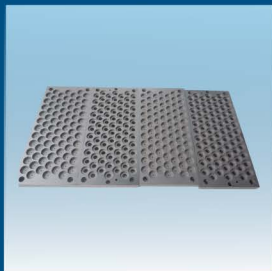
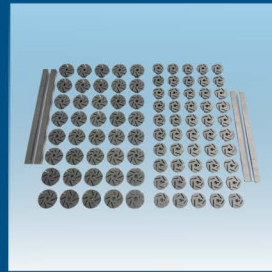
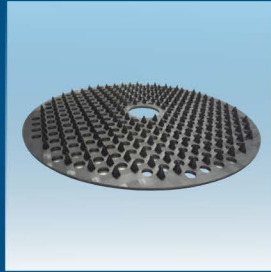


阿泰克的石墨制品

Specialty Graphite Made By Chengdu Artech



成都阿泰克特种石墨有限公司
Chengdu Artech Specialty Graphite Co., Ltd.

公司简介

成都阿泰克特种石墨有限公司成立于 2001 年，是一家专门从事碳石墨加工的公司。我们的经营理念是清晰的，即无论是现在还是未来我们都一如既往地专注于碳石墨产品的加工制造，为以下关键工业领域的客户提供可靠的高品质的碳石墨产品。

- 光伏，电子及半导体
- 高温及真空电炉
- 传统工业（如有色冶金，模具制造，玻璃石英，（玻）光纤，电解（镀），水泥，人造金刚石工具等）
- 汽车及机械领域（如制造机械密封，真空泵及压缩机等）
- 电气工程用碳石墨（如电机用碳刷，机车的接地装置以及受电弓用碳滑板等）

阿泰克公司已取得了ISO9001:2015质量管理体系认证和IATF16949:2016质量管理体系认证。

Company Profile

Founded in 2001, Chengdu Artech Specialty Graphite Co., Ltd. is sole focused business, now and future in machining and supplying of reliable and qualified carbon and graphite items. We are totally committed to the development of carbon and graphite products to support key market development in following industrial fields which is our clear vision and philosophy.

- Photovoltaic, Electronics and Semi-conductor
- High Temperature and Electrical Vacuum Furnaces
- Conventional Industries (e.g. manufacturing of non-ferrous metals, molds, glass and quartz, optical and glass fiber, electrolysis and electroplating, cement and artificial diamond tools etc.)
- Automobile and Mechanical Applications (e.g. Manufacturing of mechanical seals, vacuum pumps and compressors etc.)
- Electrical Carbon (e.g. Making and supplying of carbon brushes for motors, grounding devices for rolling stocks and carbon current collectors for the pantographs etc.)

Artech have been certified with ISO9001:2015 and IATF16949:2016.



为何要选用石墨制品? Why Choosing Graphite?

石墨以下所列优异的材料性能决定了它在各个工业领域中所起的不可或缺的重要作用。石墨的优异性能主要表现有

To have following outstanding properties which made graphite as an indispensable key material been widely used in so many different industries, which could be listed as below:

- 很高的热稳定性 /High thermal stability
- 良好的导电性 /Good electrical conductivity
- 良好的导热性 /High thermal conductivity
- 很好的耐热冲击性 /High resistance to thermal shock
- 很好的耐化学腐蚀性 /High resistance to corrosion
- 高纯度 /High purity
- 低浸润性 /Low wettability
- 良好的机械强度 /High mechanical strength
- 良好的自润滑性 /Good sliding properties

石墨的优异性能 Outstanding Properties of Graphite

密度 / Density

石墨单晶的理论密度是 2.26 g/cm^3 , 通常人造石墨的密度都在 $1.50\text{-}1.90 \text{ g/cm}^3$ 之间, 固体热解碳的密度可达 2.1 g/cm^3 . 纯石墨的密度值是其质量除以其体积 (含所有的气孔) 所得的商。

The theoretical density of monocrystalline graphite is 2.26 g/cm^3 . The density of artificial graphite is typically 1.5 up to 1.9 g/cm^3 and 2.1 g/cm^3 for solid pyrolytic carbon. The density of the highly pure graphite grades is defined as quotient between mass and volume including all pores.

开口气孔率 / Open Porosity

开口气孔率是石墨整体的组成部分, 可用液体填充 (如浸渍沥青, 树脂或是熔融的金属等)。其定义可按 DIN 51918 标准所述。

The open porosity is that part of the whole volume which can be filled with liquid (e.g. impregnated with pitch, resin or melted metals). It is determined according to DIN 51918.

可加工性 / Machinability

石墨容易加工, 其边缘强度和耐磨性好。结构复杂, 公差要求严的部件都可以通过精加工获得。

Graphite can be machined easily, edge strength and abrasion resistance are high. Complicated parts with close tolerances can be machined with precision.

浸润性 / Wettability

石墨不会被熔融的玻璃或是大多数熔融的金属浸润。
Graphite is not wetted by molten glass or by most molten metals.

耐温性 / Temperature Resistance

石墨不会被熔化, 但在 3900 K (约 3627 摄氏度) 时会升华。在空气中, 石墨能耐温至 750 K (约 477 摄氏度), 高于这个温度石墨会被氧化, 故在高温下, 石墨应在真空或是有保护性的气氛中使用。

Graphite does not melt but sublimates at about 3900 K (around 3627°C). In air graphite is resistant to temperature up to about 750 K (around 477°C), it could be oxidized over this temperature, so graphite should be used either in vacuum or with protective gases under high temperature.

耐温变 / Resistance to Temperature Change

石墨具有非常好的耐热冲击性能。故快速地加热或是冷却石墨没有问题。

Graphite is extremely resistant to thermal shock, so rapid heating or cooling is not a problem.

石墨的优异性能 Outstanding Properties of Graphite

机械强度 /Mechanical Strength

不同于其它大多数的材料，石墨的抗张，抗折和抗压强度会随着温度的升高而增加，当达到 2700 K (约 2427 摄氏度) 之后，其强度会下降。在 2700 K 时，石墨的强度值较室温时要高一倍。（见图表 1）

Unlike most materials, the tensile, compressive and flexural strength of graphite increases as temperature increases to 2700 K (around 2427 °C) and above this temperature, strength falls. At 2700 K , graphite has about double the strength which it has at room temperature. (see diagram 1)

电阻 /Electrical Resistance

同其它金属不同，石墨电阻的温度系数是负数。石墨具有良好的导电性，接近绝对零度时，石墨只有少数几个自由电子充当绝缘体，随着温度的上升，石墨的导电性会增加。（见图表 2）

The temperature coefficient of electrical resistance of graphite is negative, unlike that of metals. Graphite has good electrical conductivity. Near absolute zero, graphite has only a few free electrons and acts as an insulator. As temperature rises, electrical conductivity increases.(see diagram 2)

导热性 /Thermal Conductivity

石墨的导热性较许多金属要好且其导热性会随着温度的升高而下降。石墨的导热性随着石墨石墨化程度的不同而有所不同。（见图表 3）

The thermal conductivity of graphite is higher than that of many metals and falls with increasing of temperature. The thermal conductivity of graphite varies with the degree of graphitization. (see diagram 3)

