

HANKUK CARBON

Hankuk Carbon Sustainability and Circularity Vision and Solutions





Composites, All at once

Hankuk Carbon has been producing composite materials, including carbon fiber textiles and prepregs since 1984. With over 38 years' experience, Hankuk Carbon delivers a wide range of innovative, multi-functional composites solutions with plants in South Korea, Vietnam, and Slovakia and global offices in China, UK and Germany.

Materials

Parts & Products

Engineering & Solution

Evaluation & Analysis

5 offices

South Korea 2, Europe 1,
Vietnam 1, China 1

9 plants

South Korea 7,
Europe 1, Vietnam 1

15 %

Ratio of 79 researchers to
a total of 510 staffs

403 million

Market cap(USD)

287 million

Revenue(USD)

The largest capacity

50,600,000 m²/yr

Weaving machines, Hotmelt & Solvent lines





Business Area



Sports & Leisure

- First Domestic Production of Carbon Prepreg
- 70% Global Market Share for Fishing Tackle
- Production of High-Performance Materials for Yacht Hulls, Masts, etc.



Energy

- First in Korea to Obtain GL Certification for Wind Power Blade Materials: Spar cap (OOA, Low Temperature Curing), 3-Megawatt Class
- Production of Battery Case Materials Possessing Eco-friendly and Flame-Resistant Properties



Marine

- Possesses world No. 1 manufacturing capability for cryogenic LNG carrier insulation panels
- World No. 1 in RSB (Sole Manufacturer)
- World No. 1 in FSB: 2 Companies
- World No. 1 in R-PUF



Automotive

- Possesses production technology for rapid-curing materials for mass production and productivity enhancement
- Vehicle body structural materials (high strength, high toughness). Exterior materials (transparency)



Aerospace

- Development of materials for civilian and military aircraft
- Boeing certification for 7 types of materials for aircraft interiors across all models
- Development of secondary structural materials completed and certification process in progress (Boeing)
- Aircraft parts production (Boeing, Airbus, KAI)
- Development of high-performance, high-elasticity materials for satellites



Defense

- Flame treatment device
- Composite launch tube
- Heat-resistant material
- Guided weapon



Sustainability

- Increasing Renewable Energy Usage Through Solar Power Installation
- 90% ↑ Solar Coverage on Factory Building
- 50% ↑ Energy Consumption from Renewable Sources
- Reduced Carbon Footprint and Cost Saving





Sustainability

Recyclable Epoxy Prepreg

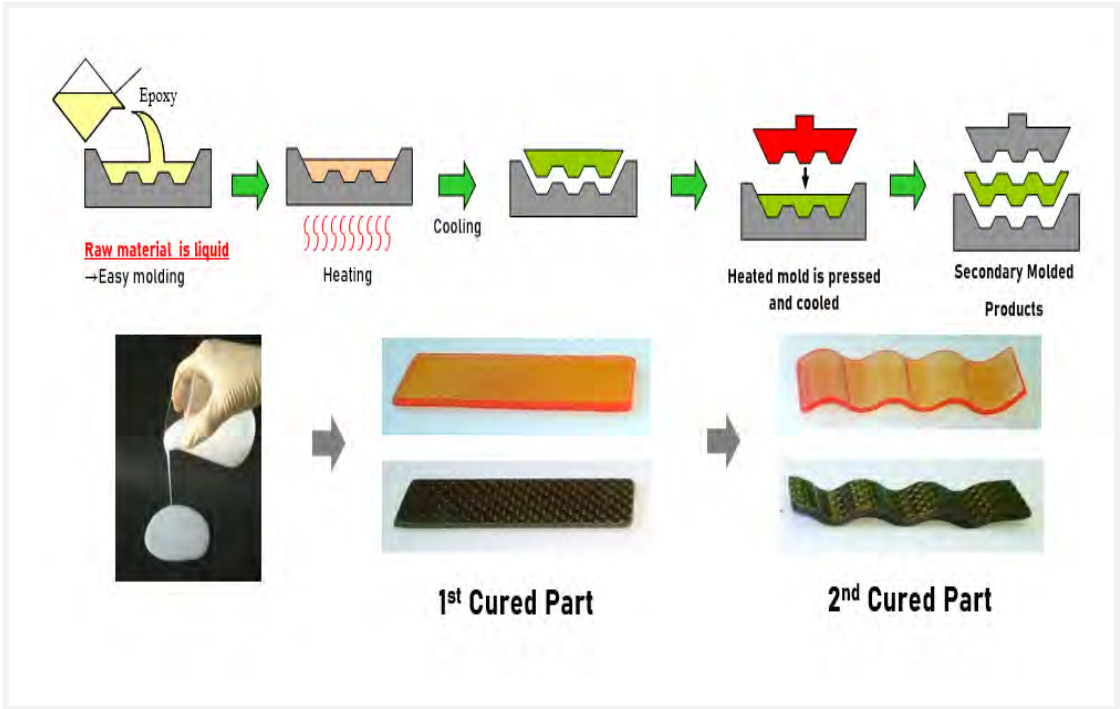
- Recyclable and Reformable Prepreg
- Enabling Secondary Forming without compromising Structural Integrity
- Reduces Additional Raw Materials during Secondary Manufacturing Processes

