XURAN NEW MATERIALS LIMITED

Special Graphite Catalog

2023

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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!

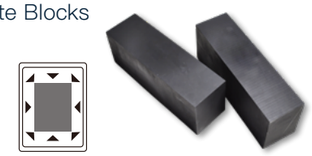
Chapter 2

Special Graphite

Special graphite is a high purity, high density and high strength graphite material and has excellent corrosion resistance, high temperature stability and great electrical conductivity. It is made of natural or artificial graphite after high temperature heat treatment and high pressure processing and is commonly used in industrial applications in high temperature, high pressure and corrosive environments.

It can be divided into various types including isostaic graphite blocks, extruded graphite blocks, molded graphite blocks and vibrated graphite blocks.

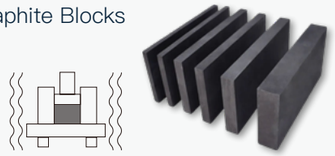
Isostaic Graphite Blocks



Extruded Graphite Blocks

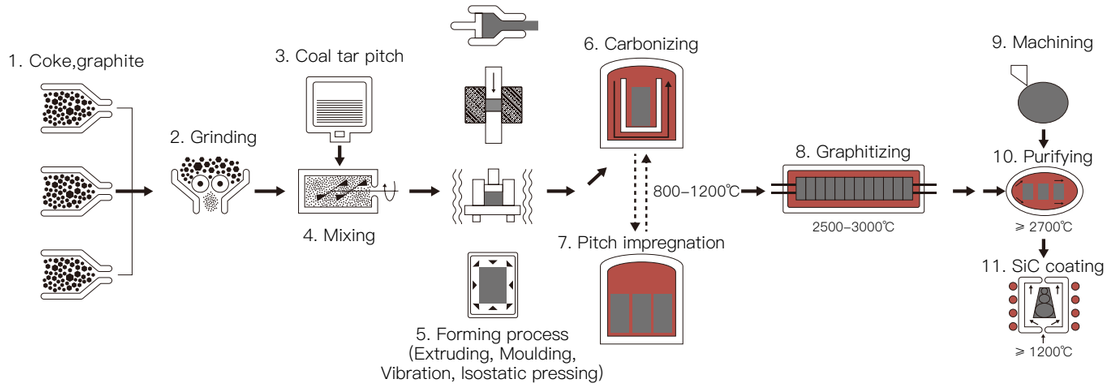
Molded Graphite Blocks

Vibrated Graphite Blocks



Manufacturing Technologies

Graphite is a unique non-metallic element composed of carbon atoms arranged in a hexagonal lattice structure. It is a soft and brittle material that is commonly used in various industrial applications due to its unique properties. Graphite can maintain its strength and stability even at temperatures exceeding 3600 °C. Now let me introduce the production process of special graphite.



Production step

Step 1: Raw material preparation

Solid raw materials (petroleum coke, pitch coke, carbon black, natural graphite, etc) are mixed by a certain proportion and then loaded into raw material troughs.

Step 2: Crushing& grinding

The mixed materials are ground into powder by crusher and ball mill and then sieved.

Step 3: Binder addition

Pitch is often used as a binder. Carbonaceous pitch (coal tar pitch, etc.) is added to the sieved material in a certain proportion. The pitch serves to increase the adhesion and plasticity, which helps the mixture to maintain a certain shape and size during the molding process.

Step 4: Material mixing

Mix the ground and sieved materials with carbonaceous pitch (coal tar pitch, etc.) evenly for further processing.

Step 5: Forming process

The mixture is compressed and shaped through different processes (extrusion, molding, vibration, isostatic pressing).

Step 6: Carbonization process

The compacted material is heated under anaerobic conditions at a temperature of 800 °C to 1200 °C, forming a solid block and this process is called carbonization process.

Step 7: Pitch impregnation

It can further reduce the porosity of the product, enhance the density and compressive strength, lower the electrical resistivity of the finished product, and change the physical and chemical properties of the product. It should be noted that after impregnation, a second calcination is required to carbonize the pitch.

Step 8: Graphitization

It is a high-temperature heat treatment process in which amorphous disordered layerstructured carbon is converted into a three-dimensional ordered graphite crystal structure at 2500 °C to 3000 °C. It can eliminate impurities and improve product performance.