热膨胀 /Thermal Expansion

石墨的热膨胀系数在 $3 \times 10^{-6} \text{K}^{-1}$ 级别，因此它只相当于铁的四分之一。热膨胀系数随石墨牌号的不同而不同，也与其材料的各向异性和温度有关。（见图表 4）

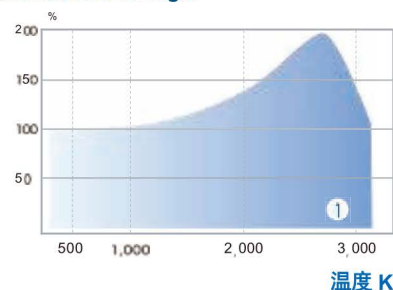
The coefficient of thermal expansion is in the order of $3 \times 10^{-6} \text{K}^{-1}$ and is, therefore, only about one quarter that of iron. It varies from grade to grade and is dependent on the anisotropic property of the material and the temperature. (see diagram 4)

比热 /Specific Heat

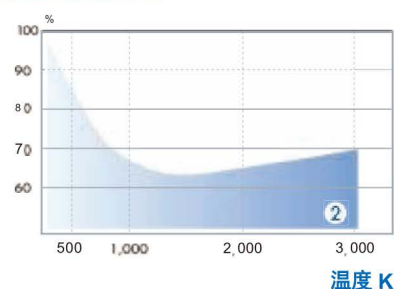
不同牌号的石墨其比热变化很小。（见图表 5）

Graphite grades differ only little in their specific heat. (see diagram 5)

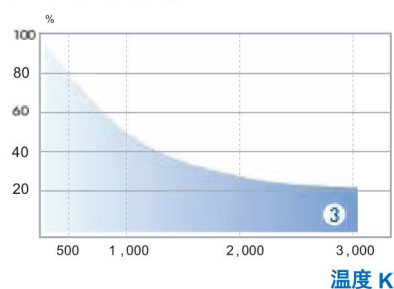
机械强度 /Mechanical Strength



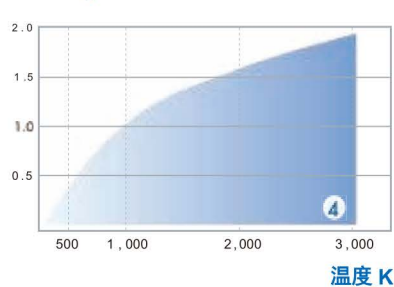
电阻 /Electrical Resistance



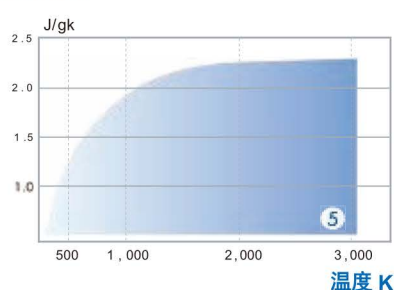
导热性 /Thermal Conductivity



热膨胀 /Thermal Expansion



比热 /Specific Heat



纯度 /Purity

不同的用途对石墨灰分的要求会有所不同。石墨的灰度可被纯化至 20-30 ppm (对石墨坯料而言) 或是小于 5 ppm (只针对加工好的成品)

Purity of graphite can be varied on different applications. Graphite can be purified to 20-30 ppm (in block) or less than 5 ppm for the finished items.

纯化后石墨中微量元素的含量如下表 /Typical Analysis of Element Concentration After Purified (in ppm)

石墨的灰分含量 Ash Content of Graphite	AL	B	Ca	Co	Cr	Cu	Fe	K	Mg
500 ppm	10-20	5-10	30-50	0.1-0.2	0.1-0.3	1-2	10-30	1-2	1-5
30 ppm	0.1	1	1	0.1	0.1	0.2	0.5	1	0.15
5 ppm	0.01	0.02	0.01	0.01	0.01	0.01	0.02	1	0.01
石墨的灰分含量 Ash Content of Graphite	Mn	Na	Ni	P	S	Si	Ti	V	Zn
500 ppm	0.1-0.3	1-5	1-3		10-20	30-50	10-20	10-20	<0.1
30 ppm	0.1	1	0.1	0.3	2	2	0.5	0.2	<0.1
5 ppm	0.01	1	0.02	0.3	2	0.5	0.01	0.02	<0.1
石墨的灰分含量 Ash Content of Graphite	Ag	Gd	Li	Mo	Sn	-	-	-	-
500 ppm	<0.5	<0.01	<0.05	0.1-0.2	<0.1	-	-	-	-
30 ppm	<0.5	<0.01	<0.05	<0.1	<0.1	-	-	-	-
5 ppm	<0.5	<0.01	<0.05	<0.1	<0.1	-	-	-	-

热解碳涂层 /Pyrolytic Carbon Coating (PyC)

在石墨基料的表面作热解碳或是热解石墨的涂层是在高温，高压通入碳氢化合物（如甲烷或乙炔）的气氛中，用化学气相沉积的方法获得的。

A pyrolytic carbon or graphite coating on a graphite substrate is produced at high temperature and pressure in a hydrocarbon atmosphere (e.g. methane or acetylene) using the CVD process.

热解碳的特点 /Properties of PyC

- 高密度 /High Density
- 无气孔 /No Porosity
- 高度各向异性 /High Anisotropy
- 平面光滑 /Smooth Surface

各向异性的特点来自热解碳在平行于晶格层面的生长层。热解碳的最佳涂层厚度为 20-30 μm ，在进行涂层前，石墨部件要倒钝锐边角并要经过纯化处理

The anisotropic property comes from the growth of the pyrolytic carbon layer in parallel lattice planes. PyC coated graphite parts with optimum coating thickness of 20-30 μm . Edges of graphite parts should be chamfered before coating and also purified before the coating.

石墨的优异性能 Outstanding Properties of Graphite

碳化硅涂层 /Silicon Carbide Coating (SiC)

石墨部件可作碳化硅涂层，其原理是在高温和毫巴级的压力下通入硅烷和碳化物气体，用化学气相沉积的方法完成涂层的。所用石墨基材的热膨胀系数应与所作的碳化硅涂层的热膨胀系数相匹配。通常的涂层厚度在 50-100 μm 之间

Silicon carbide is used as a coating for graphite parts. SiC coating are deposited from gaseous silicon and carbon compounds at high temperature in the millibar range (CVD process). The coefficient of thermal expansion of the graphite material must be matched to that of the SiC coating. The typical thickness of the SiC coating on graphite is 50-100 μm .

