Test report

Test report relating to a glass product according to European standard EN 1279-4: 2018; physical attributes of edge seal component: sealant marked as: Finotech SQ 10, Manufactured by: Hangzhou Zhijiang Silicone Chemicals Co.,Ltd

Report number	89215712-02
Date	2 March 2020
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Client	Hangzhou Zhijiang Silicone Chemicals Co.,Ltd No 1717, Century Avenue, Linjiang Industry Park HANGZHOU, Zhejiang China
Project number	8925712
Project name	19.A024 - EN1279-4 Finotech SQ 10
Number of pages	18

Contents

1 Introduction

1.1 Purpose

The tests have been performed in order to determine the properties of a sealant according to European standard EN 1279-4 [1].

1.2 Description of the test specimen

General

Name of the Manufacturer	Hangzhou Zhijiang Silicone Chemicals Co.,Ltd
Address of the manufacturer	No 1717, Century Avenue, Linjiang Industry Park HANGZHOU, Zhejiang China
Production plant of the samples	No 1717, Century Avenue, Linjiang Industry Park HANGZHOU, Zhejiang, China
Line ID where the samples are made	sealant, double screw mixer
Production date	2019-08-08
The product was marked as	Finotech SQ 10

Specific

Sample dimensions	
Dimensions of the H-samples	Sealant 50x12x12 mm Glass 50x50x6 mm
Dimensions film sample	round film 2 mm, 180 mm diameter
Sample making date	-
Sealant material	Finotech SQ 10
Type	silicone 2 component
Batch no comp. A	- white
Batch no. comp B	- black
Mix ratio	11:1 by weight
Colour	black
Function	secondary sealant
Glass Specification	
Type of glass (coating)	Clear float glass,
Type of coating (if present)	N/A

1.3 Sampling procedure

TÜV Rheinland B.V., acting as Notified Test Laboratory, has had no influence on the selection of the sample. All test specimens within the sample were test-worthy and were received December 2019 .

1.4 Application

The request for testing was submitted by the client on 17 July 2019, order or reference number or name: -/-. TRN quotation and/or assignment form number: 19.A024 rev 2.

1.5 Method of testing

All applicable tests have been performed according to the European standard EN 1279-4 : 2018 [1].

1.6 Period of testing

The tests took place in the period week 50, 2019 till week 9, 2020.

1.7 Put out to contract

No tests were performed at third parties.

1.8 Privacy statement

Due to privacy reasons, the names of involved personnel that executed the tests are not disclosed in the report. However, this information is available on internal work sheets, test forms etc. in the project file.

1.9 Notifications, accreditations, designations

TÜV Rheinland Nederland B.V. has been notified by the Dutch Ministry of Infrastructure and the Environment as Notified Laboratory (number 1750) and Notified (Factory Production Control) Certification Body (number 0336) for the European Construction Products Regulation 305/2011 (EU).

TÜV Rheinland Nederland B.V. has been accredited by the Dutch Accreditation Council (RvA) as ISO 17025 Test Laboratory (nr. L 484) and ISO 17065 Certification Body (nr. C078).

TÜV Rheinland Nederland B.V. has been designated as Technical Service (Laboratory) by the Approval Authorities for Germany (KBA – E1) and the Netherlands (RDW – E4) for automotive safety glass (ECE R43, 92/22/EC, 2009/144/EC).

TÜV Rheinland Nederland B.V. has been recognised by the German Institute for building technics (DIBt) under number NL005 as test, control and certification body.

2 Methods

The requirements for sealants consist of a physicochemical characterisation and seal strength, water vapour transmission and gas permeation data.

At the request the gas permeation was not carried out.

2.1 Physicochemical characterisation

The following properties of the cured sealant are determined according to table 2 of EN1279-4 [1]

2.1.1 Change in volume EN ISO 10563

The mass and volume change or shrinkage is determined of hand mixed specimens of the 2 part sealant made by the test house. After mixing the specimens are stored for 28 days at laboratory conditions followed by 7 days at 70 °C. After 1 day conditioning at laboratory conditions the samples were measured again. Test liquid was water.

Table 1: Change in mass and volume

Specimen	1	2	3	average
ΔM [%]	1.62	1.59	1.56	1.6
ΔV [%]	2.71	2.77	2.72	2.7

2.1.2 Infrared spectrum (IR)

The IR spectrum is taken from a freshly cut piece from a piece of cured sealant made by manufacturer.

2.1.3 Thermogravimetric analysis (TGA) EN ISO 11358-1:2014

The TGA is determined in threefold from a piece of cured sealant made by manufacturer.
In deviation from the TGA method of the standard pure oxygen gas is used instead of synthetic air.

