SR *Green*Poxy 28 / SH 166 / SA 7900C

Biobased epoxy system for filament winding

SR *Green*Poxy 28 / SH 166 / SA 7900C is a biobased epoxy–anhydride system with accelerator, specially designed for hot processing methods such as filament winding and hot compression.

- Low viscosity: excellent impregnation of all types of reinforcements.
- Long pot life, with reactivity adjustable according to the accelerator SA 7900C content.
- Excellent mechanical and thermal performance.
- Glass transition temperature (Tg) 140 °C after post-curing.

		SR *Green*Poxy 28 / SH 166 / SA 7900C	
Mixing ratio	By weight	100 / 90 / 1	100 / 90 / 2
Initial viscosity (mPa.s)	25 °C	1 025	1 150
	80 °C	27	31
	140 °C	6	6
Density (kg/L)	20 °C	1.20	
T_g2 (°C)		140	
Gel time	80 °C	1 h 30	55 min
	120 °C	7 min	4 min
	140 °C	3 min	2 min

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Resin

		SR GreenPoxy 28
Aspect and color		Viscous liquid
Gardner color		≤ 2
Viscosity (mPa.s)	20 °C	23 500
	25 °C	9 750
	30 °C	4 590
Density (kg/L)	20 °C	1.17
Biobased carbon content (%)		28
Shelf life	23 °C	24 months

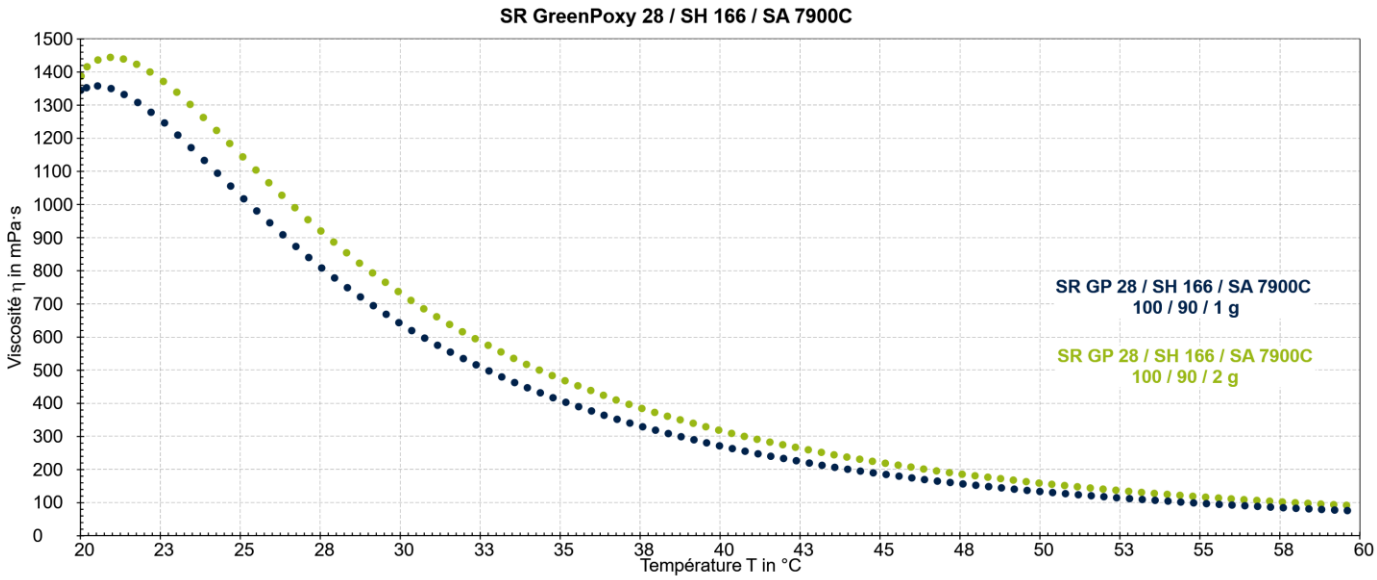
Hardener

		SH 166
Aspect et color		Yellow liquid
Gardner color		< 2
Viscosity (mPa.s)	20 °C	92
	25 °C	65
	30 °C	48
Density (kg/L)	20 °C	1.23
Shelf life	23 °C	24 months