碳化硅的特点 /Properties of SiC

- 低气孔率（获得适当的涂层厚度后，石墨部件的表面可被完全封盖住）

Low Porosity (graphite parts can be sealed completely by appropriate thickness of coating)

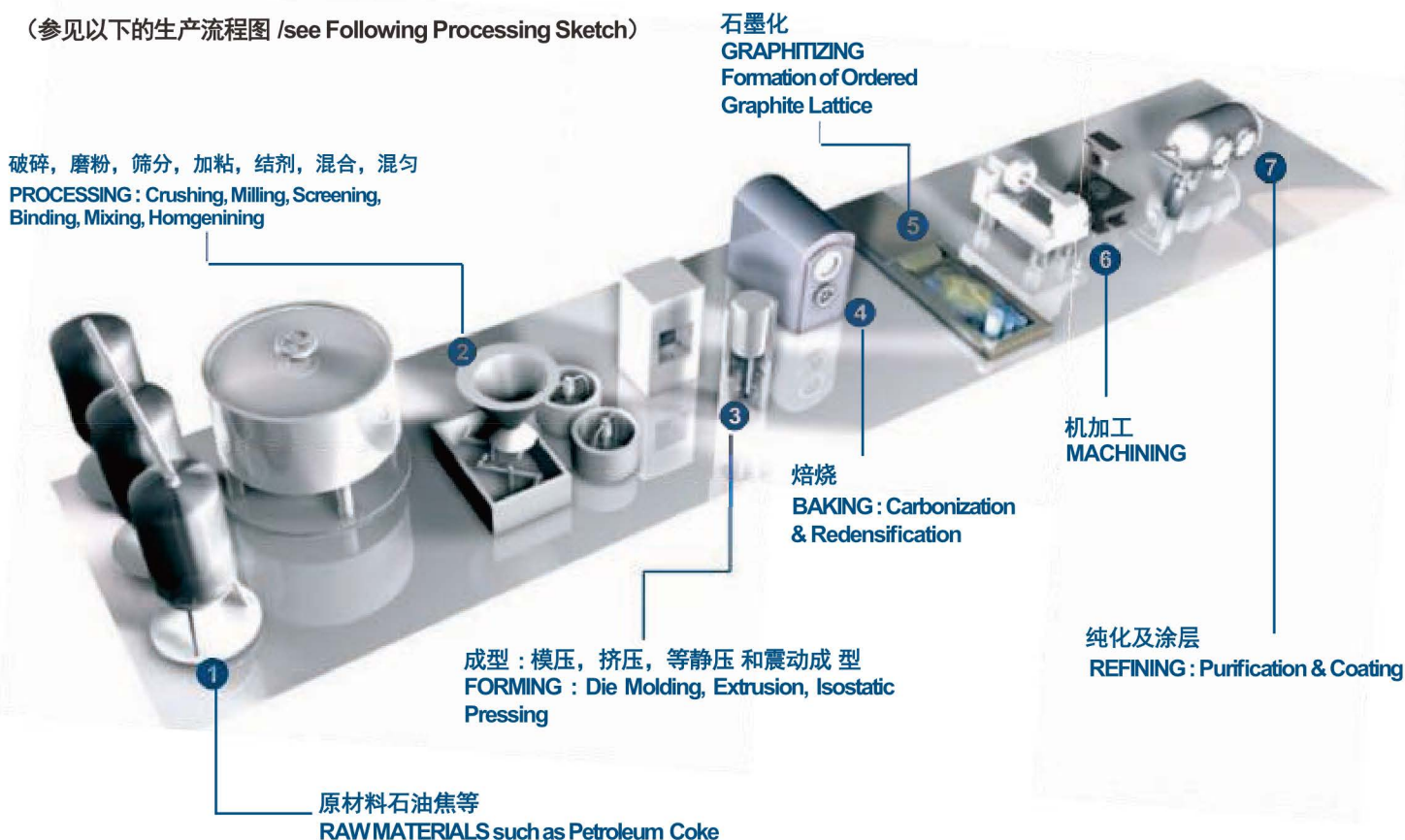
- 硬度高 /High Hardness Figure
- 导热好 /Good Thermal Conductivity
- 耐氧化 /High Oxidation Resistance
- 纯度高 /High Purity

在进行涂层前，石墨部件要倒钝锐边角并要经过纯化处理。典型用途如硅片外延用石墨舟，MOCVD 用石墨舟，石墨舟皿及快速热处理承载器等

Edges of graphite parts should be chamfered before coating and also purified before the coating. Typical applications such as epitaxy susceptors, MOCVD susceptors, boats, susceptors for rapid thermal processing (RTP).

石墨是如何制造出来的 How to Manufacturing of Graphite ?

（参见以下的生产流程图 /see Following Processing Sketch）





特种石墨的典型用途 Typical Applications of Graphite Specialities

光伏及电子半导体领域用石墨

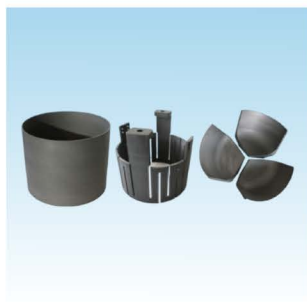
Graphite for Photovoltaic, Electronics and Semiconductor Applications

在这个工业领域里，石墨制品的典型用途有：

Some typical applications in this field:

- 太阳能光伏用石墨
Graphite for photovoltaic
- 硅外延用石墨舟、液相外延用石墨舟、金属有机物气相沉积用石墨舟
Silicon epitaxy susceptors, graphite boat assemblies for liquid phase epitaxy (LPE),
graphite susceptors for metal organic gas phase epitaxy (MOCVD)
- 离子注入及等离子蚀刻用石墨
Graphite for ion implantation and plasma etching
- 区熔半导体材料和金属用石墨舟皿及坩埚
Graphite boats & crucibles for zone refining semiconductor materials and metals
- 拉制单晶硅、锗及III/V族化合物单晶用石墨热场
Graphite hot zones for silicon crystal, germanium and III/V monocrystals pulling
- SiC晶体生长用石墨部件
Graphite parts for growth of SiC crystals
- 钎焊及玻璃金属封装用石墨模具
Brazing and glass to metal sealing jigs of graphite
- 拉制光纤用石墨部件
Graphite for pulling of optical fiber
- 按客户要求定制的石墨部件
Other customized graphite parts on requirements

特种石墨的典型用途 Typical Applications of Graphite Specialities



拉制单晶硅用石墨热场
Graphite thermal field for drawing single crystal silicon



石墨硬毡保温筒
Graphite hard felt insulation cylinder



石墨软毡
Graphite soft felt



原子吸收光谱分析仪器用石墨管
Graphite tubes for atomic absorption spectroscopy analysis instruments



石墨加热器
Graphite Heater



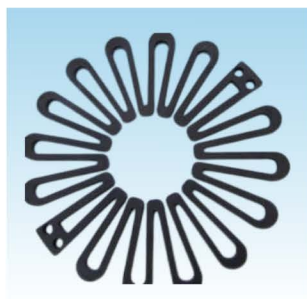
拉制单晶硅用三瓣坩埚
Three petal crucible for drawing single crystal silicon



