

## Toughened Resin System

# 4545S



4545S is toughened epoxy resin system. It has excellent fracture toughness( $G_{1c}$ ) and mechanical properties. This resin system is suitable for the realization of high performance composite structure and it is based on 250°F (121°C) curing cycle.

### COMPOSITE PROPERTIES

#### UD Tape

PROPERTY	T-700S	M40J	M46J	METHOD
Tensile Strength	2623 MPa	2651 MPa	2238 MPa	ASTM D 3039
Tensile Modulus	137 GPa	229 GPa	260 GPa	
Compressive Strength	1397 MPa	1165 MPa	950 MPa	ASTM D 695
Compressive Modulus	117 GPa	184 GPa	210 GPa	
Flexural Strength	1900 MPa	1604 MPa	1372 MPa	ASTM D 790
Flexural Modulus	122 GPa	217 GPa	237 GPa	
Open Hole Tensile Strength	484 MPa	-	-	ASTM D5766
Open Hole compressive Strength	354 MPa	-	-	ASTM D 6484
Filled Hole Tensile Strength	473 MPa	-	-	ASTM D 6742
Filled Hole compressive Strength	395 MPa	-	-	
ILSS	97 MPa	96 MPa	89 MPa	SACMA 8R-94
Fracture Toughness ( $G_{1c}$ )	360 J/m <sup>2</sup>	-	-	ASTM D 5528

※ The prepreg for mechanical testing is the carbon UD prepreg (FAW:150 gsm, R/C:33±2 wt.%) using T700S, M40J and M46J by Toray.

※ The result of 4545S  $G_{1c}$  is 33% better than our normal resin system.

#### 3K Plain Weave

PROPERTY	T300 3K Plain	METHOD
0° Tensile Strength	689 MPa	ASTM D 3039
0° Tensile Modulus	58 GPa	
90° Tensile Strength	638 MPa	ASTM D 6641
90° Tensile Modulus	56 GPa	
0° Compressive Strength	725 MPa	ASTM D 6641
0° Compressive Modulus	52 GPa	
90° Compressive Strength	674 MPa	SACMA 8R-94
90° Compressive Modulus	51 GPa	
45°/-45° In-Plan Shear Strength	72 MPa	SACMA 8R-94

※ The prepreg for mechanical testing is the carbon fabric (FAW:208 gsm, R/C:42±2 wt.%).

## NEAT RESIN PROPERTIES

PROPERTY	4545S Neat Resin	METHOD
Tensile Strength	78 MPa	ASTM D 638
Tensile Modulus	3.6 GPa	
Flexural Strength	146 MPa	ASTM D 790
Flexural Modulus	3.6 GPa	
Fracture Toughness(K1c), MPa·m <sup>1/2</sup>	1.6 MPa·m <sup>0.5</sup>	ASTM D 5045

