Materials Selection Guide

SKYFLEX Prepreg

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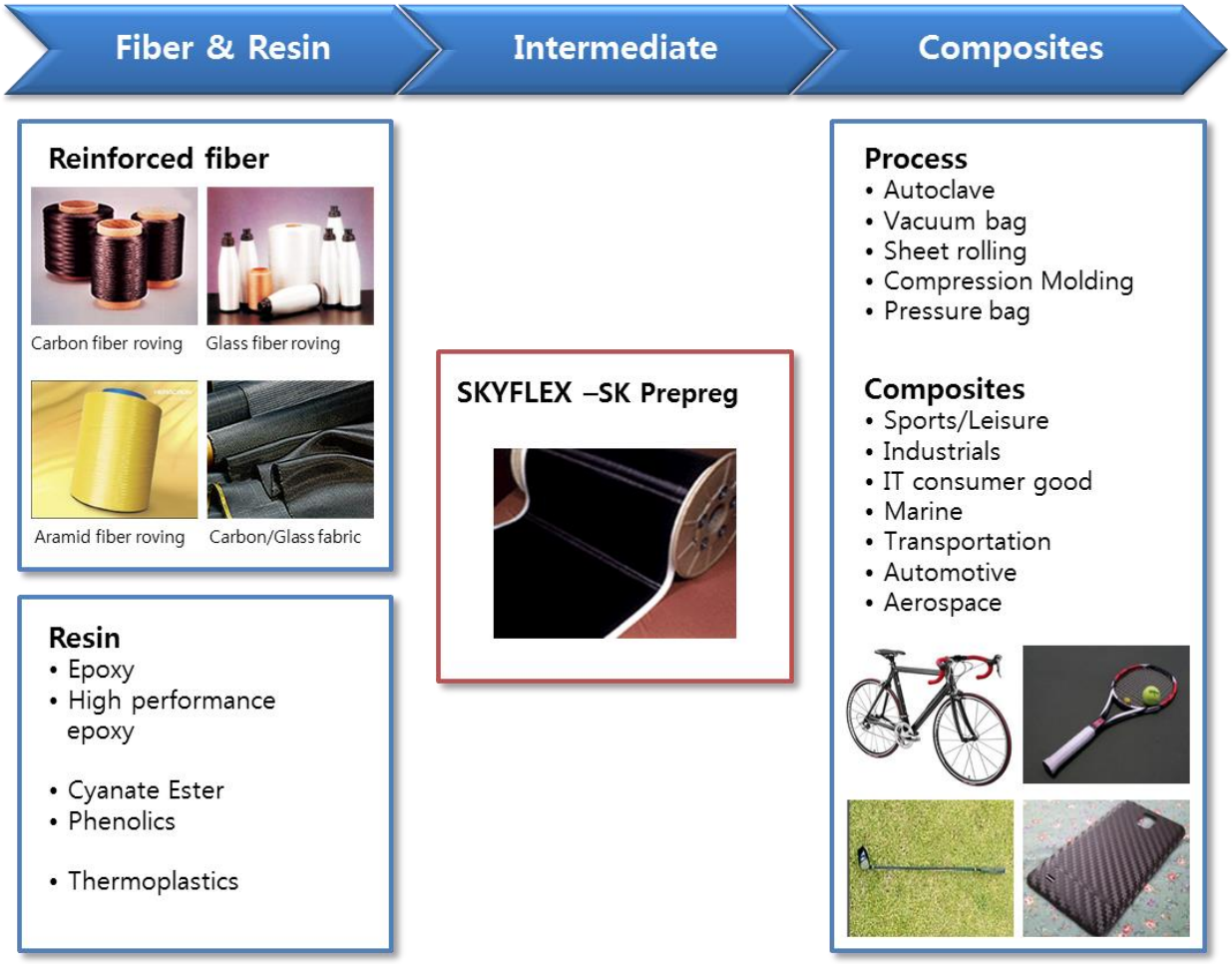
SKYFLEX – SK Prepreg

Prepreg or "pre-impregnated" material sheet is defined as a sheet of a specially formulated resin matrix with reinforcing fiber such as carbon, glass or aramid. It is an intermediate used for composite parts manufacturing. Prepregs are one of the most advanced composite materials in the world. When cured under heat and pressure, they form ultimate strong and lightweight composite parts. With its high strength and lightweight, it can be used in the sporting goods, aerospace, military, automotive, new renewable energy and IT industries."