光电行业用石墨部件
Graphite components for the optoelectronic industry



石墨加热器
Graphite Heater



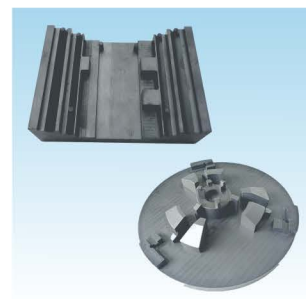
石墨加热器
Graphite Heater



蓝宝石导模法用石墨加热器
Graphite heater for sapphire guided mold method



拉制蓝宝石单晶用石墨加热器
Graphite heater for drawing sapphire single crystals



生产石英用石墨模具
Graphite molds for producing quartz

特种石墨的典型用途 Typical Applications of Graphite Specialities



SiC晶体生长用石墨部件
Graphite components for SiC crystal growth



SiC晶体生长用石墨加热器
Graphite heater for SiC crystal growth



SiC晶体生长用石墨石墨坩埚
Graphite crucible for SiC crystal growth



SiC晶体生长用石墨部件
Graphite components for SiC crystal growth



SiC晶体生长用多孔石墨
Porous graphite for SiC crystal growth



SiC外延用石墨件
Graphite components for SiC epitaxy



石墨载片盘
Graphite carrier disk



石墨托盘
Graphite tray



离子注入机用石墨部件
Graphite components for ion implantation machines



气浮托盘
Air floating tray



束源炉用石墨加热器
Graphite heater for beam source furnace



多晶硅还原炉用石墨卡瓣
Graphite card for polycrystalline silicon reduction furnace

特种石墨的典型用途 Typical Applications of Graphite Specialities



生产激光晶体用石墨加热器
Graphite heater for producing laser crystals



石墨化钢夹具
Indium graphitization fixture



MOCVD用石墨舟
MOCVD using a graphite boat



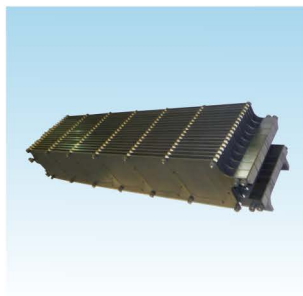
MOCVD用石墨舟
MOCVD using a graphite boat



石墨载片盘
Graphite carrier disk



LED用MOCVD石墨舟
MOCVD ink boat for LED



PECVD用石墨舟
PECVD graphite boat



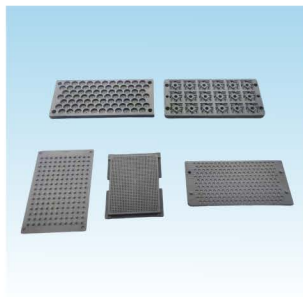
离子注入机用石墨部件
Graphite components for ion implantation machines



等离子刻蚀用石墨电极
Graphite electrode for plasma etching



电子束蒸发镀膜用石墨坩埚
Graphite crucible for electron beam evaporation aluminum plating



金属、玻璃封接用石墨工装
Graphite tooling for metal and glass sealing



拉制光纤用石墨加热器
Graphite heater for drawing optical fibers

特种石墨的典型用途 Typical Applications of Graphite Specialities

高温及真空电炉用石墨 Graphite for High Temperature and Vacuum Furnaces

在这个工业领域里，石墨制品的典型用途有：
Some typical applications in this field:

- 石墨加热件
Graphite heating element
- 硬毡和软毡
Hard felt and soft felt
- 碳碳紧固件及料架
Carbon carbon fasteners and material racks
- 石墨冶金模具
Graphite metallurgical molds
- 石墨烧结舟皿
Graphite sintering boat
- 石墨涂层舟皿
Graphite coated boat
- 铝行业用石墨转子
Graphite rotors used in the aluminum industry

使用金属或是陶瓷作为加热元件，通常真空电炉的使用温度限制在 2000 度以下，而采用石墨作为发热元件的真空电炉可被用至 2200 度，若是在有还原性或是惰性气体的保护气氛中可被用至 3000 度。

Whereas the use of metal and ceramic heating elements is usually limited to about 2000 °C ,specialty graphite material can be used for the entire range of temperature up to 2200 °C and it can be used up to 3000 °C under non-oxidizing, reducing or inert protective atmospheres.

允许的最大电负荷是由电炉的使用温度决定的。我们建议当炉温在 1000 度左右连续运行时，加热区表面的电负荷不应超过 35W/cm²，在短期运行时，加热元件的电负荷可在 50W/cm² 或以上，当炉温超过 1000°C时，电负荷应降低。

The maximum electrical loading permitted is dependent on temperature. We recommend a loading not exceeding 35 W/cm² on the hot-zone surface for continuous operation at temperature up to around 1000 °C . Short-term operation of heaters at 50 W/cm² or more is possible. The maximum loadings should decrease at temperatures above 1000°C



真空炉用石墨静电框
Graphite electrostatic frame for vacuum furnaces



真空炉用石墨加热棒
Graphite heating rods for vacuum furnaces



真空炉用马弗管
Muffle tubes for vacuum furnaces

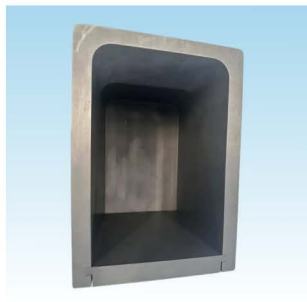


真空炉用石墨件
Graphite parts for vacuum furnaces

特种石墨的典型用途 Typical Applications of Graphite Specialities



刀片烧结用石墨舟皿
Graphite boat for blade sintering



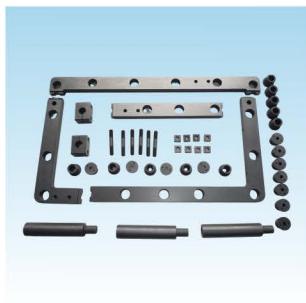
碳化钨粉用石墨舟皿
Graphite boat for tungsten carbide powder



粉末用石墨光谱电极
Graphite spectral electrode for powder



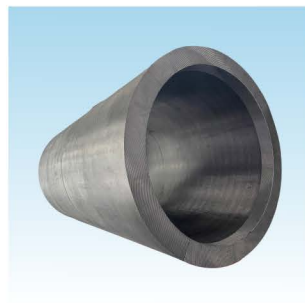
棒材烧结用石墨槽板
Graphite groove plate for bar sintering



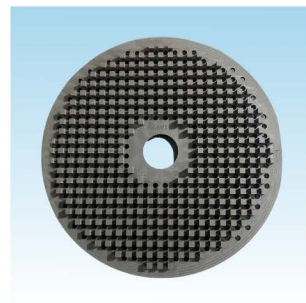
真空炉用石墨件
Graphite parts for vacuum furnaces



