



REPORT No. 14949

Requested by : SECO BELGIUM N.V.
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Subject : Tests on PA66+GF25 thermal barriers.
Sampling by SECO Belgium N.V. of 6/08/2018.
File no. BA-426-21426-AG171014-01

Our reference : BEC C587

Our invoice no. : 20180519

Date of the report : 26 October 2018

This report contains : 8 pages

General remark

The test results are exclusively related to the products submitted to the tests and this report may, in no case, be considered as an approval of this product.

To warrant that the results would be representative of the product, as it is delivered or applied, conformity of the test pieces to the product should be assured.

The measurement uncertainty is known and available on request.

The test pieces are at your disposition during two months after the date of the report.

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TESTS ON PA66+GF25 THERMAL BARRIERS

1 Received material

12 pieces of PA66+GF25 thermal barrier were delivered at Becetel on 14 August 2018.

Marking sticker: T2T08S-T2T09S JJD014600005789760418 BRUHUBMIP TRAY: L00926

LEJ HUB - 27.07.2018 01:52;

Length: 1 m;

Colour: black.

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Remark : Before testing, the test pieces were dried in an oven at 90 °C during 4 h and cooled down to room temperature in a desiccator.

2 Determination of density according to NBN EN ISO 1183-1

2.1 Test conditions

- Method A – immersion method;
- Ambient temperature: 22 °C;
- Temperature of the water: 23,2 °C.
- Date of test: 11 September 2018.

2.2 Test results

Test piece no.	Density ρ (g/cm ³)
1	1,311
2	1,309
3	1,313
Mean value	1,311 g/cm ³

3 Determination of glass-content according to NBN EN ISO 3451-1

3.1 Test conditions

- Method A: muffle furnace;
- Test temperature: 600 °C;
- Test time: 2 x 30 minutes;
- Date of test: 11 September 2018.

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3.2 Test results

Measurement no.	Glass-content (%)
1	26,0
2	26,0
Mean value	26,0 %

4 Determination of hardness according to NBN EN ISO 868

4.1 Test conditions

- Hardness: Shore D determined after 15 sec;
- Conditioning: (23±2) °C during min. 24 h in air;
- Test temperature: 22 °C;
- Date of test: 10 September 2018.

4.2 Test results

Measurement no.	Shore D hardness
1	84
2	84
3	84
4	84
5	84
Mean value	84 Shore D

5 Determination of modulus of elasticity according to NBN EN ISO 527-2

5.1 Test conditions

- Conditioning: min. 24 h in air at (23±2) °C;
- Test piece: dumbbell type 1B, width 10 mm, gauge length 50 mm, obtained by machining;
- Tensile speed: 1 mm/min;
- Temperature: 23 °C;
- The strain was determined using an Zwick MultiXtens extensometer with an initial gauge length of 50 mm. The modulus of elasticity (E-modulus) was calculated between 0,05 % and 0,25 % strain.
- Date of tests: 10 September 2018.

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5.2 Test results

Test piece no.	Thickness (mm)	Width (mm)	E modulus (N/mm ²)
1	1,99	10,25	4518
2	1,98	10,18	4556
3	1,98	10,20	4540
4	2,00	10,20	4438
5	1,99	10,18	4534
Mean value			4517
Standard deviation			46

6 Determination of tensile characteristics according to NBN EN ISO 527-2

6.1 Test conditions

- Conditioning: min. 24 h in air at (23±2) °C;
- Test piece: dumbbell type 1B, width 10 mm, gauge length 50 mm, obtained by machining;
- Tensile speed: 5 mm/min;
- Temperature: 23 °C;
- The strain and elongation at break was determined using a Zwick MultiXtens extensometer with an initial gauge length of 25 mm;
- Date of tests: 10 September 2018.