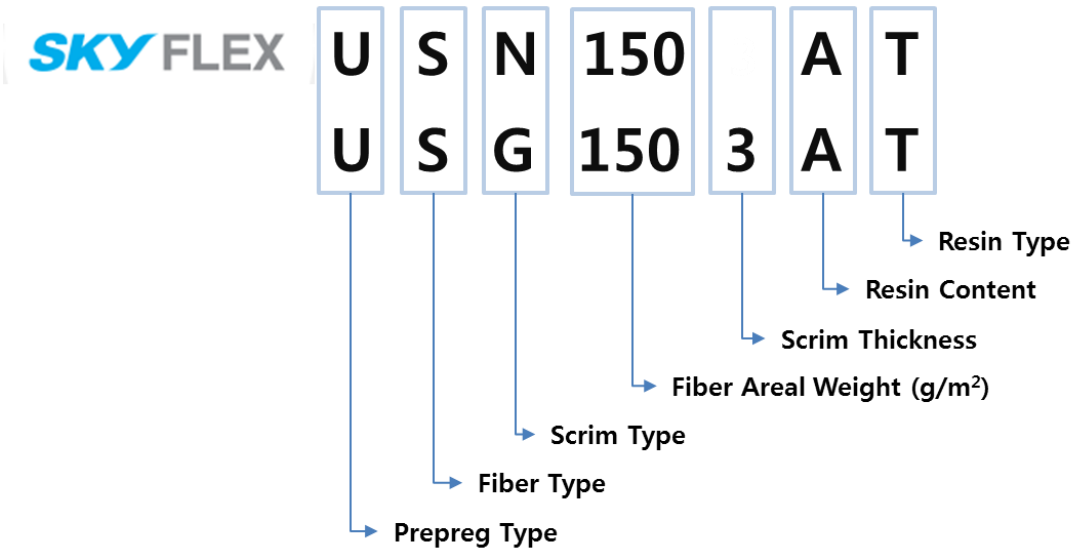
"SKYFLEX" is SK Chemical's proprietary brand name of prepregs. SK Chemicals started the commercial production of SKYFLEX carbon fiber based prepregs in 1986, and successfully dominated the sports/leisure and industrial application markets. Our vision is to be a global leader in advanced composite materials. With the establishment of our latest facility in the SK R&D center, we are developing advanced resin systems for prepregs, new composite materials that include thermoplastic prepregs, film adhesives, and core materials

SKYFLEX represents the best in the world, to offer our customers the optimized solution of materials, based on our expert know-how in design, manufacturing, testing and composite processing.



Prepreg Selection Guide

• **Classification of SKYFLEX**



• **Product range**

Parameter	Typical Range for Prepreg
Type	UD, Fabric, Tape, Yarn
Fiber (tonf/mm², Modulus)	24 ~ 80ton in Carbon fiber / E-glass, S-glass, S2-glass / Aramid
Resin Content (%)	25 ~ 50
FAW (g/m²)	20 ~ 600
Width (mm)	1,005
Packing Length (m/box)	100

※ Some characteristics such as FAW(Fiber Areal Weight), RC(Resin Content), Tacky, Gel time etc. could be tailored to meet customer's requirement

1. Prepreg Type

U S N 150 A T

Code	Prepreg Type	Characteristics	Application
U	UD (Unidirectional)	- High strength and stiffness in one direction - Easy to control fiber weight (20 ~ 600gsm) - Weak in transverse direction	Sports/Leisure Industrial application Wind energy
W	Woven fabric (including NCF)	- Strength and stiffness in multi directions - Good drape-ability and handling - Choice of weave style - For carbon woven, cosmetic appearance	Sports/Leisure Automotive
T	Slit Tape	- High strength and stiffness in one direction - Suited for fiber placement technique	Fiber placement
Y	Yarn / Single Tow	- Suitable for filament winding - X wrapping for rod	Pressure vessel Tubes

2. Fiber Type

U S N 150 A T

Fiber	Code	Character	Available Fiber	Typical Properties(1)			Std. FAW(2)
				Strength (MPa)	Modulus (GPa)	Density (g/cm^3)	(g/m^2)
Carbon	**S**	HS Carbon Fiber (24T)	Pyrofil TR50S* Torayca T700	4900	240	1.82	020~300
	I	IM Carbon Fiber (30T)	Pyrofil MR60H* Pyrofil MR40 Torayca T800H	5680	290	1.81	050~150
	M	IM Carbon Fiber (35T)	Pyrofil MS40* Torayca M35J	4410	345	1.70	050~150
	H	HM Carbon Fiber (40T)	Pyrofil HR40* Torayca M40J	4410	395	1.82	050~150
	P	HM Carbon Fiber (46T)	Pyrofil HS40* Torayca M46J	4610	455	1.85	069, 092
	R	UHM Carbon Fiber (Pitch based, 65T)	Dialead K63712*	2600	640	2.12	300
	X	UHM Carbon Fiber (Pitch based, 80T)	Granoc CN-80*	3430	780	2.17	300