真空炉用保温桶
Insulated bucket for vacuum furnace



真空炉用保温桶
Insulated bucket for vacuum furnace



CVD涂层用石墨舟皿
Graphite boat for CVD coating



石墨加热器
Graphite heater



碳碳材料
CFC

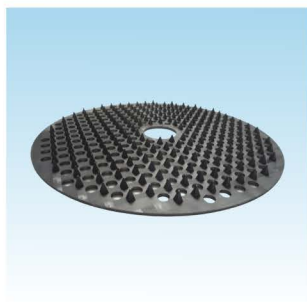


真空炉用石墨件
Graphite parts for vacuum furnaces

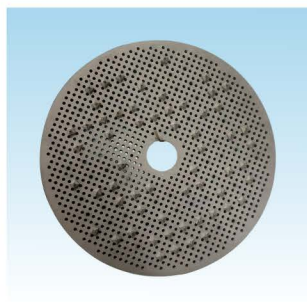


CVD涂层用石墨舟皿
Graphite boat for CVD coating

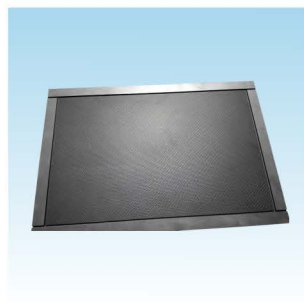
特种石墨的典型用途 Typical Applications of Graphite Specialities



CVD涂层用石墨舟皿
Graphite boat for CVD coating



CVD涂层用石墨舟皿
Graphite boat for CVD coating



石墨槽板
Graphite groove plate for bar sintering



CVD涂层用石墨隔环
Graphite spacer ring for CVD coating



CVD涂层用石墨舟皿
Graphite boat for CVD coating



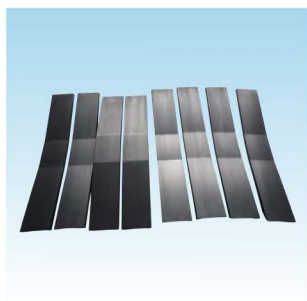
铝行业用石墨油气环
Graphite oil and gas ring for aluminum industry



黄金用石墨模具
Graphite mold for gold



铝行业用石墨加热块
Graphite heating blocks for the aluminum industry



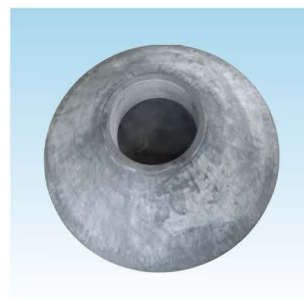
铝行业用石墨结晶器
Graphite crystallizer for aluminum industry



高温密封用石墨分瓣环
Graphite split ring for high temperature sealing



莱宝镀膜机用石墨加热器
Graphite heater for Leybold coater



铝工业用石墨捣锤
Graphite Hammer for Aluminum Industry

特种石墨的典型用途 Typical Applications of Graphite Specialities

汽车及机械领域用石墨 Carbon & Graphite for Automobile and Mechanical Application

在这个工业领域里，碳石墨制品的典型用途有：
Some typical applications in this field:

- 碳石墨轴承
Carbon graphite bearings
- 汽车电子真空泵用石墨转子及叶片
Graphite rotors and blades for automotive electronic vacuum pumps
- 机械密封用石墨环
Graphite rings for mechanical seals
- 无油真空泵用石墨旋片
Carbon vanes for oilless vacuum pumps



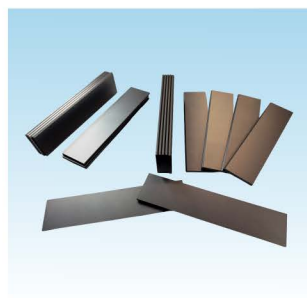
干气密封用石墨分瓣环
Segments ring for dry gas seal



水轮机用28瓣石墨密封环
Graphite Seal Ring in 28 Segments for Hydroturbine



汽车电子真空泵用碳转子和叶片
Carbon rotor and vanes for Car electric vacuum pump



无油真空泵用石墨旋片
Carbon vanes for oilless vacuum pumps



机械密封用石墨环
Graphite rings for mechanical seals



齿轮泵用石墨轴承
Carbon bearing for gear pump



屏蔽泵用石墨轴承
Graphite bearings for shielded pumps



汽车涂层装置用石墨轴承
Graphite bearings for coating device of cars



纺织机用石墨轴承
Graphite bearings for textile machine



汽车电子水泵用石墨轴承
Graphite bearings for water pump of cars

特种石墨的典型用途 Typical Applications of Graphite Specialities

电气工程用碳石墨 Carbon & Graphite for Electrical Applications

在这个工业领域里，碳石墨制品的典型用途有：
Some typical applications in this field:

- 各种直流电机和滑环电机用碳刷
Carbon brushes for DC motors and slip ring motors
- 电力机车及地铁受电弓用碳滑板
Carbon current collectors for pantographs of electrical locomotives and subways
- 电力机车及地铁的接地回流装置
Grounding devices for electrical locomotives and subways



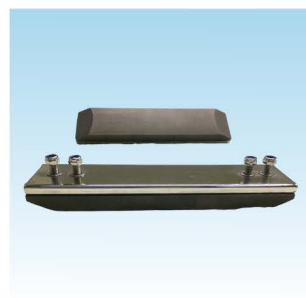
风力发电用碳刷
Carbon brushes for wind turbine



轨道接地用碳刷
Carbon brushes for grounding



受电弓用碳滑板
Carbon current collector for pantograph



第三轨用碳滑板
Carbon current collector for 3rd rail

阿泰克公司常用石墨的技术参数及标准坯料尺寸表 Data sheets and dimensions list of graphite feedstock been used in Artech

Data Sheet on Chinese Die Molded Graphite (for Industrial Applications)
国产模压成型工业领域用石墨技术参数

Grade 牌号	Density 密度 g/cm ³	Flexural Strength 抗折强度 MPa	Compressive Strength 抗压强度 MPa	Shore Hardness 肖氏硬度	Open Porosity 开口气孔率 %	Specific Electrical Resistance 电阻率 μΩm	CTE 热膨胀系数 10 ⁻⁶ /°C
ATM78	1.78	27	60	50	20	13	2.6
ATM83	1.83	35	70	55	17	13	2.6

Data Sheet on Chinese Vibrated Graphite
国产震动成型石墨技术参数

Grade 牌号	Density 密度 g/cm ³	Flexural Strength 抗折强度 MPa	Compressive Strength 抗压强度 MPa	Shore Hardness 肖氏硬度	Open Porosity 开口气孔率 %	CTE 热膨胀系数 10 ⁻⁶ /K	Max. Grain Size 最大粒度 mm	Specific Electrical Resistance 电阻率 μΩm
ATV70	1.70	13	30	50	22	2.5	2.0	8.5
ATV73	1.73	15	32	55	19	2.5	0.8	8.5

Data Sheet on Chinese Extruded Graphite
国产挤压成型石墨技术参数

石墨牌号 Graphite Grades	体积密度 Density g/cm ³	抗折强度 Flexural Strength MPa	抗压强度 Compressive Strength MPa	杨氏模量 Young's Modulus KN/mm ²	热膨胀系数 CTE X10 ⁻⁶ K ⁻¹ (20-200°C)	电阻率 Specific Electrical Resistivity μΩm	导热率 Thermal Conductivity Wm ⁻¹ k ⁻¹	肖氏硬度 Shore Hardness	平均粒度 Average Grain Size in μm
ATE 60	1.60	7	15	6.5	2.6	6.5	130	30	2
ATE 72	1.72	24	40	12	2.5	8.0	155	36	0.5
ATE 75	1.75	29	55	13	4.8	7.6	170	38	0.3