- 01. Thermoforming Property
- 02. Recyclable Property
- 03. Bonding Property

Repreg's unique differentiation ensures competitiveness in the composite materials market.



Unit	Repreg 10	Repreg 12
DMA Tg	100°C	120°C
Cure Cycle	120°C, 60min	120°C, 60min
Color	Clear	Clear
Method	Autoclave, Press, Oven	Autoclave, Press, Oven
Fiber	Carbon, Glass Fiber	Carbon, Glass Fiber





1. Thermoforming Property

1) Reusable and Remanufacturable

Circular economy through local reshaping, part shape modification, and reshaping

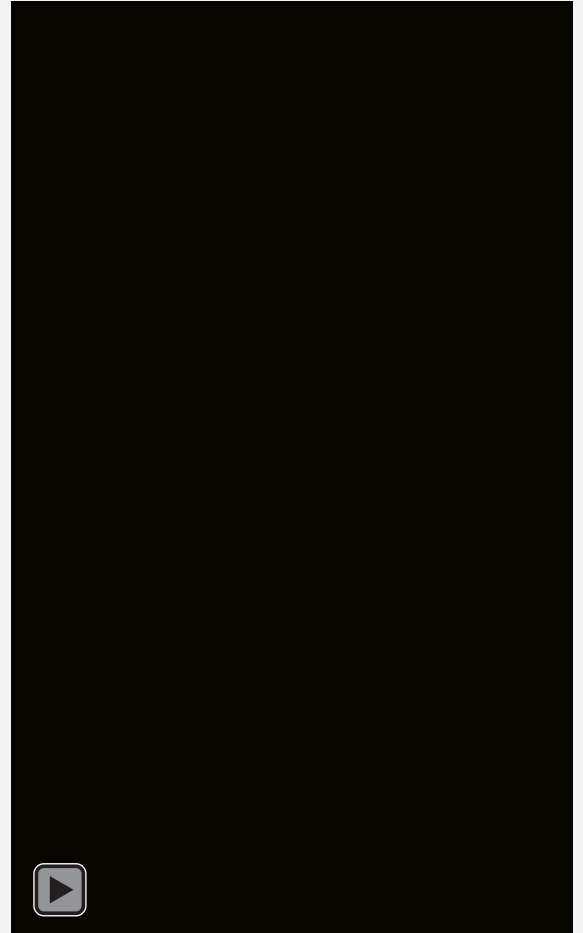
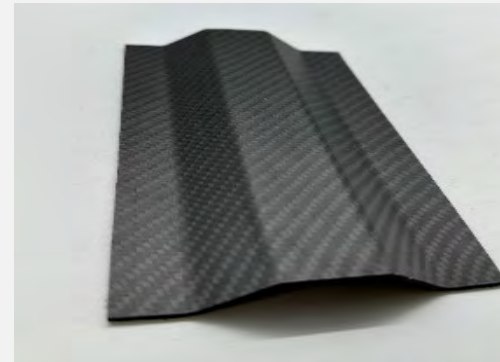
2) High degree of design freedom

The freedom of reshaping and designing complex curved surfaces leads to reduced material usage and a simplified process that eliminates post-processing.

Recyclable CFRP Thermoforming Method

1. Preheat the CFRP mold to 160°C in a high-temperature oven.
2. Apply pressure to the heated laminate using the mold tool to press it into place.
3. Once cooled to below 100°C, the mold is removed to complete the thermoforming of the CFRP.