Fiber	Code	Character	Available Fiber	Typical Properties(1)			Std. FAW(2)
				Strength (MPa)	Modulus (GPa)	Density (g/cm^3)	(g/m^2)
Glass	G	E-Glass	PFG 1062* OCV Advantex	3445	72	2.7	110
		S2 Glass	OCV S Glass AGY S2 Glass*	4890	86	2.55	110, 150
Aramid	A	Para-aramid	Kevlar 29* Technora	2900	78	1.44	090

(1) Typical Properties : Properties of asterisked grade of fibers (*)

(2) Additional FAWs are available upon customer's request.

(3) Pyrofil is the trademark of Mitsubishi rayon carbon fiber

(4) Torayca is the trademark of Toray carbon fiber

3. Scrim Type

U S **N** 150 A T

Code	Scrim	Type	FAW	Thickness	Remark
N	No Scrim	-	-	-	Without Scrim
G	Glass	Plain Glass Fabric	25	0.03	-
C	Carbon	UD	25	0.02	Specifications can be customized

4. Fiber Areal Weight / Weave Style

U S N **150** A T

W S N **3K** A T

- UD Prepreg type : 150 means FAW(Fiber Areal Weight). Can be available 20~600g/m^2
- Woven Prepreg type : 3K means Weave style

- **Weave style for woven prepreg**

Woven fabrics are generally used in high-performance composites to reinforce them. A wide range of different types of woven fabrics are used, the most familiar being plain weave, twill weave and satin weave. The density of the fibre and the type of weave critically influence the forming properties and the characteristics of the finished product.

Plain Weave

Low Drapeability
High Crimp
Good Decoration

Twill Weave
(2/1, 3/1, 2/2)

Medium Drapeability
Mudium Crimp
Good Decoration

Satin Weave
(4H, 8H)

Good Drapeability
Low Crimp

• **Typical Woven Prepreg**

Fiber	Prepreg type	Code	Weave Style	FAW	Weave Density(1) (WARF/FILL)
Carbon	**WSN**	**1K**	Plain	120	22 / 22
	WSN	**3K**	Plain	204	12.5 / 13.5
	WSN	**3KT**	Twill	240	15 / 15
	WSN	**3KTB**	Twill	283	18 / 18
	WSN	**12K**	Plain	400	6.2 / 6.2
Glass	**GEP**	**203**	Plain	25	60 / 52
	GEP	**132**	Plain	318	32 / 28
	GEP	**213**	4H Satin	162	50 / 30
	GEP	**215**	4H Satin	180	58 / 26
	GEP	**218**	4H Satin	208	64 / 26
	GEP	**224**	4H Satin	302	50 / 26
	GEP	**7781**	8H Satin	300	57 / 54

(1) Weave Density : count / inch^2

※ Another weave styles are available upon customer's request.

5. Resin Content

U	S	N	150	A	T

Code	Y	R	A	B	C	E	G
Resin Content	40%	38%	36%	33%	30%	25%	20%

※ Another resin content(20~80%) are available upon customer's request.

