

## E6-CR Glass Fiber

Best Corrosion Resistance Solution for High-Performance Composite Material



# E6-CR

# Boron-Free Fluorine-Free Glass Fiber

# Company Profile

China Jushi specializes in the production of glass fiber. The company has attained the leadership position in the global glass fiber industry in terms of Output, Technology, R&D, Quality and Market share. Jushi Group is a Chinese national, key high technology enterprise, operating a distinguished Post-Doctoral program.

Jushi always adheres to its fundamental Management principles:

- "Apply science and technology for development,
- Build the brand name to expand market share,
- Emphasize management to improve efficiency and
- Employ talented people to enable future growth".

The company owns proprietary, world-class core technologies for large E-glass fiber furnaces, C-glass fiber furnaces and clean production recycling furnaces. The company has its own core technology of world-class and achieved certifications to ISO9001, ISO14001, ISO18001, ISO12001 and ISO17025. Its testing center has been certified by both China National Accreditation Board for Laboratories (CNAS) and Germanischer Lloyd (GL). The glass fiber rovings and chopped strand mats under the "Jushi" brand have been listed as "China Top Brand" products and the trademark "JUSHI" has been recognized as "China Famous Trademark". The principal products of Jushi have been approved by China Classification Society (CCS), DET NORSKE VERITAS (DNV), Lloyd's Register (LR), Germanischer Lloyd (GL) and Attestation De Conformité Sanitaire (ACS).

Jushi produces E-glass and C-glass glass fiber products including rovings, chopped strands, chopped strand mats, woven rovings and electrical yarns and fabrics in over 20 product categories and 1000 specifications. The products are sold in all provinces in China and exported to over 100 countries. The key regions include North America, Middle East, Europe, Southeast Asia and Africa with export accounting for 50% of the total sales volume.

Jushi people adhere to our core values of "Behavior, Innovation, Responsibility, Learning, Enthusiasm" to build the company into an international group with leading manufacturing scale, advanced technology, talented team, excellent management, powerful execution, great achievements and fast growth. China Jushi strives to lead the modernization of China's glass fiber industry and maintain the leadership position in the global glass fiber industry through endless pursuit of innovation and excellence.





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# GOALS

Best Corrosion Resistance Solution for  
High-Performance Composite Materials



To achieve clean production and minimize environmental footprint, Jushi Group successfully developed E6<sup>®</sup> enhanced glass fiber in 2008. With the rapid development of new applications, the design of fiberglass composite parts is becoming more and more demanding, for example, both the manufacturers and end users want products with long-term consistency and reliability. To meet these demands, as well as to meet the technical requirements from corrosion resistance application field, the development of E6-CR glass fiber was successfully completed by Jushi Group and was commercially available since 2012.

E6-CR enhanced glass fiber is a new E-glass fiber, with enhanced properties. It combines all the benefits of E6<sup>®</sup> glass fiber with excellent corrosion resistance, thus meeting the requirements of the most demanding applications. E6-CR provides customers with best solutions for corrosion resistance.

# E6-CR GLASS FIBER

## Excellent Corrosion Resistance



Compared with typical E6<sup>®</sup> glass fiber, **E6-CR** offers the following unique benefits:

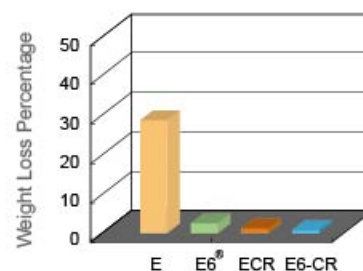
- Higher chemical stability
- Boron-free fluorine-free, to ensure clean production

**E6-CR** glass fiber is produced with a unique glass formulation, providing significant improvement in chemical corrosion resistance in neutral, acidic or alkaline solutions. The improvement in corrosion resistance is especially significant in the acidic environments. **E6-CR** is therefore particularly suitable for the applications in corrosive environments.

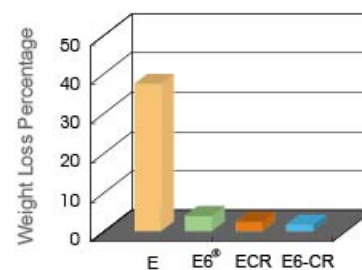
Item	Testing method	E	ECR	E6 <sup>®</sup>	E6-CR
Weight loss in acidic solution	Soaking in 10% HCl solution at 23°C for 24 hours	18.43%	0.22%	0.08%	0.06%
Weight loss in alkaline solution	Soaking in 0.025M Na <sub>2</sub> CO <sub>3</sub> at 23°C for 24 hours	0.34%	0.25%	0.24%	0.18%
	Soaking in 0.5M NaOH solution at 23°C for 24 hours	0.66%	0.45%	0.43%	0.40%
Weight loss in boiling water	Boiling in water at 100°C for 24 hours	0.61%	0.31%	0.39%	0.23%

Note: The above tested products have a uniform filament diameter.

