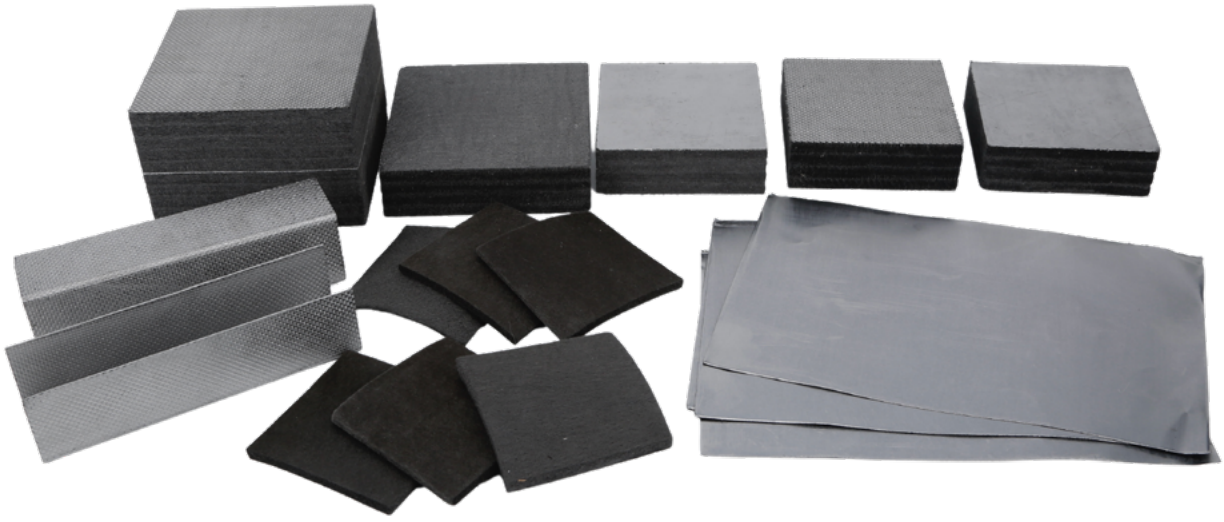
XURAN NEW MATERIALS LIMITED

Graphite Processing Catalog

2023



https://www.xrgraphite.com
sales@xrgraphite.com

Welcome to

Xuran New Materials Limited is a production–based trading company specializing in the production and sales of graphite materials and products. Located in Hebei Province, China, this company was established in 2010 and has been focused on the production and development of high quality graphite products to meet the needs of chemical, mechanical, semiconductor, new energy, metallurgy and other fields for inorganic nonmetallic materials.

Currently, our main products include special graphite, mechanical carbon graphite parts, carbon–carbon composites, graphite felts, graphite crucibles, graphite dies & molds, vacuum furnace graphite parts for heat treatment, photovoltaic thermal field graphite parts, etc. We are committed to providing our customers with effective, comprehensive solutions as well as technical consulting and product customization services.

Professional service team, strict product factory inspection and timely tracking throughout the transportation process guarantee we can provide our customers with high quality, accurate, convenient and fast services. We aim to be the most trustworthy graphite solution provider for our customers and provide strong support for the development of our customers!

Chapter 3

Graphite Processing

We can offer carbon–carbon composites, graphite felts, flexible graphite and other high quality graphite processing products. Our products have high strength, good high temperature resistance and electrical conductivity, and undergo strict testing and quality inspection. Our products has a wide range of applications including aerospace, energy, electronics, industrial manufacturing and other fields. Our professional team will provide you with best carbon material solutions to meet your needs.

Carbon–Carbon Composite

Carbon–carbon composite (c–c composite) is a composite with carbon as matrix and carbon fiber or its products (carbon felt or carbon cloth) as reinforcement, so it is also known as carbon fiber composite (CFC). The carbon matrix can be pyrolytic carbon obtained by chemical vapor deposition, as well as resin carbons prepared by carbonization and graphitization of synthetic resins or asphalt.