## THERMAL PROPERTIES

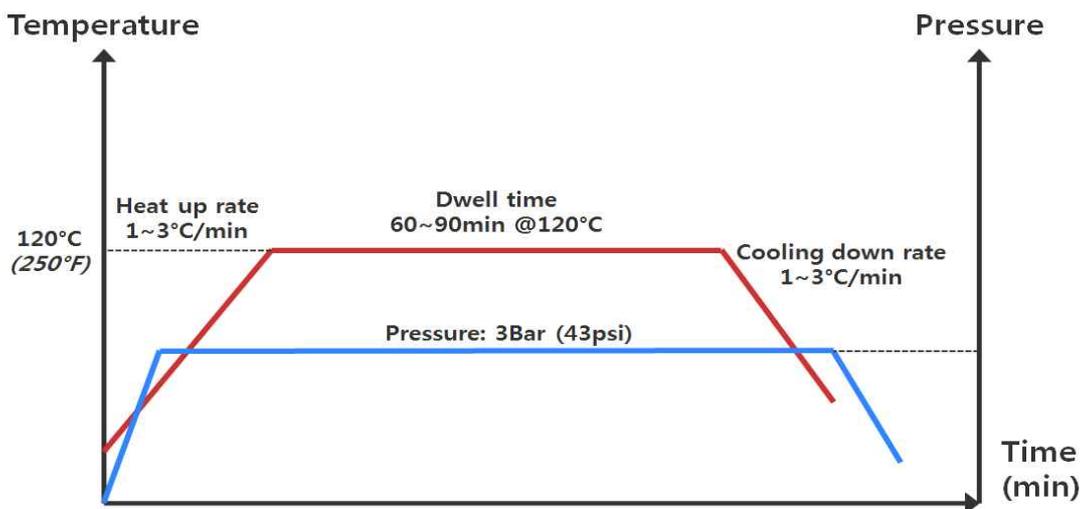
PROPERTY	VALUE
Tg by DSC	141 °C

※ Tg defined by DSC after curing as below typical curing cycle.

## PROCESSING CONDITION

TEMPERATURE	CURING TIME
80°C (Minimum Cure Temperature)	540 min
130°C	60 min

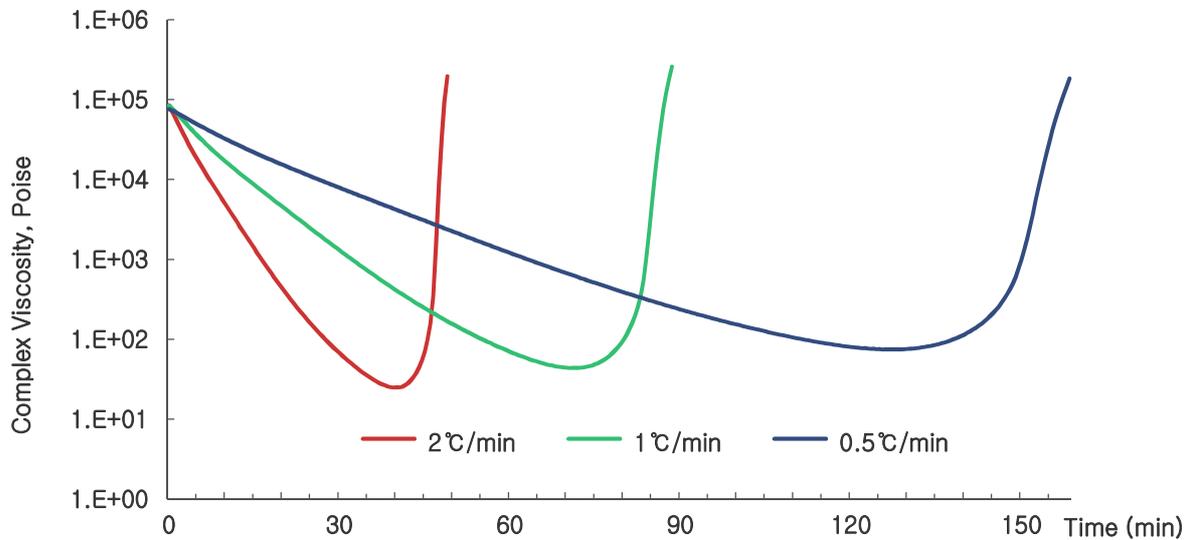
Typical autoclave cure cycle is shown as below.



## RHEOLOGY

HEATING RATE	MINIMUM VISCOSITY
0.5°C/min	78 Poise
1°C/min	44 Poise
2°C/min	15 Poise

The viscosity of 4545S was measured according to the rate of temperature rise of 0.5, 1, 2°C/min.



## SHELF LIFE

STORAGE TEMPERATURE	SHELF LIFE
Room Temperature +21°C	1.5 month
Cold Storage -5°C	3 month
Frozen -21°C	12 month

## HANDING & USE

Prepreg which is impregnated with 4545S resin system must be stored in a freezer. When material is removed from the freezer, it is essential that the roll be allowed to thaw and reach room temperature before the plastic bag is opened. For example, the thaw time for a 20 linear meter roll taken from -18°C(0°F)storage into a 21°C(70°F) room is typically between 4 and 6 hours. Condensation may form on the surface of the material. if it is not fully thawed. Moisture within a curing laminate may be detrimental to final part quality and appearance. When materials are returned to the freezer, they must be resealed to prevent ingress of moisture.