6.2 Test results

Test piece no.	Thickness (mm)	Width (mm)	Tensile strength (N/mm ²)	Strain at break (%)
1	1,99	10,25	80,6	6,4
2	1,98	10,18	80,3	6,1
3	1,98	10,20	81,7	6,4
4	2,00	10,20	80,4	6,1
5	1,99	10,18	81,5	6,2
Mean value			80,9	6,2
Standard deviation			0,7	0,2



7 Charpy impact test according to NBN EN ISO 179-1

7.1 Test conditions

- Charpy impact test on unnotched test pieces, flatwise, type 2fU;
- The test pieces were prepared by the personnel of Becetel.
- Dimensions of test pieces: length 50 mm, thickness h as delivered, width 10 mm.
- Number of test pieces: 10;
- Span: 40 mm;
- Hammer: 4 J;
- Correction factor: 0,012 J;
- Test temperature: 23 °C;
- The impact strength a_{cU} is calculated as $a_{cU} = \frac{E_c}{h.b} 10^3$ in kJ/m²;
- Date of tests: 10 September 2018.

7.2 Test results

Test piece no.	Thickness h (mm)	Width b (mm)	Corrected energy E_c (J)	Impact strength a_{cU} (kJ/m ²)
1	1,99	10,08	0,864	43,1
2	1,99	10,10	0,900	44,8
3	1,99	10,07	0,844	42,1
4	1,99	10,08	0,744	37,1
5	1,99	10,08	0,932	46,5
6	1,99	10,07	0,756	37,7
7	1,99	10,08	0,812	40,5
8	1,99	10,09	0,844	42,0
9	1,99	10,07	0,844	42,1
10	1,99	10,09	0,944	47,0
Mean value				42,3 kJ/m ²
Standard deviation				3,3 kJ/m ²

Remark: all test pieces were broken.

8 Determination of the infrared spectrum

8.1 Test conditions

The IR spectrum was determined in reflection mode directly on the received material by means of a Perkin-Elmer Spectrum One apparatus with ATR function.

Date of test: 11 September 2018.

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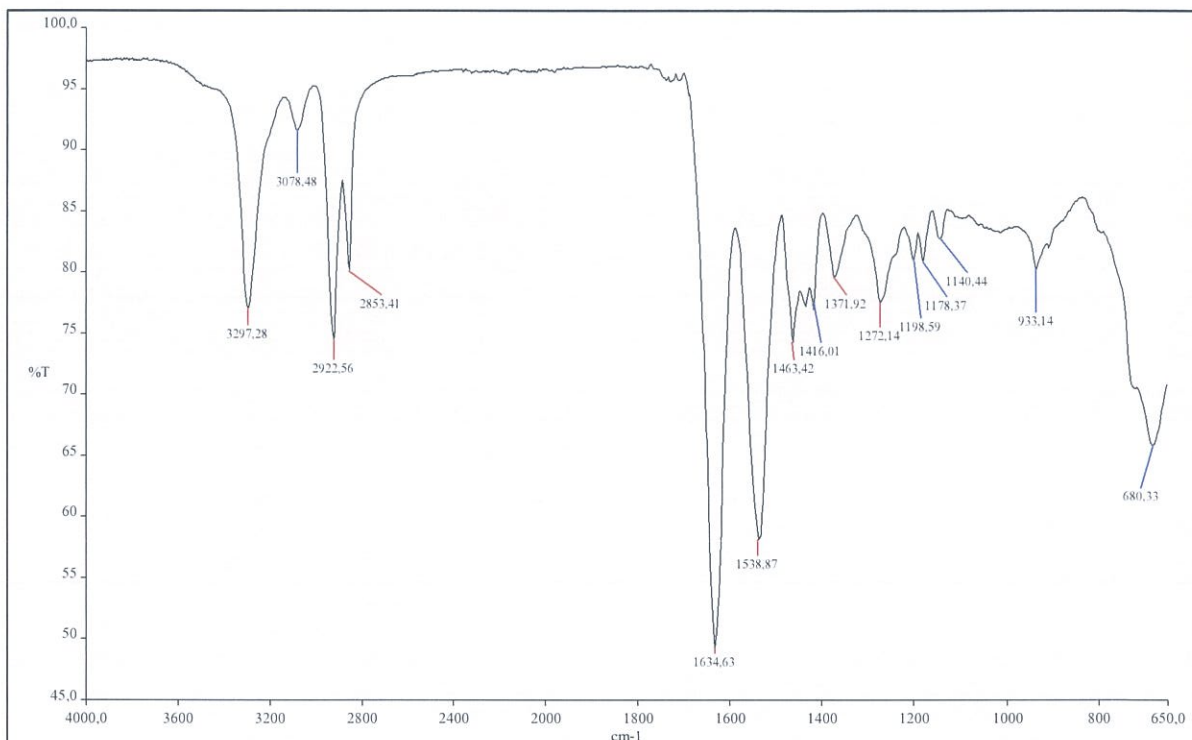
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8.2 Test results

The IR spectrum is shown here below, see graph no. 1.