6. Resin System

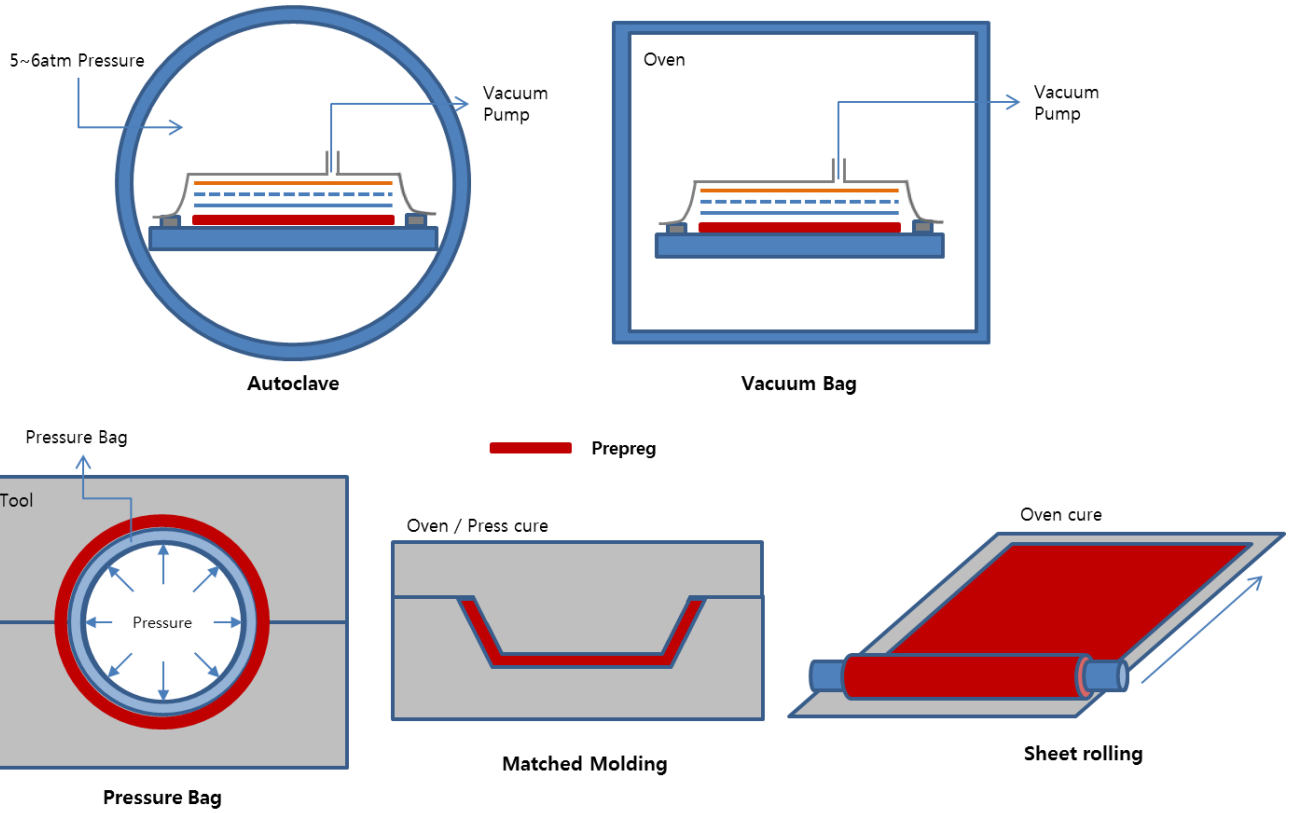
U	S	N	150	A	T

Mark	Resin System	Typical Cure Cycle[1]	Tg[2]	Controlled Flow	Toughened	Processing	Application
K	K51	90min@125℃ 30min@150℃	125	○	○	Sheet Rolling Pressure Bag Autoclave	Fishing rod, Golf shaft, Bike parts, Arrow shaft, Industrial
		Standard grade of epoxy resin system. Well balanced thermal, mechanical properties.					
T	T21	90min@125℃	110	○	◎	Autoclave Pressure Bag	Hockey Stick, Racket, Baseball bat, Automotive Part
		Rubber toughened epoxy resin system					
Q	Q10	90min@125℃	115	○	◎	Autoclave Pressure Bag	Bike parts, Hockey Stick, Golf Shaft
		Block copolymer toughened epoxy resin system					
-	H15	60min@150℃	160	○	○	Autoclave Pressure Bag	Bike parts(Rims), Industrial
		Mid-high temp resistance epoxy resin system. Conventional process condition can be used.					
H	H18	90min@150℃	155	X	X	Press Autoclave	Composite Tool Composite Roller Robot Hand
		Mid-high temp resistance epoxy resin system.					
P	H23	90min@175℃ + Post Cure	200	X	X	Autoclave	Composite Tool, Roller, Robot Hand, Industrial, Aerospace
		High temp resistance cyanate ester resin system. Low emission, low shrinkage, flame retardant					
F	F07	90min@125℃	115	△	X	Press Autoclave	TV, Notebook Housing, Automotive part, Marine(interior rart)
		Flame retardant epoxy resin system, halogen free, UL94V0, RoHS compliant					
-	L06[3]	5hrs@80℃ 30min@125℃ 10min@140℃	80	X	X	Vacuum bag Press	Large structural parts, sports good, Industrial
		Low temp curing / Fast curing epoxy resin system.					
-	C03[3]	90min@125℃	125	◎	△	Sheet rolling Pressure bag	Golf shaft, racket, bike parts
		CNT(carbon nano tube) applied epoxy resin system					
-	B01[3]	3hrs@100℃ 60min@125℃	110	X	X	Autoclave Vacuum Bag	Large structural parts, Automotive, Marine, Industrials
		Epoxy resin system for thick prepreg					
-	U12[4]	90min@125℃	100	-	-	Vacuum bag, Sheet rolling	Marine, antenna
		Styrene free Unsaturated Polyester resin system Long term good weathering properties					
-	P18[4]	90min@175℃	180	-	-	Vacuum bag, Autoclave	Transportation interior
		Phenol resin system Flame retardant, high thermal stability					

(1) Typical cure cycle should be optimized according to user's process conditions
(2) Tg : measured by DMA, onset E'
(3) These resin systems are the customer's order base product.
(4) Only woven prepreg type is available.