阿泰克公司常用石墨的技术参数及标准坯料尺寸表

Data sheets and dimensions list of graphite feedstock been used in Artech

Data Sheet on Chinese Isostatic Graphite 国产等静压成型石墨技术参数

Grade 牌号	Density 密度 g/cm ³	Flexural Strength 抗折强度 MPa	Compressive Strength 抗压强度 MPa	Shore Hardness 肖氏硬度	Open Porosity 开口气孔率 %	CTE 热膨胀系数 10 ⁻⁶ /°C	Max. Grain Size 最大粒度 um	电阻率 Specific Electrical Resistivity μΩm
ATD80	1.80	50	110	50	10	4.50	15	13
ATD82	1.82	55	110	55	10	4.40	15	13
ATD83	1.83	45	105	55	16	5.50	25	13
ATD84	1.84	52	110	76	15	6.50	21	13
ATD85	1.85	50	110	60	15	4.70	10	13
ATD5X	1.82	50	110	55	15	4.75	15	13

Data Sheet on Chinese Die Molded Graphite (for Mechanical Applications) 国产模压成型机械用碳石墨技术参数

Grade 牌号	Density 密度 g/cm ³	Flexural Strength 抗折强度 MPa	Compressive Strength 抗压强度 MPa	Shore Hardness 肖氏硬度	Open Porosity 开口气孔率 %	CTE 热膨胀系数 10 ⁻⁶ /K	Max. Temperature Be Used 最高使用温度 °C	Remarks 备注
ATM06H	1.62	60	190	90	1.0	4.8	200	"H"-浸渍过环氧树脂 "H"-Impregnated with epoxy resin
ATM20H	1.70	55	182	90	1.0	4.8	200	
ATM54H	1.80	45	100	55	1.0	4.5	200	
ATM06K	1.62	70	190	85	2.0	4.7	200	"K"-浸渍过呋喃树脂 "K"-Impregnated with furan resin
ATM20K	1.70	65	190	80	2.0	4.7	200	
ATM54K	1.70	60	165	65	2.0	4.5	200	
ATM06F	1.62	75	190	85	1.0	4.8	200	"F"-浸渍过酚醛树脂 "F"-Impregnated with phenolic resin
ATM20F	1.70	70	190	80	1.0	4.8	200	
ATM54F	1.80	65	165	65	1.0	4.5	200	
ATM20D	2.20	65	230	80	3.0	5.0	500	"D"-浸渍过锑 "D"-Impregnated with antimony
ATM54D	2.20	65	190	60	3.0	5.0	500	
ATM06P	2.40	80	240	85	2.0	5.0	500	"P"-浸渍过铜锡合金 "P"-Impregnated with Cu-Sn alloy
ATM20P	2.40	75	230	80	2.0	5.0	500	
ATM54P	2.60	65	190	60	2.0	5.0	500	
ATM06B	2.30	85	235	80	2.0	5.5	180	"B"-浸渍过巴氏合金 "B"-Impregnated with Babbitt metal
ATM20B	2.30	80	210	70	2.0	5.5	180	
ATM54B	2.30	65	155	65	1.5	5.2	180	
ATM06R	1.90	75	210	110	1.5	4.6	600	"R"-浸渍过熔融的玻璃 "R"-Impregnated with molten glass
ATM20R	1.90	65	210	95	1.5	4.6	600	
ATM54R	1.90	65	155	65	1.5	4.6	600	
ATM177F	1.83	70	220	93	2.0	9.0	200	"F"-浸渍过酚醛树脂 "F"-Impregnated with phenolic resin

机械及汽车用碳石墨技术参数

Data sheets on mechanical and automobile application

Grade 牌号	Density 密度 g/cm ³	Flexural Strength 抗折强度 MPa	Compressive Strength 抗压强度 MPa	Young's Modulus 杨氏模量 10 ⁸ MPa	Rockwell Hardness 洛氏硬度 HRB	Thermal Conductivity 热导系数 E ⁶ /K	CTE 热膨胀系数 E ⁻⁶ /K	开口气孔率 Porosity (open) Vol %	有氧气氛中 使用温度 Temperature Resistance ℃	浸渍物 Impregnation
ATMJ05	1.82	50	220	14	115,10/150	26	7.7	< 2.5	200	树脂/resin
ATMJ05D	2.55	80	290	21	115,10/150	33	6	< 2.5	500	锑/antimony
ATMJ30	1.82	75	225	22	85(肖氏)	12	5	< 2.5	200	树脂/resin
ATMJ30D	2.30	85	240	28	115,5/150	20	4.5	< 2.5	400	锑/antimony
ATMJ32	1.82	75	220	27	115,5/100	14	5	< 2.5	200	树脂/resin
ATMJ32D	2.25	95	260	30	115,5/100	20	4.5	< 2.5	400	锑/antimony
ATMJ33	1.82	70	200	25	85(肖氏)	14	5	< 2.5	200	树脂/resin
ATMJ33D	2.35	95	280	30 GPa	120,5/100	20 w/mk	4.3	< 2.0	350	锑/antimony
ATMJ45	1.81	70	210	19	115,5/100	17	5.4	< 2.5	200	树脂/resin
ATMJ45D	2.20	80	250	24	115,5/100	20	4.7	< 2.5	400	锑/antimony

多孔石墨材料技术参数表

Data Sheet of Porous Graphite

Technical Properties 性能	牌号 Grade		
	ATEP51	ATEP50	ATEP55
Bulk Density 体积密度 ≤ g/cm ³	1.17	1.17	1.17
Flexural strength 抗折强度 ≥ Mpa	5	5	5
Open Porosity 气孔率 ≥ %	40	45	50
Average diameter of pore 平均孔径	35-40	40-45	45-50
Penetration coefficient 透过率 Ft ³ /ft ² /min	2	2.5	3
Thermal conductivity 导热率 W/m.k	2	2	2
CTE 热膨胀系数 10 ⁻⁶ /K	3.5	3.5	3.5