2.1.4 Density /specific gravity EN ISO 1183-1, procedure A

The density is determined from pieces of cured sealant made by manufacturer. Immersion liquid water.

Table 2: Density (at 23±2)°C

Specimen	1	2	3	average
Density [g/cm^3]	1.440	1.440	1.439	1.44

2.2 Outer sealant strength

This part covers evaluation of the edge seal strength. The requirement is that outer sealant shall show sufficient adhesive and cohesive strength before and after aging. The maximum tension or the point of failure or the end of the tensile curve shall lie outside the triangle area AOB as given in figure 1 of EN1279-4 [1]. Besides this requirement the cross over stress on the line AB is determined (σ_c).

For the test 3 series of specimens are tested, series 1 for the initial values and two series after aging. The aging process is as follows:

- **UV exposure and high temperature moisture series 2**

After initial cure and conditioning seven test specimens are exposed to UV irradiation for (504 ±8) hours, exposed perpendicular to the glass at an intensity in the UVA range of (40 ±5) W/m^2.

After the exposure to UV the test specimens are aged in a climate chamber at (58 ±1) °C and a relative 1humidity of at least 95 % for (168 ±5) hours.

- **Water immersion series 3**

After initial cure and conditioning seven test specimens are immersed in one to two litres of distilled or deionized water for (168 ±5) hours at (23 ±2) °C.

The test specimens are measured for width, depth and height prior to aging. After the ageing, the samples undergo testing under tensile load at a speed of (5 ±0.25) mm/min after conditioning for at least 24 hr at laboratory conditions. The laboratory conditions are (23 ±2) °C and (50 ±5) % R.H.

The maximum stress (σ_s) and stress at crossing the line AB (σ_c) were calculated from the mean of the 2 contact areas between the sealant and the glass of the test specimens. The highest and lowest σ_s values were ignored so that the average values are calculated on the five remaining measured stress and strain values.

For detail test results see appendix A.

2.3 Water vapour transmission rate

Annex D1 of the EN1279-4 [1] describes the determination of the water vapour transmission rate (WVTR) of a polymeric sealant. For materials which have a WVTR less than the substitution limit given in EN 1279-1:2018 table D.2 and D3 the method is used only for confirmation that the WVTR is less than this limit (for inner and single sealant WVTR < 0.5 g.m^{-2}.d^{-1}).
The applied method is based on the measurement of the gravimetric increase in weight of test samples during the exposure in a controlled environment. The conditions of the environment used for this determination are (23 ±1) °C at a relative humidity [R.H.] of > 90%. The thickness of the sample material must be as close as possible to 2 mm. A specimen with a diameter of about 90 mm is punched out of the film sample. A metal dish is filled with a known amount of desiccant, with a RH< 5% and covered by the film. The dish is closed by clamping a lid with an opening of 50 cm² on top of the film. At regular intervals the increase in weight of the dish is measured on an analytical balance with a resolution of 0.0001 g. The increase of weight [g] (with possible corrections for the increase in mass of a dummy sample) and exposure time and exposed area are used for the calculation of the WVTR per day per m².
The results are expressed for 2 mm thick specimen as: WVTR in [g/(m².day)], at 23 °C and a relative humidity of > 85%. In the calculations an inverse relationship between transmission and thickness is assumed for samples that are thicker or smaller than 2 mm.
Of three measured samples the lowest value is reported.

Table 3: Water vapour transmission at 23°C/ >90% RH

Specimen	1	2	3
Thickness [mm]	2.07	2.06	2.08
WVTR [g.m^{-2}.d^{-1}]	11.69	11.80	11.95
WVTR [g.2 mm. m^{-2}.d^{-1}]	12.1	12.1	12.4