7. Processing

Prepregs are can be cured in different method by applying heat and pressure. The drawing below is the most common methods to fabricate composite parts



8. Auxiliaries

Item	Descriptions	Typical Grade	Application
Expandable Epoxy Core-material	- Co-curable with SK prepreg - Most advanced expandable core material - Various densities are available - Extremely high load bearing core material	SCM-350 (d=0.35g/cc) SCM-600 (d=0.60g/cc)	Bicycle Part Hockey Stick Blade Ski/Snowboard
Film Adhesives	- Good fillet formation in honeycomb - Co-curable with SK prepreg	SFA-K51 SFA-T21 (Toughened)	Sandwich Panel Boat

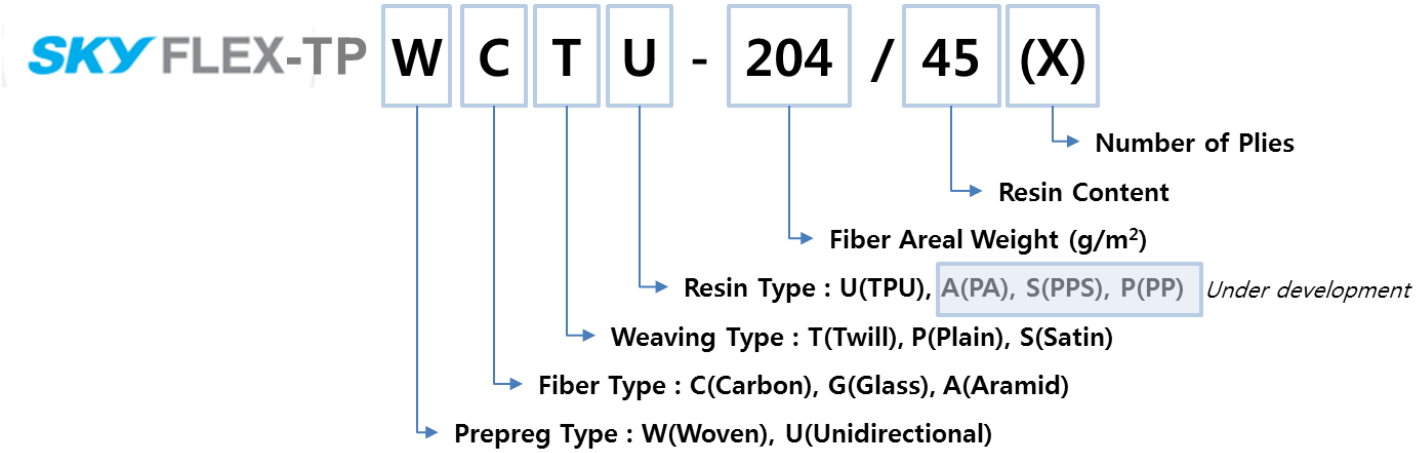
Item	Descriptions	Typical Grade	Application
OPP Wrapping Film	- Low shrinkage - Consentient thickness - Best match with SK prepreg	P Tape-30	Fishing rod Gold Shaft Other tubes
ERM (Epoxy resin for Mandrel)	- Prepreg binder resin for mandrel	ERM 2501	Fishing rod Gold Shaft Other tubes
Solid Wax	- Releasing agent for mold		-

SKYFLEX-TP : SK Themoplastic Prepreg

SKYFLEX-TP is SK chemical's proprietary brand referring to Prepreg, a sheet material made by reinforcing continuous fibers (carbon, glass, or aramid) in various types of thermoplastic resin. Combining high strength fibers with engineered thermoplastic resins, SKYFLEX-TP serves applications such as automotive, industrial, and sports and leisure fields requiring the cost-cutting advantages of light-weight material with exceptional strength and impact resistance.

Production Selection Guide for Thermoplastic Prepreg

• Classification of SKYFLEX-TP (Thermoplastic)



※ For more information, please contact us

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