阿泰克公司选用的德国进口的机械碳石墨的技术参数及标准筒料尺寸表

Data Sheet and Dimension List of Imported Mechanical Carbon Used in Artech

	牌号	浸渍物	体积密度	抗折强度	抗压强度	杨氏模量	洛氏硬度	热导率	热膨胀系数	开口气孔率	有氢气气氛中使用温度	还原气氛中使用温度	圆柱料直径	圆柱料高度	长方料长度	长方料宽度	长方料厚度	典型用途
	Grade	Impregnation	Density g/cc	Flexural strength MPa	Compressive strength MPa	Young's Modulus GPa	Rockwell hardness HRB	Thermal conductivity W/mK	Coefficient of thermal expansion E/K	Porosity (open) Vol. %	Temperature resistance °C	Temperature resistance °C in red. atm.	Cylinder* (mm) Diameter	Cylinder* (mm) Height	Square Block* (mm) X	Square Block* (mm) Y	Square Block* (mm) Z	Typical applications
碳石墨基 Carbongraphite	EK 20	—	1,70	55	155	22	105 HR 5/100	12	3.0	11,0	350	1200	530	200	330	140	60	湿运转轴承 Wet running bearings
	EK 2200*	Resin 树脂	1,82	75	200	23	110 HR 5/100	13	4.0	2,5	200	200	530	200	330	140	60	高负载密封环, 轴承 High loaded seals, bearings
	EK 2201*	Resin 树脂	1,82	75	200	23	110 HR 5/100	14	3.8	2,5	260	260	530	200	330	140	60	密封环, 轴承 Seals, bearings
	EK 2203*	Resin 树脂	1,80	70	195	22	110 HR 5/100	14	3.8	2,5	180	180	530	200	330	140	60	密封环, 轴承 Seals, bearings
	EK 2209	—	1,77	65	190	25	110 HR 5/100	15	3.6	2,5	350	400	530	200	330	140	60	高负载密封环, 轴承 High loaded seals, bearings
	EK 3205	Antimony 锑	2,30	85	260	30	120 HR 5/100	18	4.0	2,5	350	550	530	200	330	140	60	高负载密封环, 轴承 High loaded seals, bearings
	EK 2230*	Resin 树脂	1,85	60	160	22	110 HR 5/100	14	6.5	2,5	200	200	72	45	110	115	25	大批量生产的密封环, 轴承 High volume seals, bearings
	EK 2239	—	1,80	55	150	20	105 HR 5/100	15	4.5	2,5	350	400	72	45	110	115	25	大批量生产的密封环, 轴承 High volume seals, bearings
	EK 3235	Antimony 锑	2,47	65	210	30	105 HR 5/150	20	5.1	2,5	350	550	72	45	110	115	25	大批量生产的密封环, 轴承 High volume seals, bearings
	EK 24	—	1,70	60	180	18	105 HR 5/100	14	4.1	8,0	350	1200	580	200	610	325	130	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 2240*	Resin 树脂	1,80	70	200	19	110 HR 5/100	15	5.0	2,5	200	200	580	200	610	325	130	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 2241**	Resin 树脂	1,80	70	200	19	110 HR 5/100	15	4.8	2,5	260	260	580	200	610	325	130	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 2243*	Resin 树脂	1,78	60	190	18	110 HR 5/100	16	4.6	2,5	180	180	580	200	610	325	130	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 3245	Antimony 锑	2,20	80	250	22	120 HR 5/100	20	4.9	2,5	350	550	580	200	610	325	130	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 25	—	1,69	45	125	16	100 HR 5/100	9	4.5	7,0	350	950	72	45	—	—	—	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 2250	Resin 树脂	1,80	50	160	17	110 HR 5/100	10	5.1	2,5	200	200	72	45	—	—	—	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
石墨基 Graphite	EK 3255	Antimony 锑	2,15	75	220	21	120 HR 5/100	12	5.2	2,5	350	550	72	45	—	—	—	干运转及干湿混合运转的密封环, 轴承 Seals, bearings for dry running, mixed running
	EK 40*	—	1,70	35	100	10	95 HR 5/100	25	4.5	14,0	500	2500	220	260	330	140	73	干运转的密封环, 轴承 Seals, bearings for dry running
	EK 200*	Resin 树脂	1,82	50	200	13	115 HR 5/100	26	6.8	2,5	200	200	220	260	330	140	73	干运转的密封环, 轴承 Seals, bearings for dry running
	EK 201**	Resin 树脂	1,82	50	200	13	115 HR 5/100	26	6.2	2,5	260	260	220	260	330	140	73	干运转的密封环, 轴承 Seals, bearings for dry running
	EK 203*	Resin 树脂	1,80	40	160	13	115 HR 5/100	26	5.6	2,5	180	180	220	260	330	140	73	干运转的密封环, 轴承 Seals, bearings for dry running
	EK 204	Salt 盐	1,78	40	140	13	105 HR 5/100	27	4.6	12,0	600	1200	220	260	330	140	73	干运转的密封环, 轴承 Seals, bearings for dry running
	EK 305*	Antimony 锑	2,55	80	290	21	115 HR 5/100	33	6.0	2,5	500	550	220	260	330	140	73	干运转的密封环, 轴承 Seals, bearings for dry running
树脂粘结石墨基 Resin Bond Graphite	V 1626	Salt 盐	1,85	58	150	13	90 HR 5/100	73	4.0	10,0	600	1200	—	—	330	240	6.5	高负载压缩机用旋片 Vanes f. high load. compr.
	EK 60	—	1,73	80	120	22	80 HR 5/100	6	11.0	No	180	180	—	—	385	235	8.8	压缩机用旋片 Vanes for compressors
	V 1771 ¹	—	1,69	70	150	17	100 HR 5/100	5	18.0	No	220	220	—	—	385	235	8.8	大批量生产的压缩机旋片 Vanes f. high vol. compr.
	V 1352 ¹	—	1,62	75	200	18	110 HR 5/100	2	17.0	No	180	180	77/30	8/110	385	235	10	压缩机及泵用部件 Parts for compr., pumps
	V 1640 ¹ *	—	1,69	85	210	14	110 HR 5/100	3	16.0	No	180	180	77/30	8/110	385	235	10	压缩机及泵用部件 Parts for compr., pumps
	V 1640 ¹ *	—	1,69	85	210	14	110 HR 5/100	3	16.0	No	180	180	77/30	8/110	385	235	10	压缩机及泵用部件 Parts for compr., pumps

阿泰克公司选用的进口等静压石墨技术参数及标准坯料尺寸表 Data Sheet and Dimension List of Imported Isostatic Graphite Used in Artech

