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SUNNYSTEEL

SILICON CARBIDE PRODUCT

高性能碳化硅陶瓷专业制造商

Professional manufacturer of high performance silicon carbide ceramics

SUNNYSTEEL
SILICON CARBIDE PRODUCT

What is Silicon Carbide Ceramic?

Silicon carbide ceramic (SiC) is an advanced ceramic material containing silicon and carbon. It occurs in nature as the extremely rare mineral moissanite. Synthetic SiC powder has been mass-produced since 1893 for use as an abrasive. Grains of silicon carbide can be bonded together by sintering to form very hard ceramics.

With the rapid development of modern national defense, nuclear energy, spa ce technology, the automobile industry, and marine engineering, requirements for materials are increasing. It is urgent to develop all kinds of new high-performance structural materials.

Silicon carbide ceramic materials have many excellent features such as high-temperature strength, good wear resistance, small thermal expansion coefficient, high hardness, thermal shock, chemical corrosion resistance, etc. Therefore, it is widely used in the automobile, mechanical and chemical industries, environmental protection, spa ce technology, information electronics, energy, and other fields. Silicon carbide has become an irrepla ceable structural ceramic with excellent performance in many industrial fields.

+86 13916927033(W/A)

SISIC Properties

反应烧结碳化硅陶瓷制品特性

反应烧结碳化硅具有高强度、高硬度、高耐磨、耐高温、耐腐蚀、抗氧化性好、抗热震性好、导热好、耐急冷急热和抗高温蠕变等基本特性和主要特点。可制成横梁、辊棒、冷风管、热电偶保护管、测温管、喷火嘴、耐磨件、耐腐蚀件、密封件及各种异型结构件等。

Reaction bonded silicon carbide has high strength, high hardness, high abrasion resistance, high temperature resistance, corrosion resistance, good oxidation resistance, good thermal shock resistance, good thermal conductivity, rapid cooling and rapid heat resistance and high temperature creep resistance, etc. It can be made into beam, roller, cooling air pipe, thermocouple protection pipe, temperature measuring pipe, burner nozzle, wear-resisting parts, corrosion-resisting parts, sealing parts and a variety of special-shaped structural parts.

SSIC Properties

无压烧结碳化硅陶瓷制品特性

无压烧结碳化硅相比反应烧结碳化硅而言,因其材料中没有游离硅存在，所以其具有更高纯度、更优异的力学性能、更突出的耐腐蚀性（可耐强酸、强碱腐蚀，也是唯一可耐氢氟酸腐蚀的陶瓷材料）、更高的耐磨性，可在其他材料不能满足的环境中使用，服役寿命更长。

Compared with reaction bonded silicon carbide, pressureless sintered silicon carbide has higher purity, better mechanical properties, more prominent corrosion resistance (Resistant to strong acid and alkali corrosion, It is also the only ceramic material which can resistant to hydrofluoric acid corrosion), higher wear resistance, because of there's no free silicon in the material.It can be used in other materials can not meet the environment, longer service life.

