After: $T_{a20}$: 93.55%<br>$\Delta T_{20}$: -0.31%<br>18#: Before: $T_{b30}$: 93.78%<br>After: $T_{a30}$: 93.43%<br>$\Delta T_{30}$: -0.37% | P |
| 6.14 | Sand and dust test:<br>6 hours of sand and dust test are applied. The transmittance degradation after sand and dust test (ΔT) should be no more than 1.00%. | 19#: Before: $T_{b22}$: 93.77%<br>After: $T_{a22}$: 93.56%<br>$\Delta T_{22}$: -0.22%<br>20#: Before: $T_{b23}$: 93.52%<br>After: $T_{a23}$: 93.23%<br>$\Delta T_{23}$: -0.31%<br>21#: Before: $T_{b24}$: 93.60%<br>After: $T_{a24}$: 93.23%<br>$\Delta T_{24}$: -0.20% | P |
| Remarks: | The pass criteria on transmittance difference before and after each test sequence are set according to JC/T 2170:2013 requirements of coated glass used in PV modules. | | |

**Annex 1: List of measurement equipment**

| No. | Equipment | Identification | Next calibration date |
|---|---|---|---|
| 1 | Transmittance tester | OS20-02 | 11/02/2018 |
| 2 | Temperature chamber | TT20-04 | 09/03/2018 |
| 3 | Drying chamber | TT21-31 | 03/05/2019 |
| 4 | Sand and dust test chamber | ES21-346 | 07/28/2018 |
| 5 | Salt-mist corrosion test chamber | TT20-17 | 06/05/2018 |

**Annex 2: Photos**



*Overview*

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