

EP-PREG® S153 185-250°F (85-120°C) CURING EPOXY PREPREG

DESCRIPTION

Ep-preg® S153 is an epoxy prepreg suitable for the vacuum curing process. It has been designed to be easy to work in terms of handling and processing.

Ep-preg® S153 has a very long shelf life at room temperature, and long out of the bag tack time. Friendly, it can be used for very large composite parts that have to withstand severe weathering and mechanical stresses.

In spite of its high flow matrix, Ep-preg® S153 gives a high-quality surface when processed and cured properly. Ep-preg® S153 is available in all reinforcements and represents a great choice for many industrial applications.

As typically for wind blades, S153 is available in all types of E-glass fiber, such as stitched unidirectional, stitched ±45° (biaxial), and stitched ±45°/0° (triaxial).

PREPREG & LAMINATE FEATURES

- Long storing life, 15-16 weeks @ 20-23°C & 24 months @ -18°C.
- Versatile curing temperature 185-250°F (85-120°C).
- Suitable for vacuum and autoclave curing.
- Self-adhesive for core materials and secondary bonding.
- Good flexibility and easy handling.
- Environmentally friendly and retains its tack for several weeks.
- Suitable for thin and thick laminates.
- Superior mechanical properties.
- Good surface finish.
- Good fatigue and weather resistance.

CURED MATRIX PROPERTIES

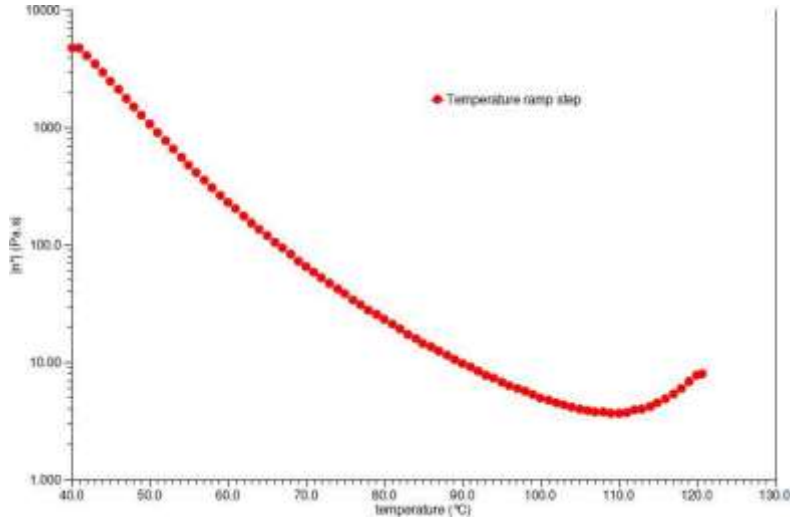
	2 hrs @ 120°C	Method
Tensile Strength (MPa)	77 ± 2	ISO R527
Tensile Modulus (GPa)	3.1 ± 0.1	ISO R527
Strain (%)	3.7 ± 0.1	ISO R527
Flexural Strength (MPa)	132 ± 5	ISO R178
Flexural Modulus (GPa)	3.05 ± 0.1	ISO R178
Strain (%)	8 ± 1	ISO R178
Compression Strength (MPa)	100 ± 2	ASTM D695
Compression Modulus (GPa)	3.2 ± 0.1	ASTM D695
Fracture toughness K1C (MPa√m)	0.8 ± 0.05	ISO 13586
Fracture energy G1C (J/m²)	230 ± 20	ISO 13586
Density (g/cm³)	≈ 1.16	
Glass Transition Temperature (°C)	112 ± 2	DSC - 10°C/min

TYPICAL APPLICATIONS

- Wind blades.
- Boats hulls and decks.
- Automobile and Sports Industries.

RHEOLOGY PROFILE

Minimum viscosity: 3.617 Pa.s @ 108.9°C



CURING SPECIFICATIONS

Minimum		Method
Curing temperature (°C)	85	DSC
Curing time (Hr) @ minimum curing temperature	6:00	DSC
Glass transition temp. Tg (°C)	97	DSC
Viscosity – 40 to 120°C @ 1°C/min – (Poise)	36.17	Rheometer
Temperature @ minimum viscosity (°C)	108.9	Rheometer

TYPICAL OVEN VACUUM CURING CYCLE

- Apply 24" Hg vacuum for 5-10 minutes before beginning heat cycle.
- Raise laminate temperature from room temperature to 185°F (85°C) within 30-45 min.
- Hold laminate at 185°F (85°C) for 30 min.
- Raise laminate temperature from 185°F (85°C) to 250°F (121°C).
- Hold laminate at 250°F (121°C) for 120 min.
- Cool the laminate to at least 176°F (80°C), prior to release vacuum pressure.