Step 9: Processing

Check all graphite properties (grain size, density, bending and compressive strength) and carry out processing.

Step 10: Purification process

If used in semiconductor, monocrystalline silicon and atomic energy industries, the materials require high purity and must remove all impurities by chemical methods. That is, put the graphite products in a halogen gas and heat them to 2700 °C. At Xuran, we have the capacity to purify ash content to 5 ppm, far surpassing our peers.

Step 11: Coating treatment.

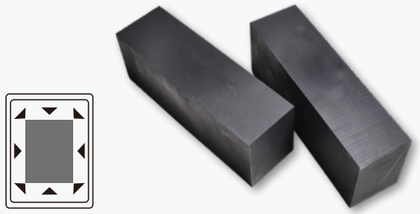
Depending on the application of graphite, the surface can be treated to make it smoother, for example, apply a silicon carbide coating on the surface at 1200 °C.

Isostatic Graphite

Isostatic graphite, made of high purity graphite by pressing, is an irreplaceable material used in the manufacturing of single crystal furnaces, metal continuous casting graphite crystallizers, and graphite electrodes for electrical spark discharge machining. In addition to these main applications, it is widely used in the fields of hard alloys (vacuum furnace heaters, sintering plates, etc.), mining (manufacturing of drill bit molds), chemical industry (heat exchangers, corrosion-resistant parts), metallurgy (crucibles), and machinery (mechanical seals).

Features

- Extremely high thermal and chemical resistance
- Excellent thermal shock resistance and oxidization resistance
- High electrical and thermal conductivity
- The strength increases as the temperature rises
- Can be used for precision machining
- Low impurity content, high purity (< 5 ppm)



Specifications of Isostatic Graphite

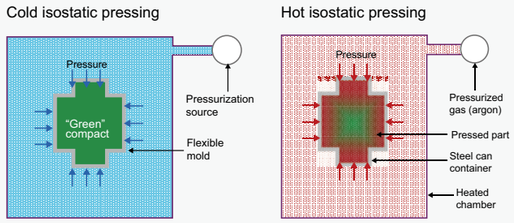
Model	Density (g/cm^3)	Particle Size(μm)	Specific Resistance (μΩ.m)	Poro sity	Shore Hardness	Compressive Strength (MPa)	Flexural Strength (MPa)	CTE ($\times 10^{-6}\,℃^{-1}$)	Application
IS-2 (Isostatic)	1.76	20	15	20%	60	95	50	5.9	Heat Exchanger/ All kinds of Machining
IS-3 (Isostatic)	1.85	10	12	13%	48	85	46	4.3	Sintering/ All kinds of Machining
IS-4 (Isostatic)	1.90	5	12	13%	48	85	46	4.3	Sintering/ All kinds of Machining
ED-1 (Isostatic)	1.83	9	12	12%	65	116	51	5.8	EDM Semi Finishing/ Finishing
ED-2 (Isostatic)	1.81	7	12	12%	69	135	62	6.8	EDM Semi Finishing/ Finishing
ED-3 (Isostatic)	1.90	5	12	12%	69	135	62	6.8	EDM Finishing Ultra Fine Grain for low electrode wear
ED-4 (Isostatic)	1.92	3	11	11%	72	160	69	6.9	EDM Finishing Lowest Electrode Wear

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

Molding Technology

The principle of isostatic pressing technology is based on Pascal's law. It changes the unidirectional (or bidirectional) compression of the material into multi-directional (omnidirectional) compression. During the process, the carbon particles are always in a disordered state, and the volume density is relatively uniform with isotropic properties. Besides, it is not subject to the height of the product, thus making the isostatic graphite have no or little performance differences.

According to the temperature at which the forming and solidification take place, isostatic pressing technology can be divided into cold isostatic pressing, warm isostatic pressing, and hot isostatic pressing. Isostatic pressing products have a high density, typically 5% to 15% higher than those of unidirectional or bidirectional mold pressing products. The relative density of isostatic pressing products can reach 99.8% to 99.09%.



Molded Graphite

Molded graphite has outstanding performances in mechanical strength, abrasion resistance, density, hardness and electrical conductivity and these performances can be further improved by impregnating resin or metal.

Molded graphite features good electrical conductivity, high temperature resistance, corrosion resistance, high purity, self-lubrication, thermal shock resistance and easy precision machining, and is widely used in the fields of continuous casting, hard alloy and electronic die sintering, electric spark, mechanical seal, etc.