Carbon–carbon composite is divided into 2D, 2.5D and 3D types by weaving direction. It features low density (< 2.0 g/cm3), high strength, high specific modulus, high thermal conductivity, low expansion coefficient, good fraction performance, excellent thermal shock resistance and high dimensional stability. It is one of the few alternative materials for applications 1650 ° C above and is therefore considered as one of the most promising high–temperature materials. It is widely used in the fields of aerospace, nuclear energy, chemical and pharmaceutical, and serves as aircraft brake disk materials, rocket engine nozzles, drone structural components, material racks in the heat treatment process, furnace beds, load–bearing plates, protective irregular–shaped plates, bolts and nuts, etc.

Carbon–Carbon Composite Performance Parameters

Model	Density (g/cc)	Compressive Strength (Mpa)	Flexural Strength (Mpa)	In–Plane Shear Strength	Ash (ppm)	CTE (10^{-6}/K)	Thermal Conductivity [W/(m.k)]	Heat Treatment Temperature	Static Friction Coefficient (μ)	Dynamic Friction Coefficient (μ)	Application
2D	≥ 1.35	125	85	–	–	–	–	≥ 2200 °C	–	–	CFC plates, L channels, U channels
2.5D	≥ 1.5	120–150	80–100	12–15	< 200	0.5–1.5	30–50	≥ 2200 °C	–	–	CFC plates, fasteners, hot press mould
2.5D	1.75	150	80–100	12	< 200	–	–	≥ 2200 °C	0.12–0.15	0.3–0.4	CFC brakes

Notes :

If you need 3D & 4D carbon–carbon composites, please contact us directly.
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Properties

Physical Property

After high temperature treatment, carbon–carbon composite has a high carbon content (> 99%), low density and good mechanical property. As the carbon has a high melting point and excellent resistant to high temperature, corrosion and thermal shock, so carbon–carbon composite has excellent resistant to acids, bases and salts.

Mechanical Property

Carbon–carbon composite has good strength and elastic modulus mechanical property, excellent wear & tear resistance.

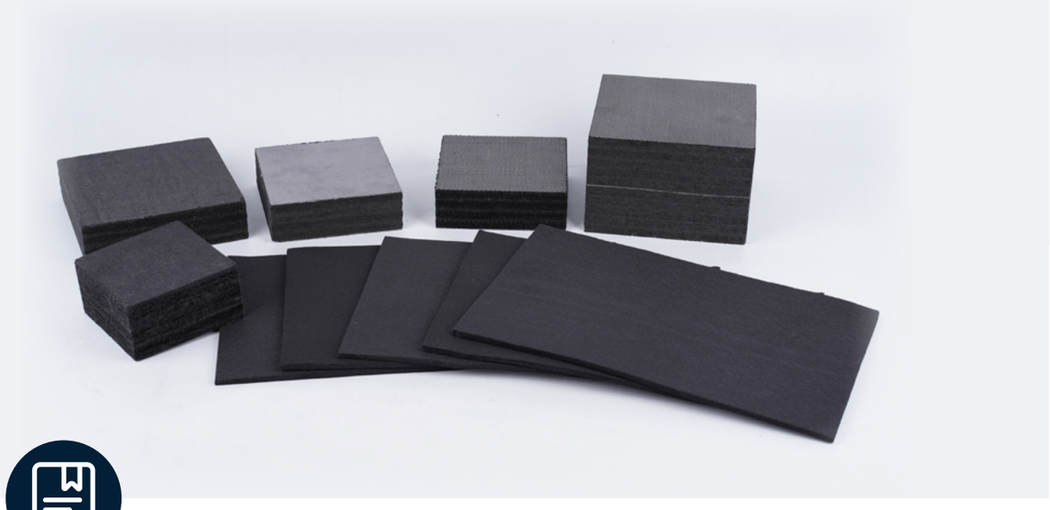
High Temperature Stability

Carbon–carbon composite can withstand up to 2500 ° C high temperature. It is insensitive to thermal stress and has good ablative resistance.