Data Sheet of Imported Isostatic Graphite
进口等静压石墨技术参数表

石墨牌号 Isostatic Graphite Grades	体积密度 Density g/cm ³	抗折强度 Flexural Strength MPa	抗压强度 Compressive Strength MPa	杨氏模量 Young's Modulus KN/mm ²	热膨胀系数 CTE X10 ⁶ K ⁻¹ (20-200°C)	电阻率 Specific Electrical Resistivity μΩm	导热率 Thermal Conductivity Wm ⁻¹ k ⁻¹	肖氏硬度 Shore Hardness	平均粒度 Average Grain Size in μm	
ATDJ-05	1.88	85	240	14.0	4.7	13	100	70	3	
ATDJ-04	1.84	65	150	12.5	3.9	14	90	60	7	
ATDJ-03	1.83	60	125	11.5	4	13	100	60	10	
ATDJ-02	1.77	50	120	10.5	3.9	14	80	55	10	
ATDJ-01	1.72	45	90	10.5	2.9	12	90	55	15	
ATDJ-11	1.75	59	98	11	3.2	13	116	55	15	
ATDJ-12	1.80	80	140	12	3.6	13	110	62	10	
ATDJ-13	1.85	69	137	12	4.1	15	81	70	6	
ATDJ-225	1.82	58	127	12	5.9	14	93	65	10	
ATDJ-331	1.79	39	90	9.8	4.8	13	104	56	10	
ATDJ-332	1.85	49	120	10.8	5.5	11	116	58	10	
ATDJ-230	1.84	65	130	11	6	16.5	79	80	8	
ATDJ-240	1.76	45	95	10.6	4.7	13.7	95	55	13	
ATDJ-220	1.77	45	90	9.8	4.3	15.5	85	52	15	
ATDJ-412	1.76	44	85	9	3.5	11.5	120	68	15	
ATDJ-511	1.77	39	78	9.8	4.5	11	116	51	10	
ATDJ-556	1.77	43.1	88.2	10.3	4.7	12.2	104	57	10	
ATDJ-570	1.83	47	102.9	11.8	4.6	10	128	58	10	
ATDJ-643	1.80	54	103	10.8	4.8	12.5	128	57	5	
ATDJ-644	1.86	59	108	11.3	4.8	11	140	61	5	
ATDJ-358	1.86	54	135	11	4.4	9.5	139	54	10	

阿泰克公司选用的汽车用石墨转子和燃料电池用双极板技术参数 Data Sheet and Dimensions of Rotors & Vanes of Automobile and Graphite bipolar plate for Fuel Cell

Data Sheet on Graphite for Rotors & Vanes of Automobile
汽车用石墨转子技术参数

牌号 Graphite Grade	ATMJ44	ATDJ46	ATDJ56
浸渍物 Impregnation	树脂 Resin	盐 Salt	盐 Salt
体积密度 Density g/cm ³	1.82	1.85	1.84
抗折强度 Flexural strength MPa	75	58	62
抗压强度 Compressive strength MPa	200	150	165
杨氏模量 Young's Modulus GPa	23	13	15
洛氏硬度 Rockwell Hardness HRB	110HR5/100	90HR5/100	110HR5/100
导热率 Thermal Conductivity W/mk	13	73	75
热膨胀系数 CTE E _{6/K}	4.0	4.0	4.0
开口气孔率 Open Porosity Vol. %	2.5	10.0	10.0
有氧气氛中使用温度 Temperature resistance in air °C	200	600	600
还原气氛中使用温度 Temperature resistance °C in red. atm.	200	1200	1200
典型用途 Typical Applications	高负载密封环，轴承 High load seals, bearings	高负载压缩机旋片 Vanes for high load compressors	高负载压缩机旋片 Vanes for high load compressors

Data Sheet on Graphite bipolar plate for Fuel Cell
燃料电池用石墨双极板技术参数

石墨牌号 Grade	体积密度 Density g/cm ³	电阻率 Specific Electrical Resistivity μ Ωm	抗折强度 Flexural Strength MPa	抗压强度 Compressive Strength MPa	洛氏硬度 Rockwell Hardness HR	肖氏硬度 Shore Hardness	气孔率 Open Porosity %	推荐温度 Recommended Working Temperature °C	主要用途 Main Application
ATM03H	≥1.85	≤12	≥60	≥95	≥110	≥50	≤1	≤180	氢燃料电池 Hydrogen Cell
ATM03HTJ	≥1.85	≤12	≥60	≥95	≥110	≥50	≤1	≤180	钒液流电池 Vanadium Redox Flow Battery
ATM03HK	≥1.85	≤15	≥65	≥110	≥120	≥50	≤1	≤180	耐腐蚀燃料电池 Corrosion-resisting Fuel Cell
ATM03HET	≥1.85	≤15	≥65	≥110	≥110	≥50	≤1	≤180	甲醇、乙醇燃料电池 Methyl Alcohol, Ethanol Fuel Cells

阿泰克公司选用的石墨软毡、硬毡、碳布和碳碳复合材料的技术参数 Data Sheets and Dimensions of Soft Felt, Rigid Felt, Carbon fabric and CFC

Data Sheet on Carbon fabric 炭布的技术参数

牌号 Grade	含碳量 Carbon Content wt%	灰份 Ash Content wt%	抗拉强度 (经向) Strength of Extention (Wrap) N/25mm	抗拉强度 (纬向) Strength of Extention (Weft) N/25mm	导热系数 Thermal Conductivity Coefficient w/mk	电阻率 Specific Electrical Resistance Ω/m	厚度 Thickness mm
炭布 Carbon fabric ATTB	≥ 98	≤ 1.50	4845.3	5152	0.3	0.4-0.8	0.4-0.6

Data Sheet on Graphite Soft Felt 石墨软毡的技术参数

牌号 Grade	含碳量 Carbon Content wt%	灰份 Ash Content wt%	密度 Density g/cm ³	导热系数 Thermal Conductivity Coefficient w/mk	电阻系数 Coefficient of Resistance Ωcm	抗拉强度 Strength of Extention MPa	处理温度 Processing Temperature $^{\circ}C$	使用温度 (真空) Operating Temperature in Vacuum Gases $^{\circ}C$	使用温度 (惰性气体) Operating Temperature in Inert Gases $^{\circ}C$
ATSF	99.5~99.9	0.5~0.1	0.08~0.12	0.026	0.12~0.16	0.1~0.12	≥ 2000	≥ 2200	≥ 2800

Data Sheet on Graphite Rigid Felt 石墨硬毡的技术参数

牌号 Grade	密度 Density g/cm ³	含碳量 Carbon Content wt%	灰份 Ash Content wt%	弯曲特性 (面方向) Flexural Strength (Plane Direction) MPa	热传导性 20 $^{\circ}C$ Thermal Conductivity at 20 $^{\circ}C$ W/m/k	热传导性 1000 $^{\circ}C$ Thermal Conductivity at 1000 $^{\circ}C$ W/m/k	挥发性 Volate %	处理温度 Processing Temperature $^{\circ}C$
石墨硬毡 ATRF	< 0.18	> 99.9	< 200	2.0	0.25	0.46	0	2200

Data Sheet on CFC CFC碳纤维复合材料的技术参数

牌号 Grade	密度 Density g/cm ³	抗弯强度 Bending Strength Mpa	抗拉强度 Strength of Extention MPa	热膨胀系数 CTE $10^{-6}/K$	最高使用温度 Max. Operating Temperature $^{\circ}C$
ATC13	1.32	90	60	0.5	2500
ATC15	1.51	135	76	0.6	3000
ATC17	1.62	170	98	0.7	3000

阿泰克 -
善做石墨

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This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as guaranteeing specific properties of the products described or their suitability for a particular application.



成都阿泰克特种石墨有限公司
Chengdu Artech Specialty Graphite Co., Ltd.

地址：四川省成都市崇州市华业路128号
Address: 128 Huaye Road, Chongzhou City,
Chengdu, Sichuan Province

邮编 /Postal Code: 611230

电话 /TEL: +86-28-8260 2128

邮箱/E-mai: atk009@artech-graphite.com
atk011@artech-graphite.com

www.artech-graphite.com