Features

- High temperature and corrosion resistance
- Excellent thermal shock resistance
- Outstanding self-lubrication
- High purity and high electrical conductivity
- Easy precision machining

Specifications of Molded Graphite

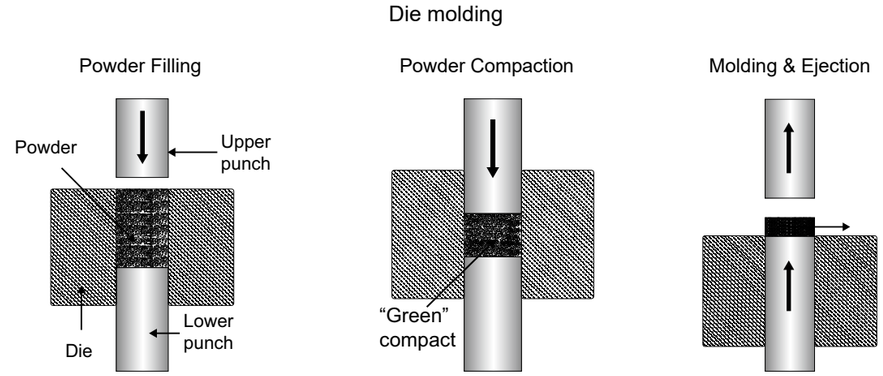
Model	Density (g/cm^3)	Particle Size(μm)	Specific Resistance (μΩ.m)	Poro sity	Shore Hardness	Compressive Strength (MPa)	Flexural Strength (MPa)	CTE ($\times 10^{-6}\,℃^{-1}$)	Application
MD-1 (Molded)	1.78	25	12	20%	48	80	40	5	Sintering/ All kinds of Machining
MD-2 (Molded)	1.72	25	12	19%	45	60	32	5	Sintering/ All kinds of Machining
MD-3 (Molded)	1.56	25	12	23%	35	38	16	5	Sintering/ All kinds of Machining

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

Molding Technology

The molding method is generally used to produce small-sized cold-pressed graphite or finely structured products. The principle is to fill a certain amount of paste into a mold of the required shape and size, and then apply pressure from the top or bottom. Sometimes, apply pressure from both directions to compress the paste into shape in the mold. The pressed semi-finished product is then demolded, cooled, inspected, and stacked.

There are both vertical and horizontal molding machines. Molding method generally can only press one product at a time,so it has a relatively low production efficiency. However, it can produce high-precision products that cannot be made by other technologies. Moreover, the production efficiency can be improved through simultaneous pressing of multiple molds and automated production lines.



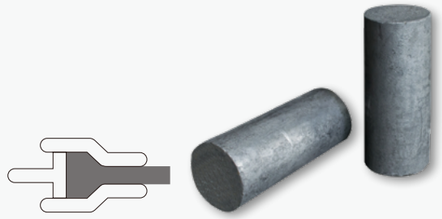
Extruded Graphite

Extruded graphite is formed by mixing high purity graphite particles with a binder and then extruding them in an extruder. Compared with isostatic graphite, the extruded graphite has a coarser grain size and a lower strength, but it has a higher thermal and electrical conductivity.

Currently, most carbon and graphite products are produced by extrusion method. They are mainly used as heating elements and thermal conductive components in high-temperature heat treatment processes. In addition, graphite blocks can also be used as electrodes to carry out current transfer in electrolysis processes. Therefore, they are widely used as mechanical seals, thermal conductive materials and electrode materials in extreme environments such as high temperature, high pressure, and high speed.

Features

- Good chemical stability and high temperature resistance
- Excellent thermal and electrical conductivity
- High thermal shock resistance and high mechanical strength
- Great lubrication performance and low static charge



Specifications of Extruded Graphite

Model	Density (g/cm^3)	Particle Size(mm)	Specific Resistance (μΩ.m)	Poro sity	Shore Hardness	Compressive Strength (MPa)	Flexural Strength (MPa)	CTE ($\times 10^{-6}℃^{-1}$)	Application
GE-1	1.72	0.8/2.0	7.5	-	-	35	14	2.4	Electrode/ Rotors & Shafts
GE-2	1.60	0.8/2.0	9.5	-	-	25	10	2.9	Electrode/ Rotors & Shafts