160°C Thermoforming
Press Pressure (3bar)



Comparison in terms of sustainability

Unit	Thermoset CFRP	Recyclable CFRP	Thermoplastic CFRP
Mechanical Property	excellent	Equivalent level to epoxy	Limited
Reforming	difficult	excellent	excellent
Reuse	difficult	excellent	excellent
Recycling	difficult	excellent	excellent
Sustainability	difficult	excellent	excellent

Comparison with thermosetting materials

- Mechanical properties and Workability equivalent comparable to those of thermosetting epoxy materials
- It is highly advantageous in terms of sustainability as it allows for physical and chemical recycling while retaining the advantages of epoxy.

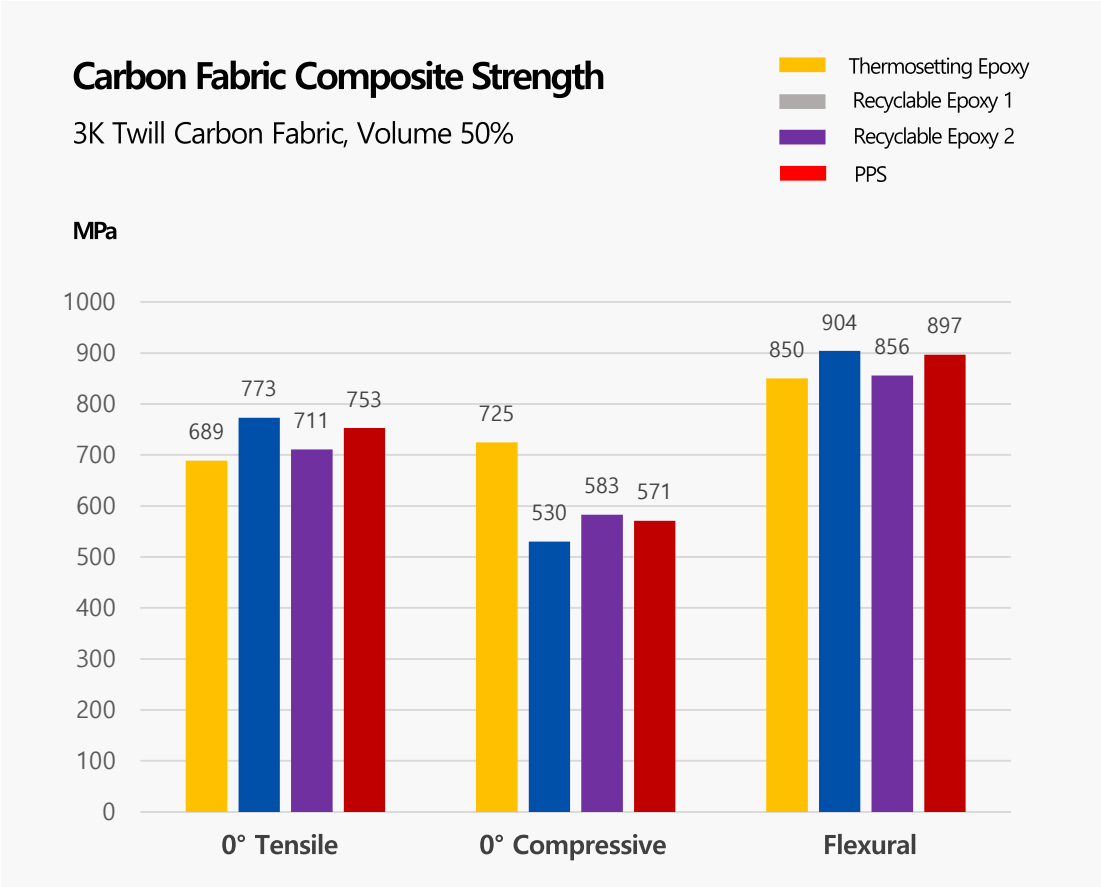
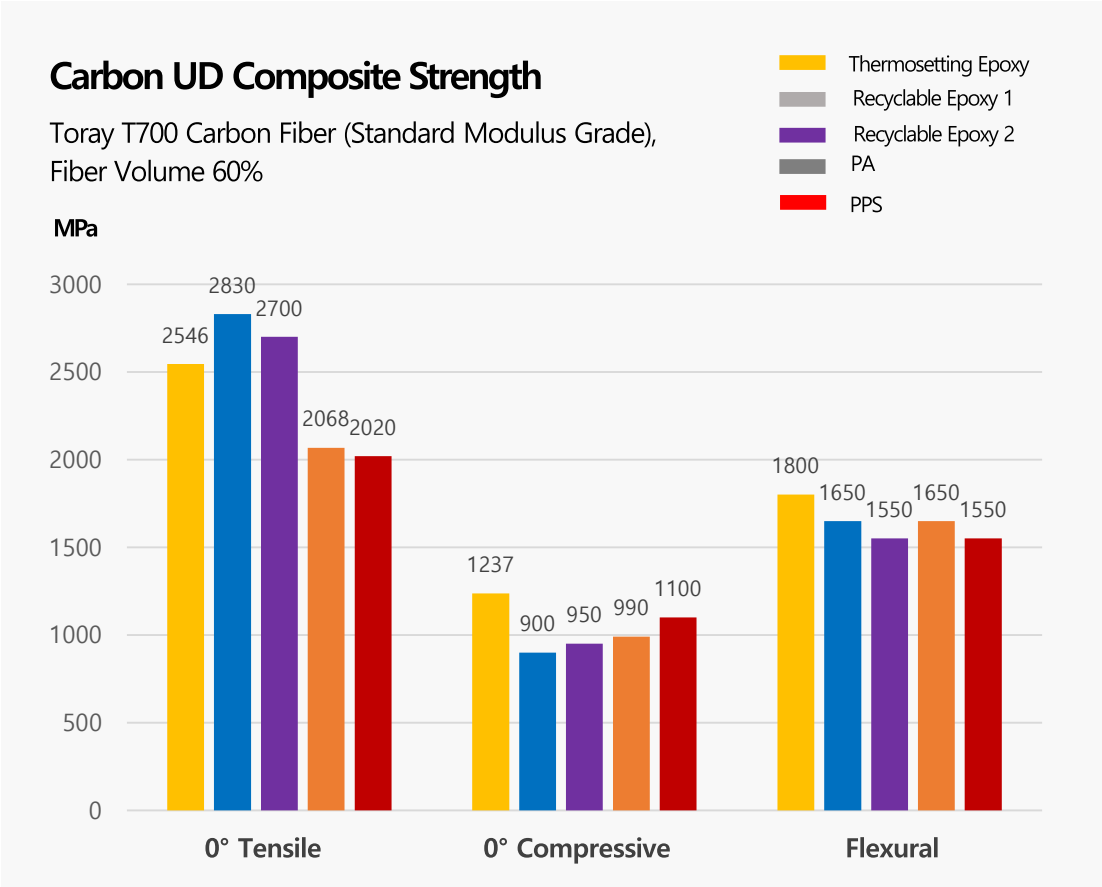
Comparison with thermoplastic materials