Mixtures SR *Green*Poxy 28 / SH 166 / SA 7900C

		SR *Green*Poxy 28 / SH 166 / SA 7900C	
Mixing ratio	By weight	100 / 90 / 1	100 / 90 / 2
Initial viscosity (mPa.s)	25 °C	1 000	1 150
	80 °C	27	31
	120 °C	8	11
	140 °C	6	6
Gel time	80 °C	1 h 30	55 min
	120 °C	7 min	4 min
	140 °C	3 min	2 min
Density (kg/L)	20 °C	1.20	1.20

Initial mix viscosity



Post-curing

The mechanical properties on an epoxy system can be optimized through the implementation of a post-curing cycle. The Sicomin laboratory uses predefined cycles to create technical data sheets and facilitate the comparison of different systems. These experimental cycles can be adapted to the specific target application, taking into account the following parameters:

- Selected epoxy system (T_g2)
- Available heating methods
- Dimensions and sampling of the piece
- Nature of the tooling (thermal conductivity of the material)

Many system can provide good mechanical properties after curing at room temperature (>18 °C) for 24 to 48 hours before demolding. However, mechanical properties improve rapidly with a slightly higher temperature, around 40 °C, for several hours.

Epoxy systems with high T_g and slow hardeners imperatively require post-curing at higher temperature. The post-curing can start immediately after the exothermic peak, but it can also begin later, after the assembly of different components and before finishing operations. If the nature of the models and tooling is not suitable for high temperatures, we recommend carrying out the initial steps up to a maximum admissible temperature, then, after cooling and demolding, continuing the cycle with suitable former.

For a conventional epoxy system, we recommend a step-by-step cycle of 20 °C each for a duration of 4 hours.

Example for an epoxy system with a T_g2 of 100 °C:

4 h at 40 °C + 4 h at 60 °C + 4 h at 80 °C + cooling at room temperature before demolding.

There are many epoxy systems with short, high temperature curing cycles that do not fit into this post-curing scheme (pultrusion, hot press, pre-preg). For these systems, the initial curing achieves maximum mechanical performance without post-curing.

We invite you to contact our technical department for any questions on this subject.

Mechanical properties on cast resin

		SR *Green*Poxy 28 / SH 166 / SA 7900C	
Mixing ratio	By weight	100 / 90 / 1	100 / 90 / 2
Post-curing cycle*		4 h 80 °C + 8 h 140 °C	
Tensile			
Modulus	N/mm²	3 300	3 200
Maximum strength	N/mm²	85	66
Breaking strength	N/mm²	85	66
Elongation at max. strength	%	4.2	2.5
Elongation at break	%	4.2	2.5
Flexion			
Modulus	N/mm²	3 000	2 900
Maximum strength	N/mm²	143	132
Breaking strength	N/mm²	143	132
Elongation at max. strength	%	5.9	5.6
Elongation at break	%	5.9	5.6
Shear			
Breaking strength	N/mm²	50	56
Compression			
Yield strength	N/mm²	116	112
Offset compression yield	%	17.3	18.2
Charpy impact strength			
Resilience	kJ/m²	50	56
Glass transition			
T_g1	°C	135	140
T_g2	°C		140

*These post-curing cycles are applied after a 24 hour ambient temperature hardening period, allowing to surpass gel point and the exothemic peak.

Mechanical tests are carried out on samples of pure cast resin, without prior degassing, between steel plates.

Measurements are carried out following norms:

Physical properties

Gardner color	*NF EN ISO 4630*
Viscosity	*NF EN ISO 3219 - Rheometer, geometry cone/plate 50 mm - 2 ° at 10 s^{-1}*
Liquid density	*ISO 2811-1 - Pycnometer*
Powder density	*NF EN ISO 1183-3 – Helium pycnometer*
Foam density	*NF EN ISO 845*
Biobased carbon content	*ASTM D68166-16 – Some values are theoretically calculated*

Reactivity

Gel time	*Time sweep G' = G''- Rheometer, geometry plate/plate 50 mm, gap 1 mm*
Pot life	*Mean time to reach 50 °C or limit time for use*

Thermal properties

Glass transition	*NF EN ISO 11357-2 - Ramp from -5 to 180 °C at 20 °C/min* *The T_g values are recorded at the midpoint using the tangent method.* *T_g1 : 1er pass* *T_g2 : 2nd pass*

Mechanical properties

Tensile	*ISO 527-2*
Flexion	*ISO178*
Compression	*ISO 604 ou NF EN ISO 844 (foams)*
Charpy impact strength	*NF EN ISO 179-1*
Shear	*ASTM D732-17 (Punch tool)*
Toughness	*ISO 13586:2000*