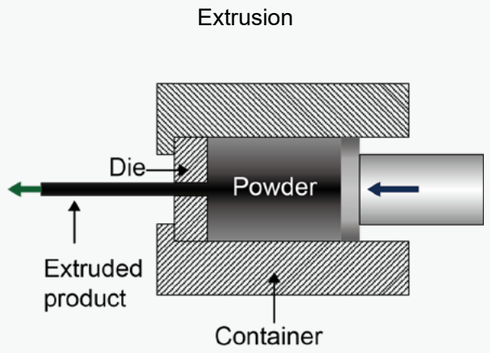
Notes :
1 MPa = 10.2 kgf/cm^2; 1 W/m.k = 0.86 ^{k}cal/cm.h.° C
These properties are typical values and not guaranteed.

Molding Technology

The extrusion method is to load the paste into the paste cylinder of the press and extrude it. The press is equipped with a replaceable extrusion ring (can be replaced to change the cross-sectional shape and size of the product) in front of it, and a movable baffle is provided in front of the extrusion ring. The main plunger of the press is located behind the paste cylinder.

Before applying pressure, place a baffle before the extrusion ring, and apply pressure from the opposite direction to compress the paste. When the baffle is removed and pressure is continued to be applied, the paste is extruded from the extrusion ring. Cut the extruded strip into the desired length, cool and inspect it before stacking. The extrusion method is a semi-continuous production process, which means that after a certain amount of paste is added, several (graphite blocks, graphite materials) products can be continuously extruded.

Currently, most carbon and graphite products are produced by extrusion method.



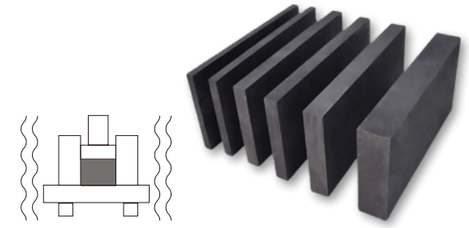
Vibrated Graphite

Vibrated graphite has a uniform structure with medium grain size. Besides, it becomes very popular because of its low ash content, enhanced mechanical strength, and good electrical and thermal stability, and is widely used for processing large-scale workpieces. It can also be further strengthened after resin impregnation or anti-oxidation treatment.

It is widely used as a heating & insulation element in the production of polysilicon and monocrystalline silicon furnaces in the photovoltaic industry. It is also widely used in manufacturing heating hoods, heat exchanger components, melting and casting crucibles, construction of n nodes used in electrolytic processes, and manufacturing of crucibles for melting and alloying.

Features

- High temperature resistance and corrosion resistance
- Self-lubrication property
- High purity and high electrical conductivity



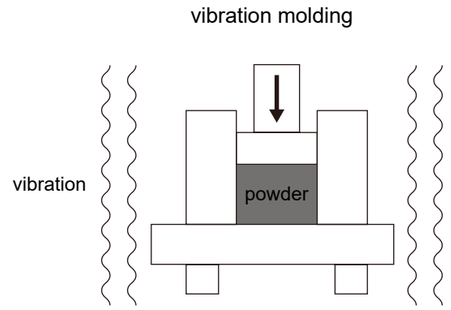
Specification of Vibrated Graphite

Model	Density (g/cm^3)	Particle Size(mm)	Specific Resistance (μΩ.m)	Poro sity	Shore Hardness	Compressive Strength (MPa)	Flexural Strength (MPa)	CTE ($\times 10^{-6}℃^{-1}$)	Application
MC-0 (Extruded)	1.75	0.8/2.0	9	-	-	40	18	2.5	Heat Exchanger / Heater
MC-1 (Extruded)	1.74	0.8/2.0	9	-	-	38	16	2.3	Heat Exchanger / Heater
MC-2 (Extruded)	1.70	0.8/2.0	10	-	-	29	12	2.3	Heat Exchanger / Heater
MC-3 (Extruded)	1.68	0.8/2.0	10	-	-	18	8	2.3	Heat Exchanger / Heater

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.

Molding Technology

The principle of making vibrated graphite is to fill the mold with a paste-like mixture, and then place a heavy metal plate on top of it. In the next step, the material is compacted by vibrating the mold. Compared with extruded graphite, the graphite formed by vibration has higher isotropy.



Graphite Solutions for Tomorrow's Innovations

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