- Similar to thermoplastic materials, partial or additional shapes can be continuously created using heat and pressure.
- Compared to thermoplastics, they have a high Tg and low heat deflection temperature, making them easy to apply to equipment.

CFRP	Regreg	PA	PPS	PAEK
Glass Transition Temperature(°C)	100-120	100-120	90	140
Thermoforming Temperature(°C)	>160	>200	>300	>320

Carbon UD, Carbon Fabric Composite mechanical properties

Mechanical properties comparable to those of HC thermosetting epoxy materials.





2. Bonding Property

1) Repair instead of Replacing parts

Damaged CFRP parts can be repaired and reinforced instead of being replaced, extending service life and reducing waste.

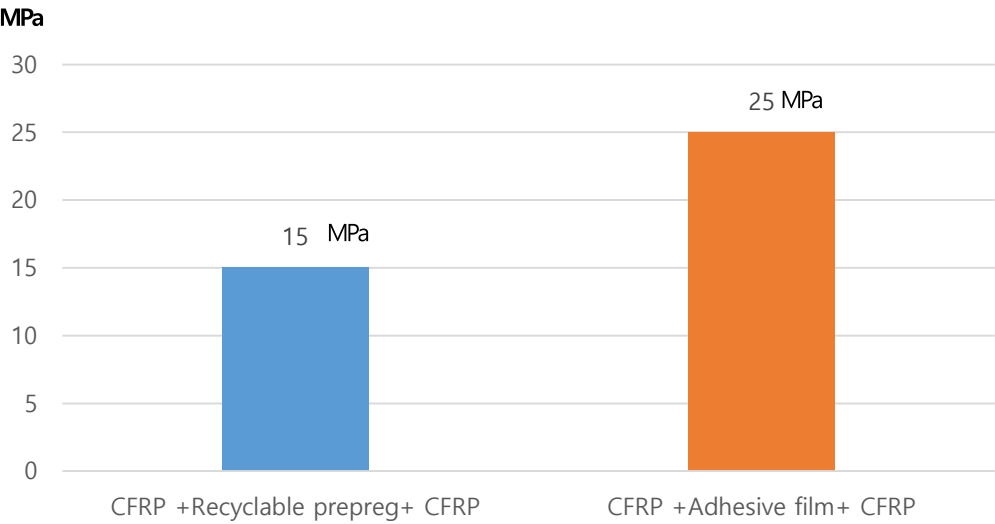
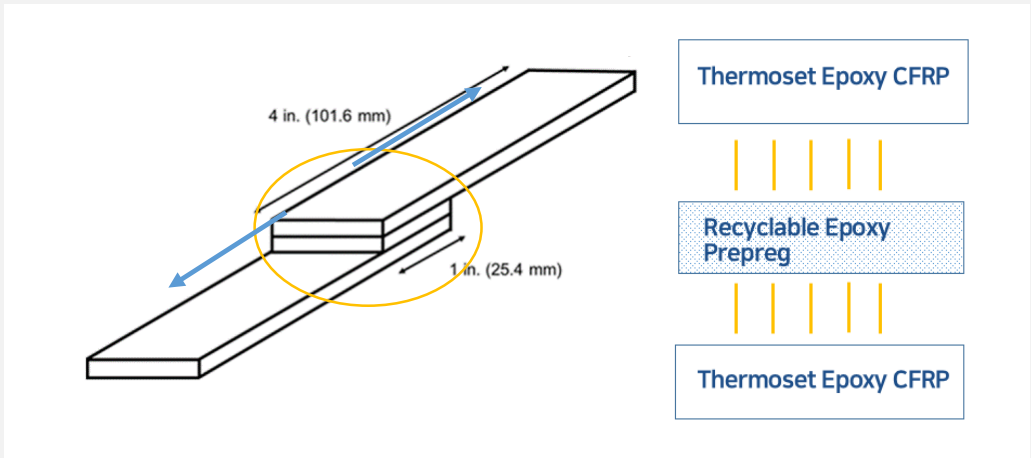
2) Reduce Bonding Process

Reducing additional adhesives and fasteners helps minimize material usage and manufacturing waste.

Unit	Thermoset CFRP	Recyclable Prepreg
Bonding	Impossible	Direct joining possible with thermoforming
Process	Adhesives and mechanical fasteners	Heat re-molding and heat fusion possible
Productivity	Complex process, many assembly processes	Structural integration possible in a single process

Lap shear Test

Load application direction(Tensile)





3. Recycle Property

1) Implementation of a Circular Economy

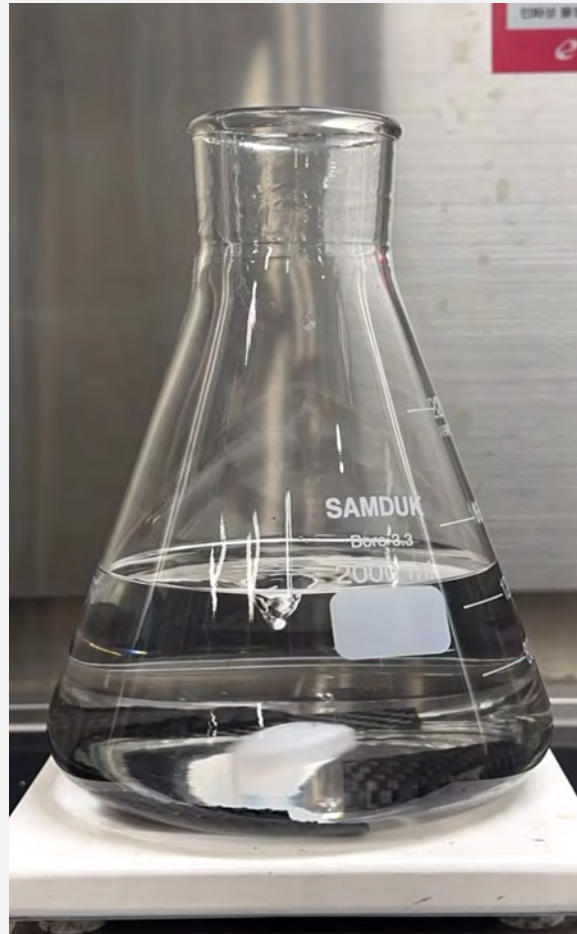
a circular composite economy through fiber recovery, resin separation, and material reuse.