2.4 Volatile content

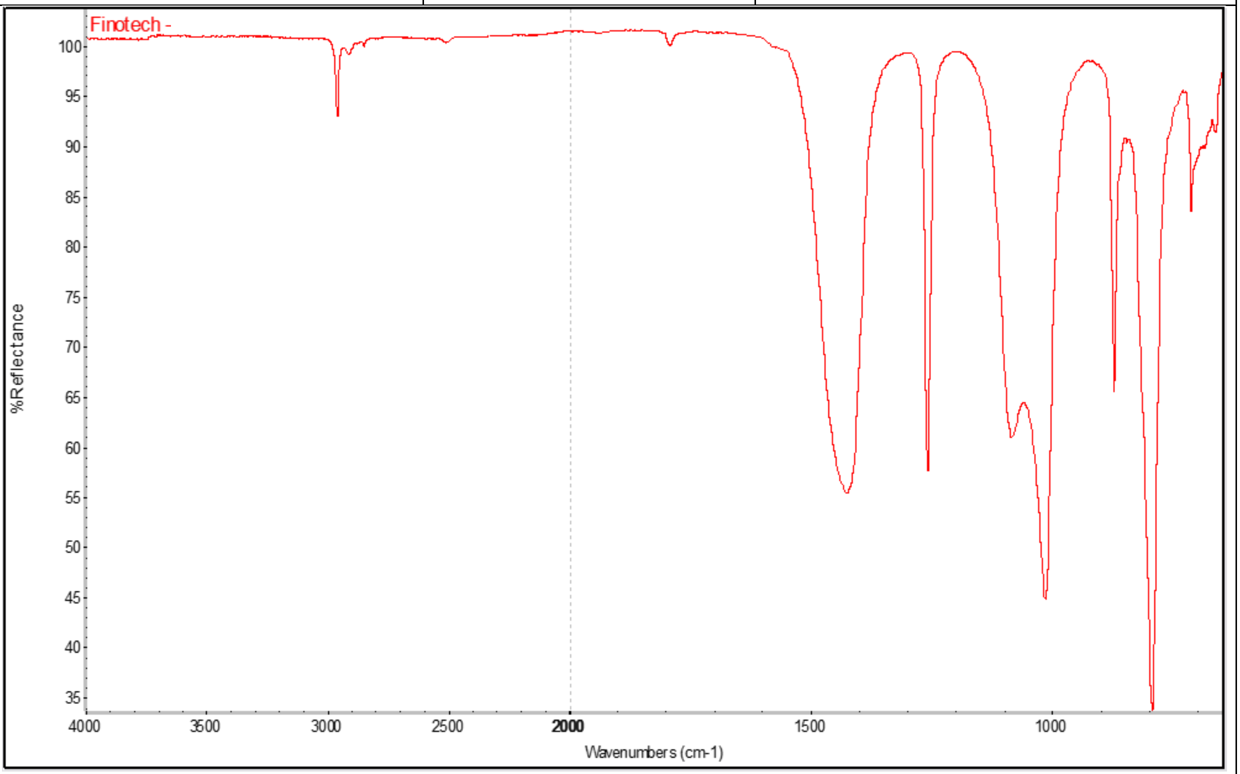
The volatile test was carried out on three pieces of 2 mm thick and 50 mm diameter sealant film according to Annex H of EN1279-4 at (70±3) °C for 168 hours. Reported is the average weight loss as volatile content.

Table 6: Volatile content

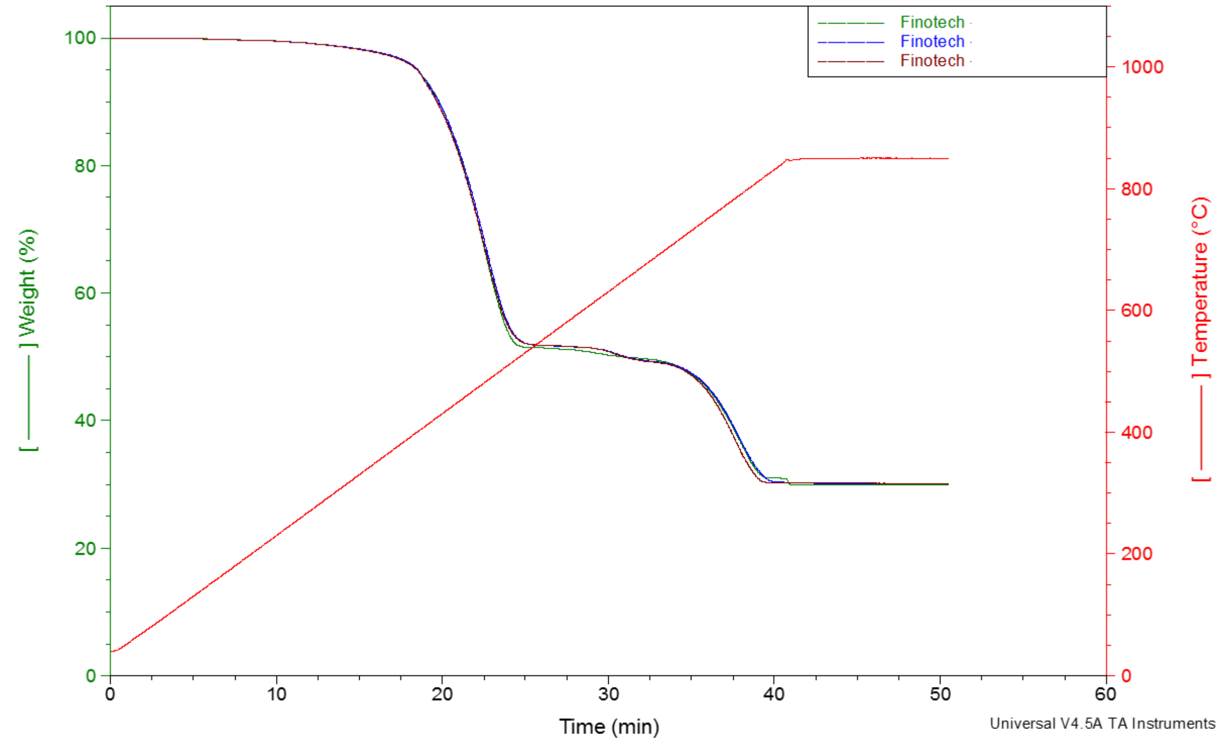
Specimen	1	2	3
Initial mass [g]	4.4065	4.2181	4.1994
Final mass [g]	4.3899	4.2014	4.1840
Difference [g]	0.0166	0.0167	0.0154
%	0.38%	0.40%	0.37%
Date of test	6-13 January 2020		