Notice:

- It must be understood that the curing time starts only after the prepreg temperature achieves the recommended temperature. The use of a thermocouple is a must to monitor the actual prepreg temperature.
- In case of vacuum bag processing, one ply of lightweight breather, 120 gsm, is recommended. A heavyweight breather, 340 gsm, has to be used in case of Autoclave processing. In both cases, two or three additional layers of breather have to be applied locally beside the vacuum ports.

ALTERNATIVE CURING CYCLES

Temperature (°C)	Gel time (mins)	Dwell time (Hrs:mins)	DSC Tg (°C)
85	-	6:00	95-100
90	-	4:00	95-100
100	-	6:00	110-115
110	13-15	-	-
120	7-9	2:00	110-115

VACUUM CURED STITCHED FIBER LAMINATES

30 min @ 85°C & 2 hrs @ 120° C

Properties	E-Glass						T 700	Test Method
	Stitched UD		Triax0/±45		Biax ±45		12K UD	
Fiber weight (gsm)	1152	1594	950		600		309	
Resin Content by weight (%)	32	32	38		50		44	
Number of layers	2	2	3		4		5	
Cured laminate thickness (mm)	1.8	2.2	2.4		2.5		1.9	
Laminate fiber volume (%)	50.3	57.8	45.9	45.9	37.8	37.8	50	
Tensile & Flexural Values in (°)	0	0	45	0	45	0	0	
Tensile strength (MPa)	1201	1217	440	151	348	125	1570	BS EN ISO 527-4
Tensile modulus (GPa)	39.5	45.9	33	12	18.2	7.5	115	BS EN ISO 527-4
Flexural strength (MPa)	1074	-	620	293	490	231	-	BS EN ISO 14125
Flexural modulus (GPa)	47	-	19	12.6	16.8	8.1	-	BS EN ISO 14125
Normalized properties @ 53% FVF								
Cured laminate thickness (mm)	1.71	2.37	2.12	2.12	1.78	1.78	1.78	
Tensile strength (MPa)	1077	1080	498	171	488	175	1628	BS EN ISO 527-4
Tensile modulus (GPa)	41.6	42.2	32.1	11.8	25.5	10.6	120	BS EN ISO 527-4
Tensile stiffness Coef. (GPa*m)	37.6	-	-	-	-	-	-	BS EN ISO 527-4
Flexural Strength (MPa)	1137	-	702	352	688	261	1775	BS EN ISO 14125
Flexural modulus (GPa)	49.9	-	18.6	12.4	19.6	9.2	120	BS EN ISO 14125
Inter-laminar Values in (°)	0	0	45	0	45	0	0	
Shear strength (MPa)	75	75	45	28	-	-	90	ASTM D-2344
Shear strength (MPa)	-	-	-	-	51.5 [■]	-	-	EN-2377

■ 8 layers (l = 26.06 mm; b = 13.45 mm; d = 4.11 mm)

STORAGE AND HANDLING

All Ep-preg® prepregs are wrapped in a barrier film immediately after impregnation. During storing and handling, the following notes must be considered:

- Ep-preg® prepregs should be stored in their original packaging barrier film, or an equivalent film, at -18°C.
- Before use, the prepreg roll has to be out of the freezer and remain tightly sealed for 48 hours, time required to reach ambient room temperature.
- It is highly recommended to handle the prepreg at a clean area where relative humidity is $\leq 52\%$ and ambient temperature is 20-23°C.

SAFETY PRECAUTIONS

Usual precautions, as following, must be considered:

- During lamination, workers must avoid skin contact by wearing appropriate disposable protective gloves.
- Clean protective coveralls or equivalent clothes must be worn before laminating and also sanding.
- Protective glasses must be worn to avoid eyes contamination. In case of contamination, eyes must be flushed for 15 min and then medical treatment must be applied.
- After working, hands and contaminated skin, if any, have to be washed with soap and warm water. This has to be implemented as a routine practice.