2) Recovered Carbon Fiber Reuse

Reduces carbon emissions and composite waste

3) Enables simple and efficient chemical recycling

Room temperature chemical recycling enables energy-efficient and supports a circular economy.



Utilization methods for recycled carbon fiber

We are exploring the potential uses of recycled carbon fiber nonwoven fabric, including as a heating agent, in heated vehicle seats (seat heaters), and in mattresses, and as a conductor.

Lab Scale Recycle





Recovery Carbon Fiber, Resin, Solvent



Recycling methods for recovered materials

Material	Using	Target and Verification Properties
Carbon fiber	Carbon fiber sheet	- Optimizing Carbon Sheet Manufacturing - Confirming Electromagnetic Shielding and Thermal Conductivity Properties
Resin	Toughness Pellet Resin Additive	- Confirming the feasibility of manufacturing a toughening additive in pellet form. - Testing was conducted on the impact strength and toughness of the additive ratio.

Carbon fiber sheet made from recovered carbon fiber





Key Concept

01. Recyclable Epoxy CFRP

High-performance application made with a recyclable epoxy prepreg

04. Closed-Loop CFRP

Closed-loop CFRP made from recycled carbon fiber sheets



02. Material Recovery

Recovering carbon fiber & resin through recycling process

03. Sheet Fabrication

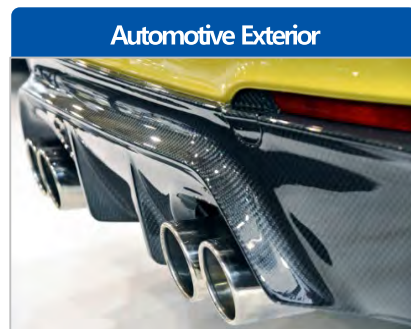
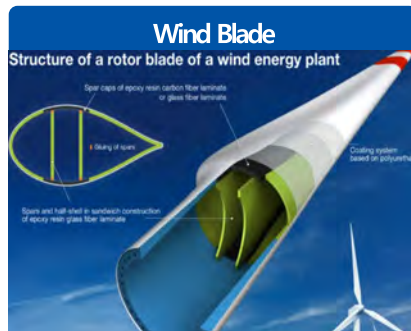
Carbon sheet made with recovered carbon fiber



Application Areas

HANKUK CARBON is responding to the eco-friendly composite material market for creating sustainability with its recyclable epoxy material.

In addition, we are continuously seeking to utilize unique characteristics to adapt to changing trends in areas such as future mobility.



Recyclable and thermoplastic composites

Recyclability, Remoldability

- Eco-Friendly, Sustainable Composite Market
- Wind Power Blade Market, Automotive
- (Carbon Regulations, Eco-Friendly Advanced Technology + Application of Eco-Friendly Materials)
- Eco-Friendly Natural Fiber Composite Market
- (Natural Fiber-Reinforced Composites + Recyclable Technology)
- Recycled Carbon Sheet

Applications for conventional thermosetting epoxy composites

clear appearance and excellent mechanical properties

- Wind turbine blades, robotic arms:
- Automotive: Bumper beams, side impact door beams
- Aerospace: Landing gear doors, outer shells
- Sports and leisure: Helmets, hockey sticks, bicycle frames, golf shafts
- Electronics

Applications for composite materials requiring impact strength

energy absorption, crashworthiness, impact resistance

- Automotive Exterior
- Sports and Leisure: Fishing Rods, Bicycle Frames
- Building Structural Exterior

Composites, All at once.
Providing additional customer value.



THANK YOU.



HANKUK CARBON GROUP aspires to improve
"Sustainability of Composites"
by Minimizing Carbon Footprint throughout the full life cycle.