3 Summary test results

Sealant	**Finotech SQ 10**	
Physicochemical characterisation (EN1279-4:2018, 5.2)		
Volume shrinkage	Sealant	ΔV = (2.7 ±0.1) %
Density / Specific gravity	Cured sealant	ρ = (1.44 ±0.01) g/cm³
Infrared spectrum	Cured sealant	



Thermogravimetric analysis	Cured sealant (threefold)	for details see appendix B



Outer sealant strength (EN1279-4:2018, 5.3)		
Initial test (series 1)	Adhesive bond (float glass-sealant-float glass)	pass σ_c = (0.357 ±0.003) MPa
After exposure to UV, temperature and moisture (series 2)	Adhesive bond (float glass-sealant-float glass)	pass σ_c = (0.325 ±0.003) MPa
After immersion in water (series 3)	Adhesive bond (float glass-sealant-float glass)	pass σ_c = (0.353 ±0.001) MPa
Charateristics for the substitution of sealants (EN1279-4:2018, 5.5)		
Cross-over stress (series 1)	Adhesive bond (float glass-sealant-float glass)	σ_c = (0.357 ±0.003) MPa
Water vapour transmission rate	sealant sheet (2 mm thickness)	WVTR = 12 $g.m^{-2}.d^{-1}$
Gas permeation rate (Argon)	sealant sheet (2 mm thickness)	not determined
Additional results		
Volatile content	(0.4. ±0.1) %	

4 Conclusion

The outer sealant marked by the client or manufacturer as: Finotech SQ 10, manufactured by: Hangzhou Zhijiang Silicone Chemicals Co.,Ltd, meets the applicable requirements for outer sealant strength and fogging test as stated in the European standard EN 1279-4:2018 [1].

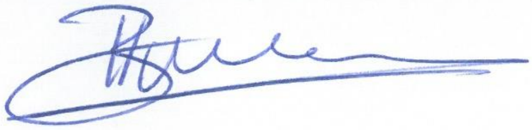
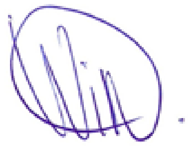
The test results exclusively relate to the tested objects.

Remark 1
When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the sealant. The decision and responsibility lies at the manufacturer.

5 References

1 European standard EN 1279-4: 2018 (E),
Glass in building – Insulating glass units – Part 4: Methods of test for the physical attributes of edge seal components and inserts,
European Committee for Standardization, July 2018.

6 Signatures

Author	Signature
Mr. M.A.A.M. Schets, B.Sc. Senior Expert	
Peer review	Signature
Mr. R. Brandhorst Senior Expert	
Approved by	Signature
Mr. W. Notten Local Business Field manager	

