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Ultracur3D® RG 35 B

Rigid | HDT 80 | Black

Extended TDS

Complete Technical Documentation and Testing Summary

Version: 2.0

Contents

Technical Data Sheet

Rigid resin with optimum combination of strength, stiffness and temperature resistance.

General Properties	Norm	Typical Values
Appearance	-	Black
Viscosity, 25°C	Cone/Plate Rheometer[1)]	950 mPas
Viscosity, 30°C	Cone/Plate Rheometer[1)]	630 mPas
Density (Printed Part)	ASTM D792	1.2 g/cm³
Density (Liquid Resin)	ASTM D4052-18a	1.11 g/cm³

Tensile Properties[2)]	Norm	Typical Values
E Modulus	ASTM D638	2600 MPa
Ultimate Tensile Strength	ASTM D638	62 MPa
Elongation at Break	ASTM D638	10%

Flexural Properties	Norm	Typical Values
Flexural Modulus	ASTM D790	2300 MPa
Flexural Strength	ASTM D790	108 MPa

Impact Properties	Norm	Typical Values
Notched Izod (Machined), 23°C	ASTM D256	21 J/m
Unnotched Izod, 23°C	ASTM D256	112 J/m
Notched Charpy (Machined), 23°C	ISO 179-1	1.3 kJ/m²

Thermal Properties	Norm	Typical Values
HDT at 0.45 MPa	ASTM D648	87°C
HDT at 1.82 MPa	ASTM D648	64°C
Flammability	UL 94 (1.5 mm)	HB
Glow-wire Test	IEC 60695-2-12/-13 (2 mm)	GWIT: 675°C GWFI: 650°C

Thermal Properties	Norm	Typical Values
Glass transition temperature (DMA, tan(d))	ASTM D4065	112°C

Biocompatibility	Norm	Typical Values
Cytotoxicity – Neutral Red	ISO 10993-5 (2009)	PASS[3)]

Other	Norm	Typical Values
Hardness Shore D	ASTM D2240	83
Water Absorption, Short-Term (24 hours)	ASTM D570	0.42%
Water Absorption, Long-Term (>2800 hours)	ASTM D570	2%

Mechanical properties overview

1) Determined with TA-Instrument DHR rheometer, cone/plate, diameter 60 mm, shear rate 100 s^{-1}
2) Tensile type ASTM D638 type IV, Pulling speed 5 mm/min
3) For the statement on Biocompatibility data see Chapter: Biocompatibility.
4) If not noted otherwise, all specimens are 3D printed. Samples were tested at room temperature, 23°C. ASTM sample size (L x W x H): ASTM D790 80 x 4 x10 mm, ASTM D256 63 x 3.2 x 12 mm, ASTM D648 127 x 3.2 x 13 mm, ISO 179-1 80 x 4 x 10 mm, UL 94 125 x 1.5 x 13 mm, IEC 60695-2-12/-13 60 x 2 x 60 mm.

Printing Performance

The combination of 3D printer and material has a huge impact on the quality of the parts produced. The measured design characteristics as well as the printing speed can be found in the Printing Evaluation Guideline of Ultracur3D® Resins.

Long-Term UV

Durability is a key feature for the components utilized within many industries, as they expect the materials used to withstand years of exposure to the elements. Through the effects of UV radiation, photopolymers can degrade over time. The aging can be caused by the influence of UV light, heat and water. The degree of ageing depends on duration and intensity.

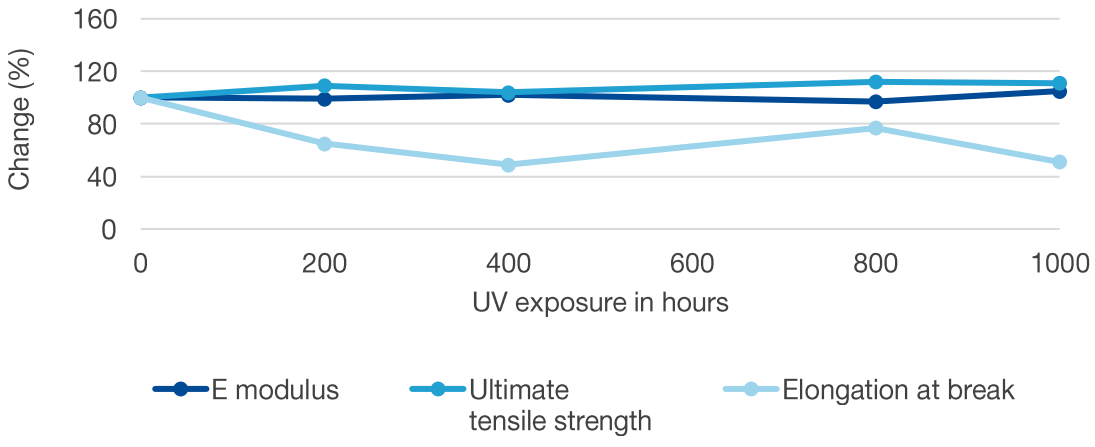
Test Method and Specimens

The ageing tests were performed with ASTM D638 type IV tensile bars and color cones as per ISO 4892-2:2013 method A, cycle 1.