Chemical Property

The difference between carbon fiber and metal materials is that carbon fiber is a non–metal material. Therefore, carbon fiber materials have low electrochemical activity, outstanding corrosion resistance and anti–aging properties, and can adapt to a variety of working environments and prolong the service life of carbon fiber products.

Graphite Felt



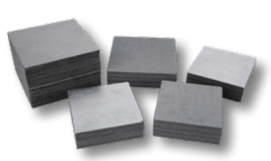
Graphite felt, also known as graphite fiber felt, is mainly used as a thermal insulation and refractory material for various industrial furnaces including single crystal furnaces, carbonized furnaces, quartz furnaces, vacuum furnaces, thermal balance reaction furnaces, heat treatment furnaces, sintering furnaces, welding furnaces, and high-pressure furnaces for metallurgy, machinery, and chemical engineering industries. It is also used as a filter material for high-purity corrosive chemical reagents.

Graphite felt has a carbon content of over 99%, which is higher than carbon felt. Under non-oxidizing atmosphere conditions, its working temperature can be over 2000 ° C. It works with graphite composite boards and graphite special-shaped parts to form the insulation layer of industrial furnaces.

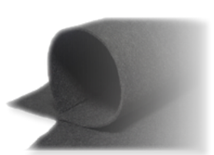
Graphite felt is divided into soft graphite felt and rigid graphite felt.In addition, carbon felt before high-temperature graphitization is also an excellent high-temperature thermal insulation material and has good adsorption properties for inorganic gases and the like.

Soft Graphite Felt

Rigid Graphite Felt



Carbon Felt



Soft Graphite Felt

Soft graphite felt is a flexible insulating material for high temperature applications in inert or vacuum environments and is entirely made of carbon fibers. When used as an insulation material for high-temperature industrial furnaces, it can be bound and stitched with carbon ropes woven through special process. Due to its controlled internal structure and electrical conductivity, soft felts can also be used for energy storage like redox flow cells. Soft graphite felts are divided into PAN-based soft graphite felts, rayon based soft graphite felts, and soft felts for battery.

Features

- Low thermal conductivity and static-free
- Low specific heat:
  Allow for rapid heating and cooling of furnaces.
- High temperature stability:
  In oxidizing environments up to 350 ° C, in protective or vacuum environments up to about 3000 ° C for graphite and 1000 ° C for carbon.
- Easy machining:
  Can be cut with scissors or blades and suitable for small bending radius.
- Good surface properties:
  Not subject to all molten metals.
- High purity:
  Low sulfur and ash contents.
- High resistivity:
  Coupling in an inductive field only occurs above 12 kHz.

PAN-Based Soft Graphite Felt

It is a refractory insulating material specially used in high temperature vacuum furnaces and inert gas furnaces with a working temperature of 3992 ° F (2200 ° C). It features high carbon content, good thermal resistance, low ash content, low sulfur content, good oxidization resistance, easy cutting and installation. If required, it can be purified to less than 10 ppm.

Specification of PAN-Based Soft Graphite Felt

Model	Heat Treatment Temperature	Carbon Content	Density (g/cc)	Ash (ppm)	Available Thickness (mm)
CSF-1 Carbonized Soft Felts	1200 ℃	≥ 97.5%	0.14-0.16	≤ 800	3/5/6/8/10 /12.7
GSF-1 Graphite Soft Felts	2200 ℃	≥ 99.5%	0.12-0.14	≤ 300	

Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Application

- Redox flow cell
- Microbial fuel cells or biofuel cells
- Furnace body insulation and parts
- Heat shields and heat sinks
- Backing strips for welding
- Cathodes for flow cell applications
- Used on the reaction surface in the electrochemical process
- Glass blowing pads and plumber pads
- Work as catalyst substrates in the electrochemical process
- Ultralight furnace lamp wick
- Automotive exhaust lining
- Thermal insulation materials

Rayon-Based Soft Graphite Soft Felt

Also known as viscose graphite felt, it is made of viscose based fibers (rayon) that are cured, shaped, and purified through secondary high-temperature processing, and pre-calcined at 4532 ° F (2500 ° C) to complete the graphitization of the material, making it suitable for working in environments above 2200 ° C. It is a soft felt material with good flexibility and compressibility, and can be easily cut into different sizes.