Appendix A, Details seal strength tests

Series 1: Initial

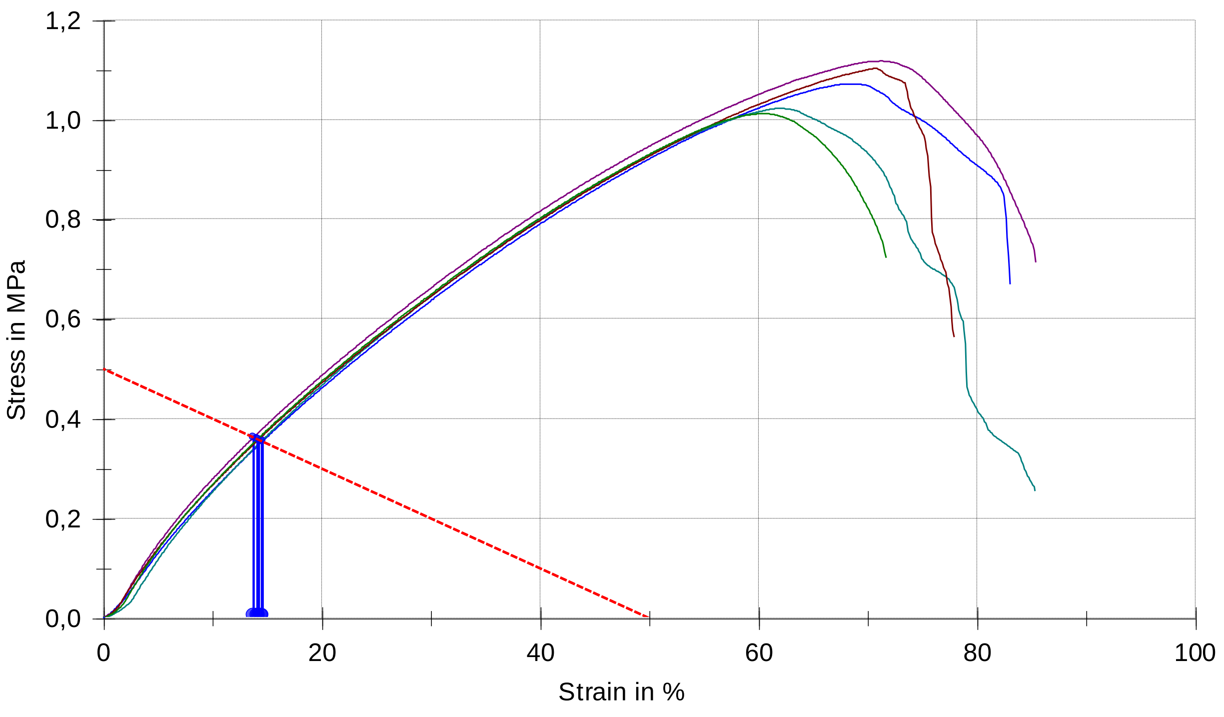
Results:

Legends	Nr	width b0 mm	thickness a0 mm	A mm²	Kit height mm	σ c MPa	ε c %	σ-max MPa	ε Break %	Failure
□	3	50,0	12,2	610,0	12,0	0,354	14,6	1,07	83	Cohesive
□	4	50,0	12,3	615,0	12,0	0,355	14,5	1,02	85	Cohesive
□	5	50,0	11,6	580,0	12,0	0,362	13,8	1,12	85	Cohesive
□	6	50,0	11,8	590,0	12,0	0,357	14,3	1,10	78	Cohesive
□	7	50,0	11,4	570,0	12,0	0,358	14,2	1,01	72	Cohesive

Statistics:

Series n = 5	width b0 mm	thickness a0 mm	A mm²	Kit height mm	σ c MPa	ε c %	σ-max MPa	ε Break %
x	50,0	11,9	593,0	12,0	0,357	14,3	1,06	81
s	0,0	0,4	19,2	0,0	0,003	0,3	0,05	6
ν	0,00	3,24	3,24	0,00	0,91	2,28	4,43	7,28