The material is recognised as PA.



Graph no. 1: IR-spectrum

9 Determination of melting temperature according to ISO 11357-3

9.1 Test conditions

- The melting temperature was measured by means of Differential scanning calorimetry (DSC) – a technique in which the difference in energy inputs into a substance and a reference material is measured as a function of temperature, while the substance and reference material were subjected to a controlled-temperature program. The recorded thermogram is the differential scanning calorimetric or DSC curve.
- A test piece of 5 to 20 mg was heated 2 times at a speed of 20 °C/min, in a nitrogen flow. An aluminium cup with perforated lid was used.
- Date of test: 11 September 2018.

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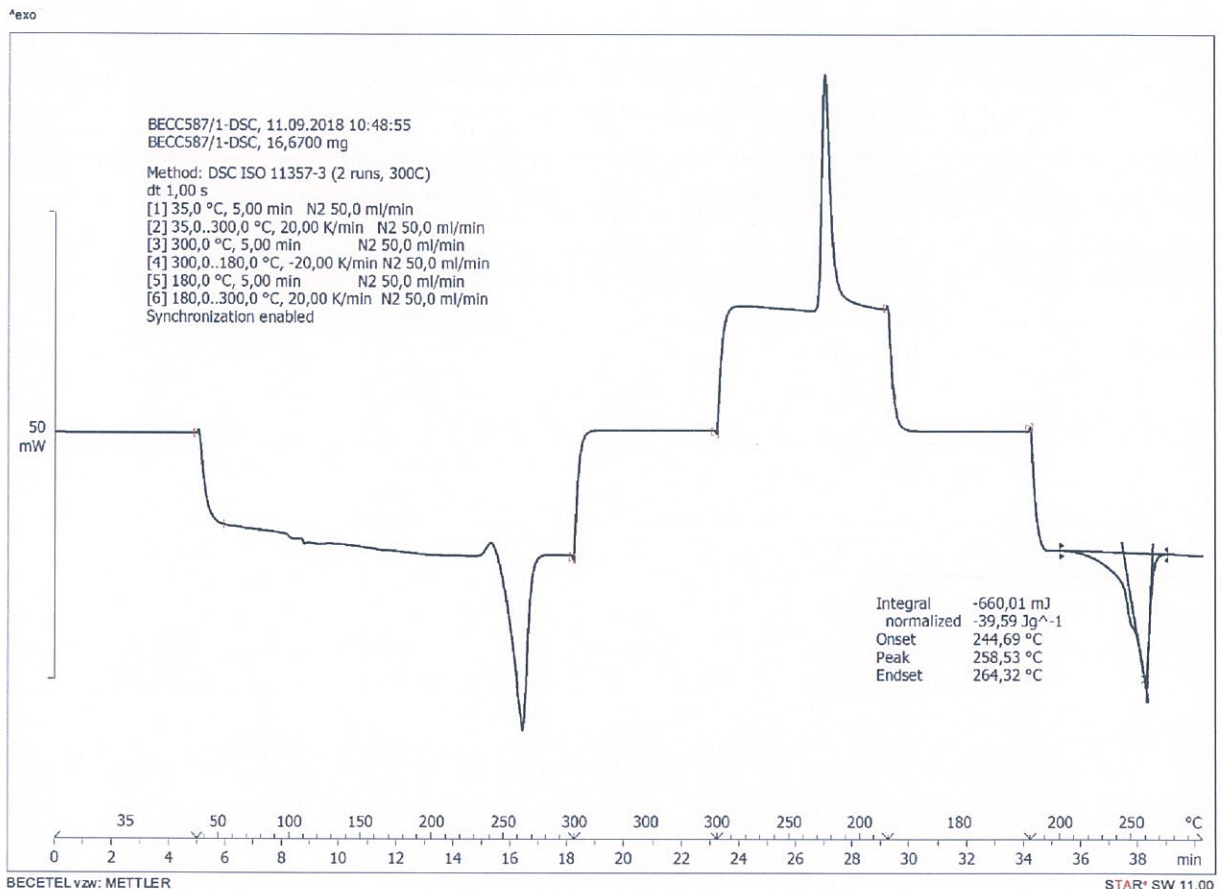
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9.2 Test results