Specifications of Rayon-Based Soft Graphite Felt

Model	Heat Treatment Temperature	Carbon Content	Density (g/cc)	Ash (ppm)	Available Thickness (mm)
CSF-2 Carbonized Soft Felts	1200 ℃	≥ 98.5%	0.10-0.14	≤ 500	3/5/6/8/10 /12.7
GSF-2 Graphite Soft Felts	2200 ℃	≥ 99.9%	0.08-0.14	≤ 300	

Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Application

- Redox flow cell
- Microbial fuel cells
- Furnace body insulation and parts
- Heat shields and heat sinks
- Backing strips for welding
- Cathodes for flow cell applications
- Used on the reaction surface in the electrochemical process
- Glass blowing pads and plumber pads
- Ultralight furnace lamp wick
- Automotive exhaust lining
- Thermal insulation materials

Soft Felt for Battery

It is specially used as quality electrode material for most energy storage systems like vanadium redox flow battery. It adopts special fibers and weave design, aiming to achieve high liquid absorption and electrical efficiency applications. As continuous production equipment is adopted, it has many unique properties including flat, smooth surface, uniform thickness and overall electrochemical uniformity. Therefore , as electrode, it has excellent performance in Vanadium Redox Flow Battery (VRFB) battery packs with low internal resistance, uelectrochemical quality with uniform activity, good corrosion resistance, slow decay after multiple cycles and high energy efficiency.

Technical Data of Soft Felt for Battery

Carbon Content	Ash Content	Bulk Density (g/cm^3)	Specific Surface Area(m^2/g)	Fiber Peeling Rate (μg/g)	Oxidation Rate (600℃)	Porosity	Surface Resistivity (mΩ/cm^3)	Internal Resistivity (mΩ)	Energy Efficiency		
									Current Density 80 mA/cm^2	Current Density 100 mA/cm^2	Current Density 110 mA/cm^2
>99%	<0.2%	0.08-0.11	2.3-4	44960	< 2.6%	85%-95%	0.165-0.193	15.3-26.7	85.33%	84.22%	82.68%

Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Specifications of Soft Felt for Battery

Length (m)	10、20、50、100
Width (m)	1.22、1.35、1.42、1.45
Thickness (m)	2.2、3.0、3.6、4.2、4.8、5.0、5.6、6.0、7.0

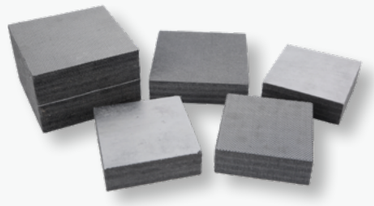
Application

- Electrode material for most energy storage systems like vanadium redox flow battery.

Rigid Graphite Felt

Rigid graphite felt has excellent ablative resistance, thermal shock resistance, airflow erosion resistance, good high temperature insulation effect and high temperature stability, etc. It is widely used in most high-end markets, including solar energy industry, semiconductor monocrystalline silicon industry, artificial crystal industry, optical fiber industry, high temperature vacuum sintering furnaces, heat treatment furnace, etc.

Rigid graphite felt is a thermal insulation material that is based on soft graphite felt and then formed by using a small amount of binder to composite any shape (for example, barrel, disk, cuboid) after high-temperature graphitization treatment. It can effectively improvs the original working environment and operability. Besides, it can also have different surface coating treatments upon request to meet the needs of various applications. Compared with soft felt, its fume forming rate is significantly reduced, thereby extending its service life.