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SISIC/SSIC Roller

辊棒

反应烧结碳化硅辊棒
SISIC Rollers

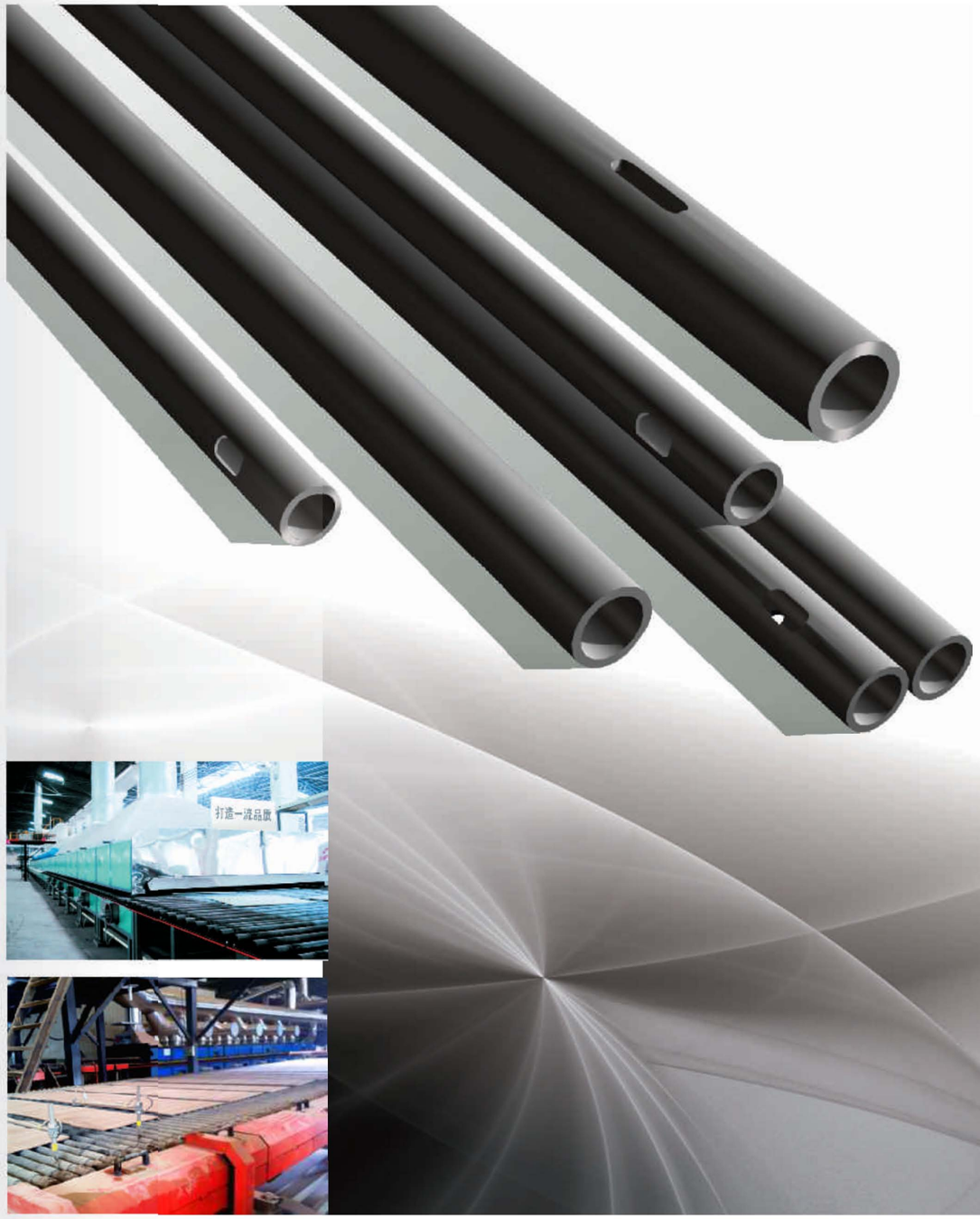
反应烧结碳化硅辊棒抗氧化、高温承载力大、长期使用不变形，使用寿命是氧化铝陶瓷辊棒的10-15倍，适用于日用瓷、卫生瓷、建筑瓷、磁性材料及新能源电池材料等辊道窑的高温烧成带。

The SISIC Rollers are oxidation resistance, high bending strength under high temperature ,no deformation for a long application time.Service life is 10-15 times more than Alumina roller. They can be made as perfect kiln-furniture for roller hearth kiln in the field of domestic ceramics, sanitary ceramics, building ceramics , magnetic materials and new energy battery materials.

无压烧结碳化硅辊棒
SSIC Rollers

无压烧结碳化硅辊棒的承载力以及抗氧化性在所有碳化硅材料中最好，使用温度可达1600℃，同时具有极好的耐腐蚀性能。随着锂电池行业的发展，对正负极材料的需求量对来越大，如钴酸锂（LCO）、锰酸锂（LMO）、三元材料（NCM）、磷酸铁锂（LFP）等烧结过程中会产生大量的强碱性气体，传统的反应烧结碳化硅辊棒中含有15-20% 的游离硅，会与强碱性气体发生反应从而缩短使用寿命。无压烧结碳化硅中不含有游离硅，碳化硅含量可达99%以上，极大的延长了辊棒的使用寿命（是反应烧结的5倍以上），从而大大降低了维护成本。

The bearing capacity and oxidation resistance of pressureless sintered silicon carbide roller are the best among all sic materials.operating temperature up to 1600℃, and has excellent corrosion resistance. Along with the development of the lithium battery industry, the demand for anode materials are on to the greater, such as lithium cobalt oxides (LCO), Manganese acid lithium (LMO), Nickel-cobalt-manganese ternary material (NCM), lithium iron phosphate (LFP) will produce a large amount of strong alkali gas during firing process, the traditional reaction bonded silicon carbide roller contains 15-20% free silicon, can react with strong alkali gas so as to shorten the service life. There is no free silicon in the pressureless sintered silicon carbide, and the content of silicon carbide can reach more than 99%, which greatly extends the service life of the roller (more than 5 times of theSiSiC), thus greatly reducing the maintenance cost.