Curves



Series 2: UV and high temperature moisture

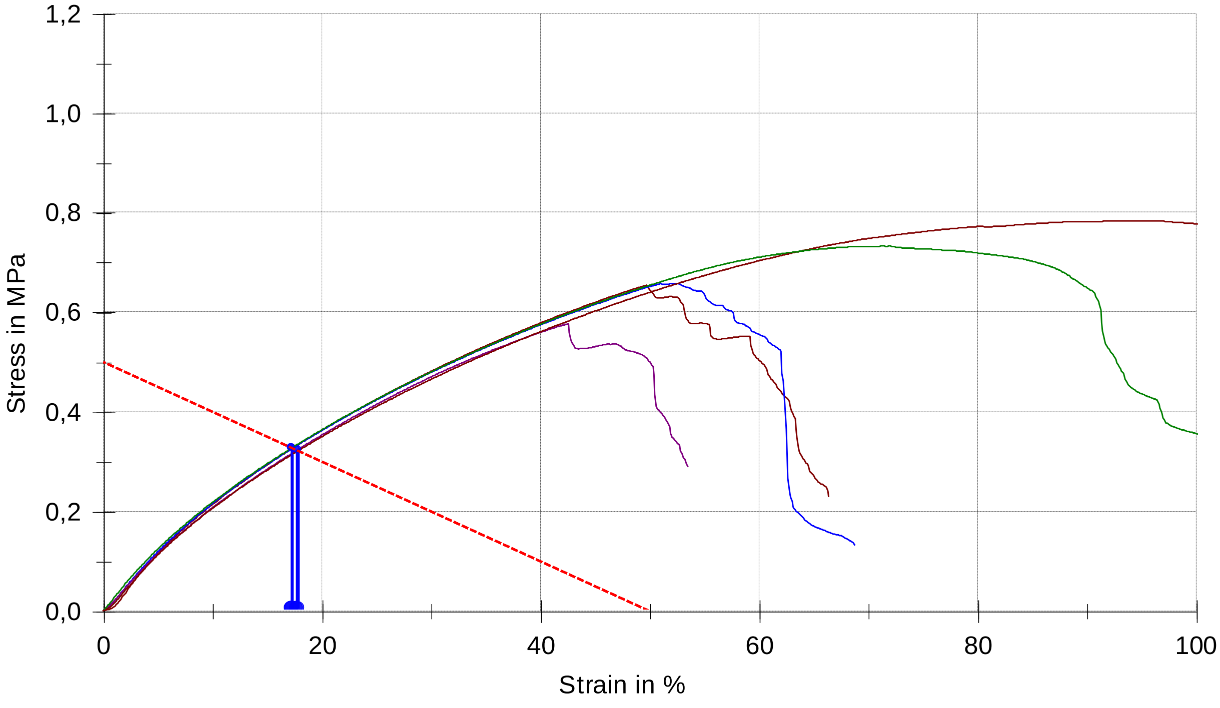
Results:

Legends	Nr	width b0 mm	thickness a0 mm	A mm²	Kit height mm	σ c MPa	ε c %	σ-max MPa	ε Break %	Failure
□	1	50,0	11,9	595,0	12,0	0,326	17,4	0,65	66	Cohesive
□	3	50,0	12,1	605,0	12,0	0,326	17,4	0,66	69	Cohesive
□	5	50,0	12,0	600,0	12,0	0,322	17,8	0,58	54	Cohesive
□	6	50,0	11,6	580,0	12,0	0,321	17,9	0,78	127	Cohesive
□	7	50,0	11,5	575,0	12,0	0,327	17,3	0,73	102	Cohesive

Statistics:

Series n = 5	width b0 mm	thickness a0 mm	A mm²	Kit height mm	σ c MPa	ε c %	σ-max MPa	ε Break %
x	50,0	11,8	591,0	12,0	0,325	17,5	0,68	84
s	0,0	0,3	12,9	0,0	0,003	0,3	0,08	30
ν	0,00	2,19	2,19	0,00	0,81	1,51	11,69	36,08

Curves



Series 3: Water immersion

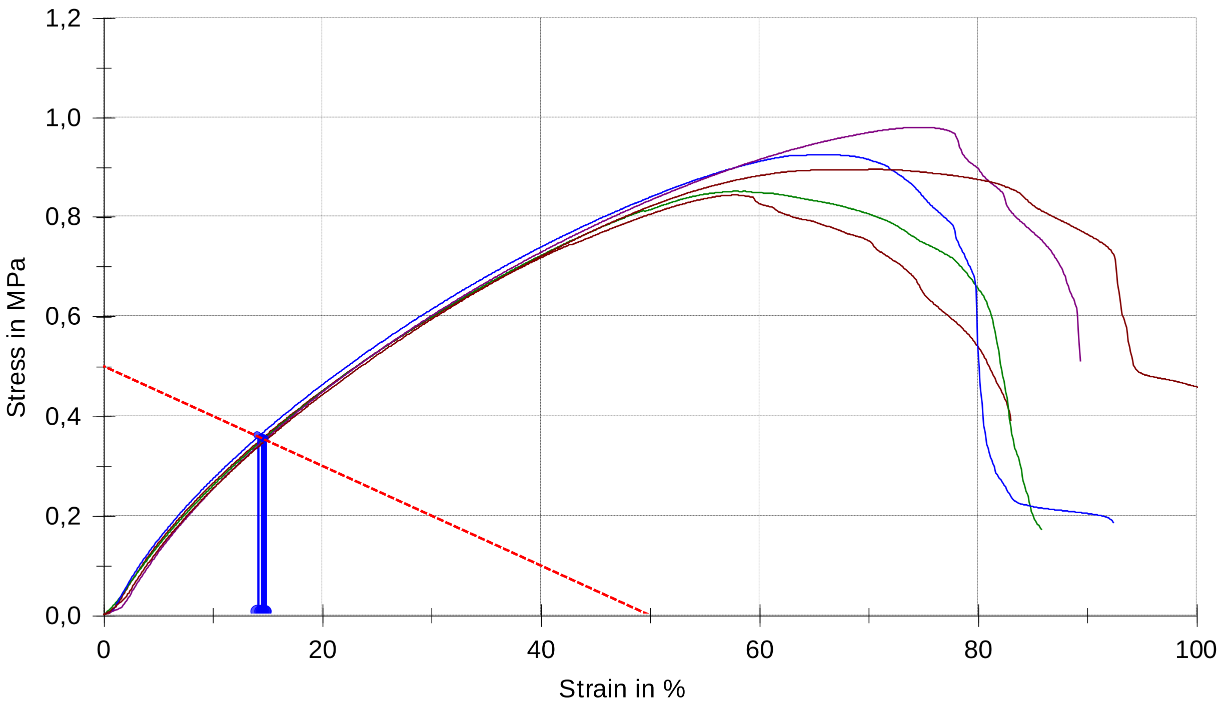
Results:

Legends	Nr	width b0 mm	thickness a0 mm	A mm²	Kit height mm	σ c MPa	ε c %	σ-max MPa	ε Break %	Failure
□	1	50,0	11,8	590,0	12,0	0,354	14,6	0,84	83	Cohesive
□	2	50,0	12,0	600,0	12,0	0,353	14,7	0,85	86	Cohesive
□	3	50,0	11,5	575,0	12,0	0,358	14,2	0,92	92	Cohesive
□	5	50,0	12,2	610,0	12,0	0,352	14,8	0,98	89	Cohesive
□	6	50,0	11,7	585,0	12,0	0,351	14,9	0,89	111	Cohesive

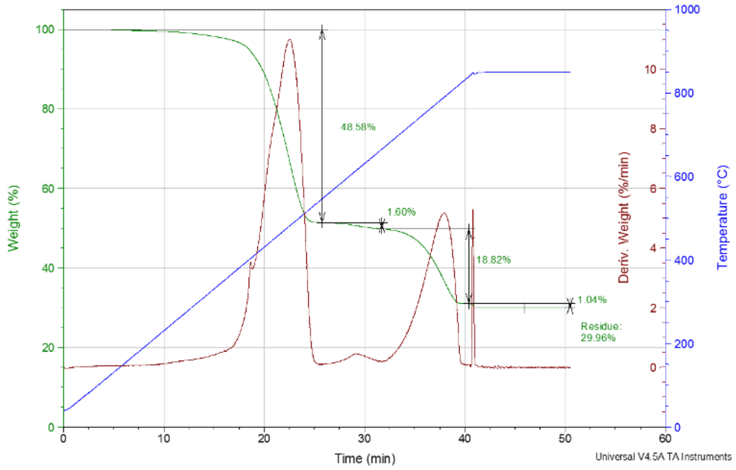
Statistics:

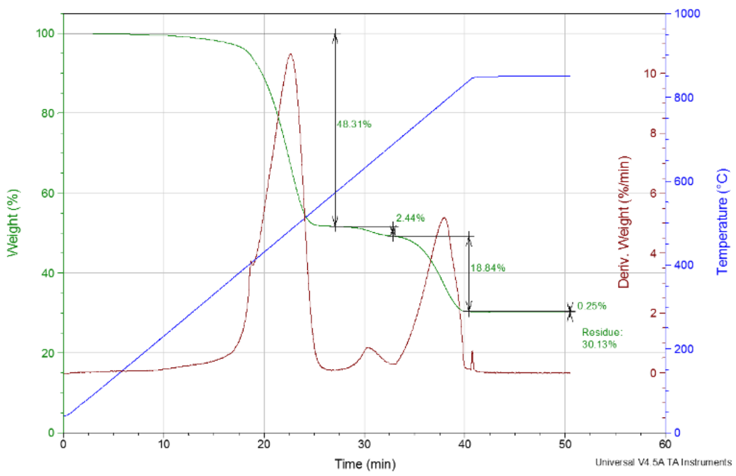
Series n = 5	width b0 mm	thickness a0 mm	A mm²	Kit height mm	σ c MPa	ε c %	σ-max MPa	ε Break %
x	50,0	11,8	592,0	12,0	0,353	14,7	0,90	92
s	0,0	0,3	13,5	0,0	0,003	0,3	0,06	11
ν	0,00	2,28	2,28	0,00	0,76	1,84	6,22	11,85