Rigid graphite felt is generally divided into pitch-based rigid graphite felt, PAN-based rigid graphite felt and rayon-based rigid graphite felt.

In addition to rigid felt based on soft graphite felt, we also have a new type of rigid graphite felt made from a laminated material composed of fiber filaments and binder, which is then graphitized at high temperatures to form a complete felt.

Features

- Rigid graphite felt can withstand high temperature treatment (about 2250 °C and above), and has low shrinkage and low volatile emission.
- Low ash content and high purity, high purity rigid felt after purification has an ash content of less than 20 ppm, which ensures the purity of thermal field.
- Low thermal conductivity, good thermal insulation effect, energy saving, and good consistency of product quality.
- Fiber matrix to ensure uniform thermal insulation effect and good high temperature stability.

PAN-Based Rigid Graphite Felt

It is made from high-quality PAN-based carbon felt that has been graphitized. It is used in the protective atmosphere and insulation of vacuum furnaces, and features high temperature resistance, corrosion resistance, low thermal conductivity, etc. Surfaces and edges are sealed to reduce the porosity and increase the oxidation resistance. Besides, it can be layered internally to improve radiation heat retention and reduce the furnace contaminant. It often serves as the insulation layer of industrial furnaces including single crystal furnaces, carbonized furnaces, quartz furnaces, vacuum furnaces, induction furnaces, high-frequency furnaces and reaction heat balance, heat treatment furnaces, sintering furnaces, welding furnaces. Moreover, it can also be used as a corrosion-resistant filter material.

Specifications of PAN-Based Rigid Graphite Felt

Model	HeatTreatment Temperature	Carbon Content	Density (g/cc)	Ash (ppm)	Surface Treatment	Shape
CRF-1 Carbonized Rigid Felts	1200 ℃	≥ 97%	0.2-0.35	≤ 500	Graphite Foil Coated; CFC(Carbon Cloth) Coated; Anti-Oxidatioin Painting	Graphite Rigid Board: Thickness 20-600mm; Graphite Cylinder: Diameter up to 1500-1800 mm
GRF-1 Graphite Rigid Felts	2200 ℃	≥ 99%	0.16-0.32	≤ 200		

Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Rayon-Based Rigid Graphite Felt

It is used in the protective atmosphere and insulation of vacuum furnaces. It can be easily cut or machine-customized to desired sizes and is suitable for square and circular hot zones. Surfaces and edges are sealed to reduce the porosity and increase the oxidation resistance. A foil can be added to the surface of graphite felt that can be layered internally to improve radiation heat retention and reduce the furnace contamination. It is widely used in vacuum furnaces, powder metal sintering, sputtering targets, CVD, CVI and CVR furnaces, carbon fiber heat treatment furnaces, silicon/GaAs crystal growing furnaces, annealing and hot pressing, and fiber optics production.

Specifications of Rayon-Based Rigid Graphite Felt

Model	Heat Treatment Temperature	Carbon Content	Density (g/cc)	Ash (ppm)	Surface Treatment	Shape
CRF-1 Carbonized Rigid Felts	1200 ℃	≥ 98%	0.15-0.30	≤ 500	Graphite Foil Coated; CFC(Carbon Cloth) Coated;Anti-Oxidatioin Painting	Graphite Rigid Board: Thickness 20-600mm; Graphite Cylinder: Diameter up to 1500-1800 mm
GRF-1 Graphite Rigid Felts	2200 ℃	≥ 99%	0.12-0.25	≤ 200		

Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Pitch-Based Rigid Graphite Felt

It is made of It is made of asphalt carbon fiber mat hardened and compounded asphalt carbon fiber with certain rigidity, self-supporting property, low density, no short fiber shedding, and excellent insulation efficiency. It is widely used as insulation material for various high-temperature vacuum furnaces including vacuum heat treatment furnaces, sintering furnaces, melting furnaces, and recrystallization furnaces. It has a long service life and is easy to install and remove.