Measurement	Value
Extrapolated onset temperature T_{eim}	245 °C
Peak temperature T_{pm}	259 °C
Extrapolated end temperature T_{efim}	264 °C
Graph no.	2



Graph no. 2: DSC-spectrum

10 Determination of water absorption according to NBN EN ISO 62

10.1 Test conditions

- 2 test pieces, length (61 ± 1) mm, cut from the barrier, were immersed in demineralized water at a temperature of (23 ± 2) °C (method 1).
- Test period: 24 h + saturation (reweighing at 48 h, 96 h, ...).
- The test pieces are weighed before and after the test.
- The water absorption is calculated, $c = (m_2 - m_1)/m_1 \times 100$ (%).

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With m_1 = mass of the test piece before immersion (mg);

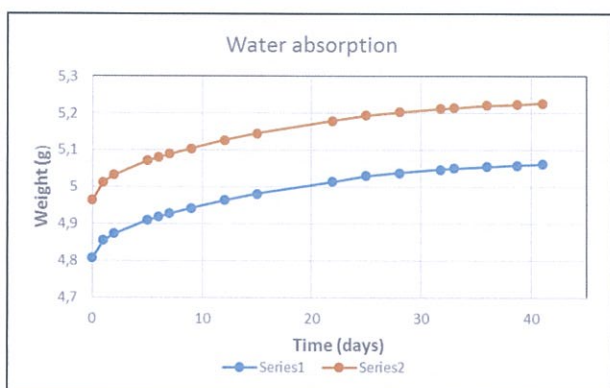
m_2 = mass of the test piece after immersion (mg);

- Date of test: 5 September – 17 October 2018.

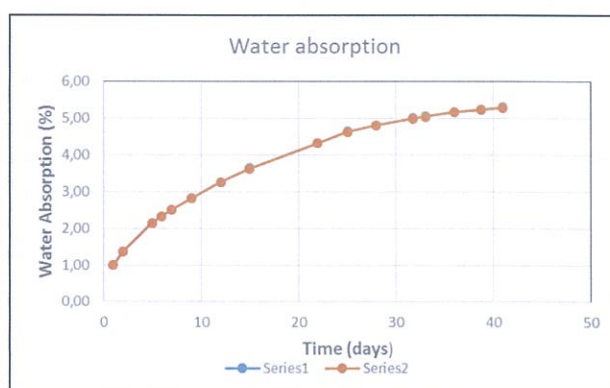
10.2 Test results

Test piece no.	Water absorption c after 24 h (%)	Water absorption c_s (%)
1	1,0	5,3
2	1,0	5,3
Mean value	1,0 %	5,3 %

- (1) The test was stopped after an immersion period of 41 days (see graphs no. 3 and 4 here below).



Graph no. 3 : water absorption

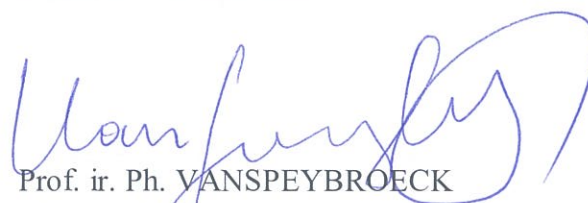


Graph no. 4 : water absorption

Remark: The tests mentioned in paragraphs 2 and 6 belong to the scope of the accreditation following NBN EN ISO/IEC 17025 (BELAC accreditation no. 181-TEST).

Melle, 26 October 2018.


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