Weight loss comparison of E, E6<sup>®</sup>, ECR and E6-CR glass fibers soaking in 10% HCl solution at 96°C after 24 hours



Weight loss comparison of E, E6<sup>®</sup>, ECR and E6-CR glass fibers soaking in 10% H<sub>2</sub>SO<sub>4</sub> solution at 96°C after 24 hours



### Physical and Electrical Properties of ECR, E6<sup>®</sup> and E6-CR Glass Fibers:

Property	Testing method	Unit	ECR	E6 <sup>®</sup>	E6-CR
Density	ASTM C693	g/cm <sup>3</sup>	2.66	2.62-2.63	2.62-2.63
Refractive Index	ASTM C1648	/	1.576	1.566	1.566
Expansion Coefficient	ASTM D696	10 <sup>-6</sup> K <sup>-1</sup>	5.9	6.0	6.0
Softening Point	ASTM C338	°C	900	898	902
Elastic Modulus	ASTM E1876	GPa	80	81	82
Dielectric Constant (23°C, 1MHz)	ASTM D150	/	7.2	7.1	7.0

# E6-CR REINFORCEMENTS

## Excellent Environment Durability

In the future, end-use composite products will operate in even harsher environments and the end-users will expect enhanced durability. Compared with E6® glass fiber, **E6-CR enhanced glass fiber** reinforced composite materials offer better corrosion resistance and temperature endurance, making composite parts more reliable and cost effective.

### Superior Mechanical Properties

Test Sample	Property	Standard	E	E6®	E6-CR
Tensile property of impregnated roving, Epoxy resin	Tensile strength (MPa)	ASTM D2343	1900~2000	2500~2700	2500~2700
	Tensile modulus (MPa)	ASTM D2343	73~75	81~83	81~84
1200 g/m <sup>2</sup> UD fabric, ( tested in 0° direction), Infusion process, Epoxy resin	Tensile strength (MPa)	ISO 527-5	/	1120.6	1125.0
	Tensile modulus (MPa)	ISO 527-5	/	42.6	42.9
	Fiber Volume Content (%)	ISO 1172	/	53.6	54.0
	Tensile strength (MPa)	ISO 14126	/	805.5	810.5
	Tensile modulus (GPa)	ISO 14126	/	42.9	43.1
	Fiber Volume Content (%)	ISO 1172	/	54.3	54.4

### Chemical Stability

#### Degradation (% Loss) after boiling in water for 7 days

Sample	Property	Standard	E6®	E6-CR
800g/m <sup>2</sup> woven roving Unsaturated polyester Hand laid laminates	Glass content (%)	ISO 1172	57	57
	Tensile strength (MPa)	GB/T 1447	38.1%	11.4%
	Tensile modulus (GPa)	GB/T 1447	2.8%	1.9%
	Flexural strength (MPa)	GB/T 1449	29.5%	22.3%
	Flexural modulus (GPa)	GB/T 1449	2.6%	1.8%

### Temperature Resistance

Glass fiber reinforced composites are increasingly used in harsh environments, such as pipes used in oil-field processing or in treatment of high temperature waste gases. Drastic changes in ambient temperature can reduce the strength and thus shorten the operating life of composite materials.

The composite samples tested below were dried for 10 days at 180, and then put in an -60 environment for another 10 days. The relative loss of properties after the exposure is shown in the table below.

Sample	Property	Standard	E6®	E6-CR
800g/m <sup>2</sup> woven roving Unsaturated polyester Hand laid laminates	Glass content (%)	ISO 1172	58	58
	Tensile strength (MPa)	GB/T 1447	4.9%	4.5%
	Tensile modulus (GPa)	GB/T 1447	6.8%	6.1%
	Flexural strength (MPa)	GB/T 1449	17.0%	15.4%
	Flexural modulus (GPa)	B/T 1449	14.0%	12.8%




# ENVIRONMENTAL PROTECTION

## Become a Model for Clean Production

China Jushi is committed to improving our environmental footprint. We have invested heavily in the most modern technologies available to reduce pollutant emissions into our environment. Improved oxygen firing technology reduced total waste gas emissions from the furnace by 80% and the nitrogen oxide emissions by over 90%. State of the art glass recycling technology ensures zero discharge of process waste glass fiber. Modern waste purification technology enables zero discharge of industrial waste water from our production process. E6-CR glass fiber is produced by more scientific production technology and process which not only improve the product performances, but also control air pollutants at source. The development of E6-CR glass fiber is consistent with our constant commitment to social responsibility and sustainability. Not only have we achieved the goal of improving our glass fiber products, but we also have improved our environmental footprint at the same time.



E6-CR



## **CUSTOMER AND TECHNICAL SUPPORT ORGANIZATION**

### **Offer Best Technical Support**

China Jushi possesses world class core technologies and advanced testing and analysis capabilities for glass, organic chemistry, fiberglass and composites. We have established a global network of marketing and technical service professionals to help customers solve problems in materials development and process optimization. We collaborate closely with customers to address market challenges and promote the growth of the composites industry.

We will share with you all the information on **E6-CR** glass fiber reinforcements as well as our considerable knowledge of compounding and molding technology and processes.



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★All the data given in this brochure is preliminary and China Jushi reserves the right to update or modify the data without notice.



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