Specifications of Pitch-Based Rigid Graphite Felt

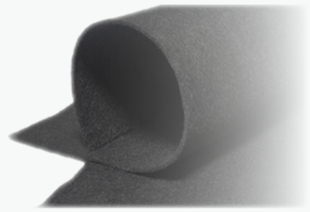
Model	Carbon Content	Thermal Conductivity (W/m·K) Nitrogen Environment1000 ° C	Compressive Strength (MPa)	Flexural Strength (MPa)	Bulk Density (g/cm^3)	Ash Content	Treatment Temperature
GAF-1	> 99.80%	0.20 - 0.27	0.17 - 0.6	1.0 - 1.8	0.15 - 0.30	< 0.1%	2000 ℃

Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Carbon Felt

Carbon felt is a felt-like material made of carbon fibers, which can be converted into graphite felt through high-temperature graphitization. Carbon felt has broad-spectrum adsorption, large capacity, good adsorption of inorganic gases, non-melting or dripping when exposed to fire, no smoke and toxicity. It can maintain flame-retardant performance even after repeated washings. Besides, it can be used as an adsorption purification material, insulation material for vacuum furnaces, and inert gas furnaces.

Currently, carbon felt is mainly divided into polyacrylonitrile (PAN)-based carbon felt, viscose-based (rayon)-based carbon felt, and bitumen-based carbon felt. Among them, PAN-based carbon felt is the most widely used.



Features

- **Thermal insulation.** Carbon felt has low thermal conductivity coefficient, low thermal capacity, low density, high temperature resistance, and heat shock resistance.
- **Lightweight and aesthetically pleasing.** It can enhance the surface strength of composite materials while being lightweight and having high strength.
- **Environmentally friendly with good adsorption capacity.** It has good adsorption properties for inorganic gases.

Carbon Felt Specifications

Model	Heat Treatment Temperature	Carbon Content	Density (g/cc)	Ash (ppm)	Available Thickness (mm)
CSF-1 (Pan-Based)	1200 °C	≥ 97.5%	0.14-0.16	≤ 800	3/5/6/8/10/12.7
CSF-2 (Rayon-Based)	1200 °C	≥ 99.5%	0.12-0.14	≤ 300	

Notes :

1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 kcal/cm.h.° C

These properties are typical values and not guaranteed.

Application

- **Solvent recovery.** It can be used for the adsorption and recovery of (gas and liquid) solvents in chemical, pharmaceutical, spray painting, chemical fiber, rubber and other industries.
- **Air purification.** It can absorb and filter air polluted by organic solvents as well as smoke generated in daily life (such as SO_2, NO_2, O_3, NH_3, etc.).
- **Water purification.** It can remove heavy metal ions, carcinogens, odors, residual chlorine, bacteria, and discoloration in water.
- **Protective equipment.** It can be used to make gas masks, masks, protective chemical products, smoke filtering plugs, etc.

Flexible Graphite

Flexible graphite is a structural compact foil (paper) or sheet made by chemically treating ordinary graphite powder to obtain graphite interlayer compound, and then expanding it at high temperature to get expanded graphite, which is then pressed, baked at high temperature and impregnated. It retains the excellent properties of natural graphite while adding its unique flexibility, resilience, and sealing performance. It can be made into flexible graphite products and graphite sealing products. It is widely used in the sealing of valves, pumps, and reaction vessels under high temperature, high pressure, and corrosion-resistant media. Recently, flexible graphite has been widely used to make fuel cell bipolar plates. In addition to maintaining the electrical conductivity, thermal conductivity, and corrosion resistance of graphite, its simple preparation process also makes it an excellent material for reducing bipolar plate costs.