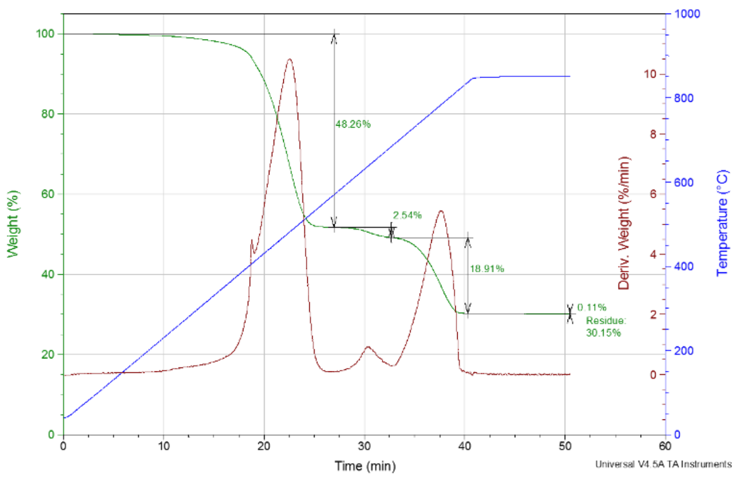
Curves



Appendix B, Details TGA







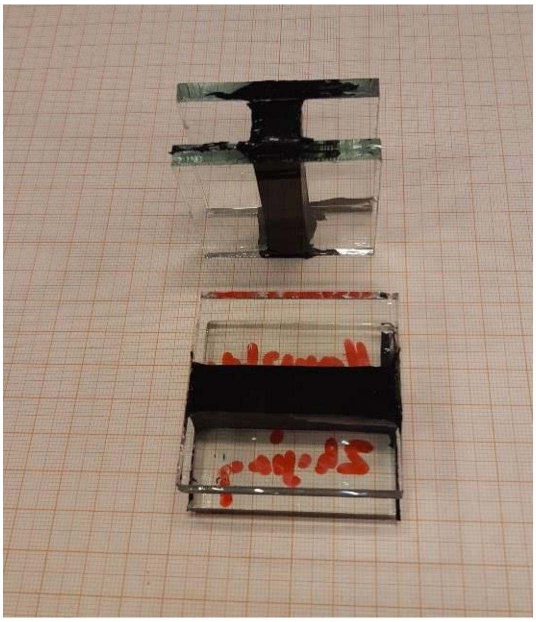
Average weight Change		
Start	Stop	Weight
min	min	%
0	26	48.4
26	32	2.2
32	41	18.9
41	51	0.5
Residue		30.1

Method

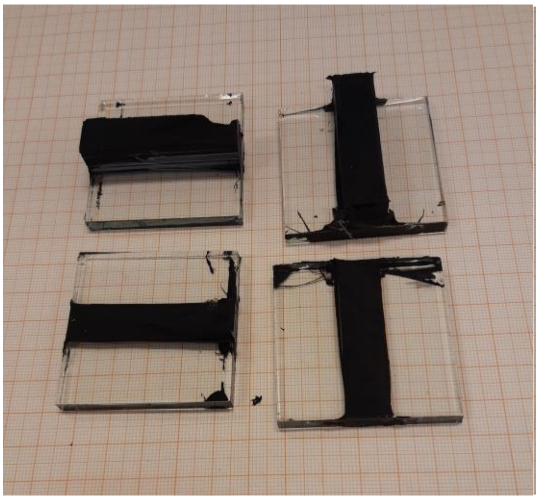
Heating from 40 °C to 850°C at 20 K/min under nitrogen flow

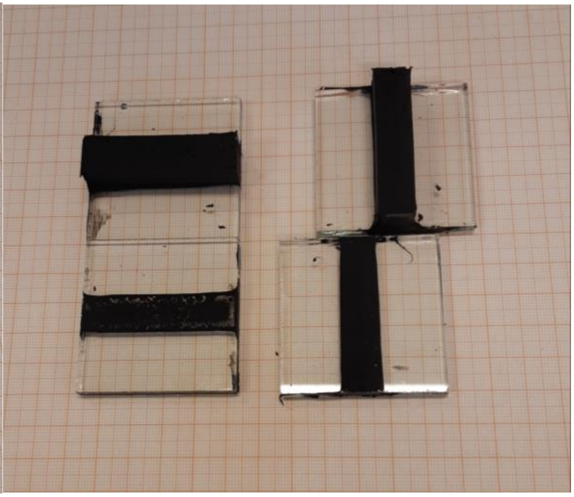
10 min isotherm at 850 °C in oxygen flow.

Appendix C, Pictures of the test specimen



H-sample before tensile test





H-sample after tensile test; initial. *H-sample after tensile test; UV.*

- End of test report -