Cycle No.	Exposure period	Irradiance		Black standard tempera-ture in °C	Chamber tempera-ture in °C	Relative humidity in %
		Broadband (300 nm to 400 nm) in W/m²	Narrowband (340 nm) in W/(m² nm)			
1	102 min dry	60 ± 2	0.51 ± 0.02	65 ± 3	38 ± 3	50 ± 10
	18 min water spray	60 ± 2	0.51 ± 0.02	-	-	-

Testing conditions for ISO 4892-2 method A, cycle 1

Mechanical Testing



Change in mechanical properties after accelerated weathering

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The final values after 1000 hours of long-term UV exposure can be found below.

Property	Before long-term UV exposure	After 1000 hours of UV exposure
E modulus	2600 MPa	2740 MPa
Ultimate tensile strength	63 MPa	70 MPa
Elongation at break	9%	4%

Mechanical properties before and after 1000 hours of UV exposure as per ISO 4892:2 method A

Coloration

After being exposed up to 1000 hours, no significant changes in color could be observed.

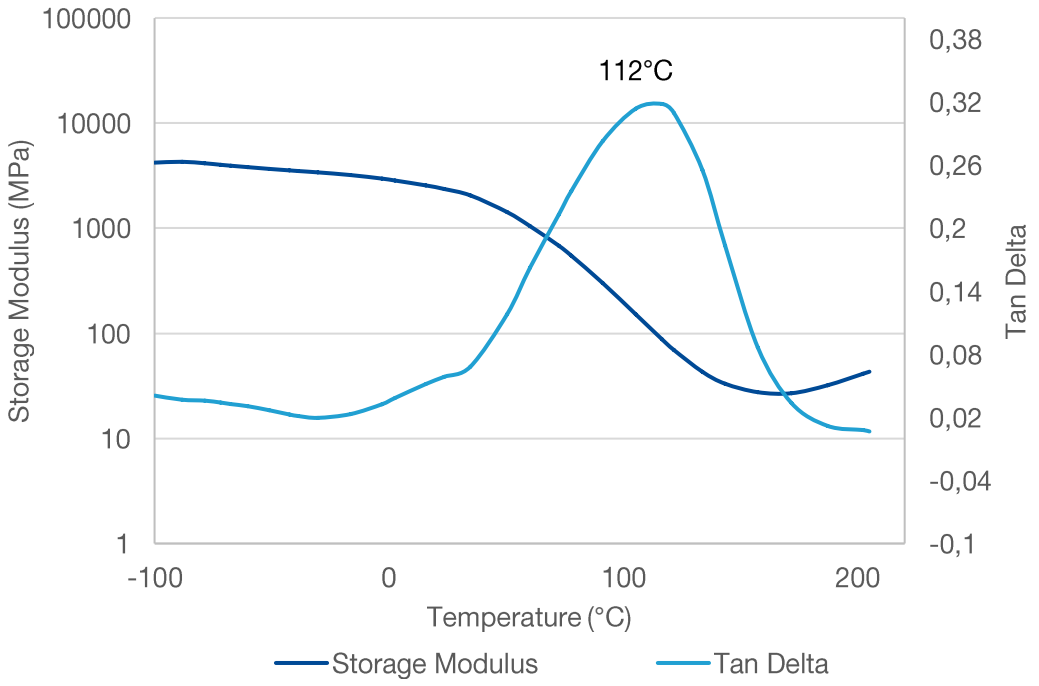
Effect of UV exposure on color of the specimens

Dynamic Mechanical Analysis (DMA)

In this DMA measurement, a cyclic strain is applied to the sample, and the response of the sample is recorded as a function of temperature. This can give a good impression of the changes in material behavior, both at low and high temperatures. The measured Storage modulus is a good indication of the stiffness of the material. The maximum in Tan Delta gives the glass transition temperature.

	Setting
Measurement	Strain-controlled
Temperature sweep	1°C / min
Strain	0.019% (linear viscoelastic regime)
Type of loading	Dual cantilever
Frequency	1 Hz

Testing conditions DMA



DMA curve

Biocompatibility

Product: Ultracur3D® RG 35 B

Revision: 08th of March 2021

3D printed test items of the above stated product have fulfilled the requirements of tests as stated below:

Cytotoxicity Testing- Neutral Red:

(ISO 10993-5 (2009))

The biocompatibility tests were recorded on test specimen of the above referenced product to show compatibility of the material in general. The biocompatibility tests listed are not part of any continuous production protocol. The test assessments reflect only the test specimen and have to be retested on the final product. It remains the responsibility of the device manufacturers and /or end-users to determine the suitability of all printed parts for their respective application.

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