Specifications of Flexible Graphite

Model	Carbon Content	Specific Resistance (μΩ·m)	Sulfur Content (ppm)	Chlorin Content (ppm)	Compressive Strength (Mpa)	Flexural Strength (Mpa)	Tensile Strength (Mpa)	Density (g/cm^3)	Compressing Modulus	Rebounding Modulus
GF-2	95% - 99.9%	3 - 7	0 ~ 1200	≤ 35	≥ 160	≥ 4.5	-	1.0 (±0.05)	≥ 40%	-
GP-3	≥ 99.9%	-	≤ 1100	≤ 50	-	-	≥ 40	1.25 (±0.05)	30% - 35%	10% - 12%
GP-4	≥ 99.9%	3 - 7	≤ 1200	≤ 40	-	-	≥ 40	1.25 (±0.05)	30% - 35%	19%

Notes :

1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C

These properties are typical values and not guaranteed.

Features

- **Excellent Heat Resistance**

Flexible graphite can be used up to 3000 ° C in a vacuum or reducing atmosphere. It has an extremely low thermal expansion coefficient. It will neither become brittle or crack at low temperatures nor become soften or creep at high temperatures.

- **Good Sealing Performance**

Flexible graphite has high compression resilience, with a general compression ratio of up to 50% and a resilience rate of no less than 20%. When the compression ratio is 12%, the resilience rate can reach 70%. It has a low stress relaxation rate, generally only 1/3 times of that of asbestos sheet. Even it is treated at 100 ° C for 22h, its stress relaxation rate generally will not exceed 5%. Additionally, flexible graphite is also impervious.

- **Good Chemical Resistance**

Flexible graphite has excellent stability in almost all acids, bases, salts, organic solvents, oils, and seawater. However, it may corrode in aqua regia, chromic acid, concentrated sulfuric acid, and concentrated nitric acid.

- **Radiation Resistance**

Flexible graphite does not deteriorate and its properties do not change under long-term exposure to various kinds of radiation. This property makes it can b e used as a good sealing material in the nuclear industry and aerospace devices.

Related Product Category

- **Flexible Graphite Paper/Foil**

Flexible graphite foil is an excellent sealing material for high temperature, high pressure transfer of liquids, gases, steams, chemicals and corrosives. This material is made of high purity, high crystalline natural flake graphite, which goes through special acid and heat treatment to produce expanded graphite crystals. The expanded graphite crystals are then formed into foil through a calendaring process without any resins and binders.

- **Flexible Graphite Sheet**

Flexible graphite sheets are the basic materials for manufacturing various graphite composite sheets, graphite belts, packing, and sealing gaskets. This material is made from natural flake graphite that is chemically treated and then rolled after high temperature expansion without any resins and binders. It has high temperature resistance, corrosion resistance, radiation resistance, low creep relaxation rate, and excellent flexibility.

- **Flexible Graphite Gasket**

Flexible graphite gaskets are punched or cut from flexible graphite sheets, and have good corrosion resistance, high/low temperature resistance, good compression resilience, and high strength. They are widely used in pipelines, valves, pumps, pressure vessels, heat exchangers, condensers, etc.

- **Flexible Graphite Packing**

Flexible graphite packing are braided from flexible graphite yarns, which are reinforced by cotton fiber, glass fiber, carbon fiber, etc. It has a very low friction and will not damage shafts and stems. Besides, ti has good thermal conductivity, chemical resistance and high resilience. It can be used in valves, pumps, expansion joints, mixers and agitators in high pressure and high temperature conditions and especially suitable for harsh media conditions.

Graphite Solutions for Tomorrow's Innovations

XURAN NEW MATERIALS LIMITED

Contact information

Mobile: +86-15373888622 **WhatsApp:** +86-15373888622

Email: kevin@xrgraphite.com / sales@xrgraphite.com

Web: www.xrgraphite.com

Address: 2 Daqing Street, Hengshui City, Hebei Province, China