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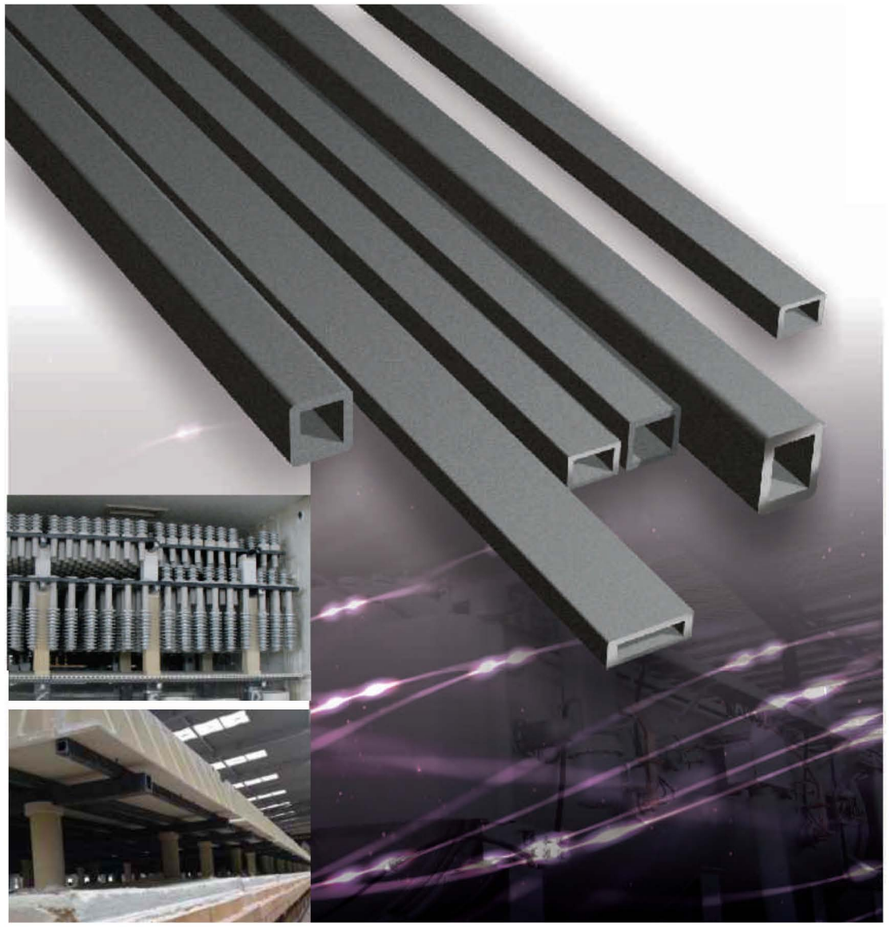
SISIC Beam

横梁

真空反应烧结碳化硅横梁具有抗氧化，高强度，长期使用不变形等特点。横梁是梭式窑，隧道窑，双层窑及其他工业窑炉的承重支架;

The SISIC Beams have series of characteristic such as oxidation resistance, high bending strength , no deformation for a long application time. SISIC Beams are applicable to shuttle kiln, two-stage roller hearth kiln and other industrial kiln.



SISIC Burner Nozzle

喷火嘴

燃烧器喷火嘴是各种燃气，燃油等工业窑炉理想的燃烧室，尤其各式分火器对宽体窑和温差要求较高的工业窑炉，能有效的控制窑炉温差。

The SISIC Burner Nozzles are the best parts for all kinds of kilns which are used gas or oil, especially for the industrial furnace to separate fire as a machine which is be high requested on broad of furnace and different temperature. They can control temperature effectively.

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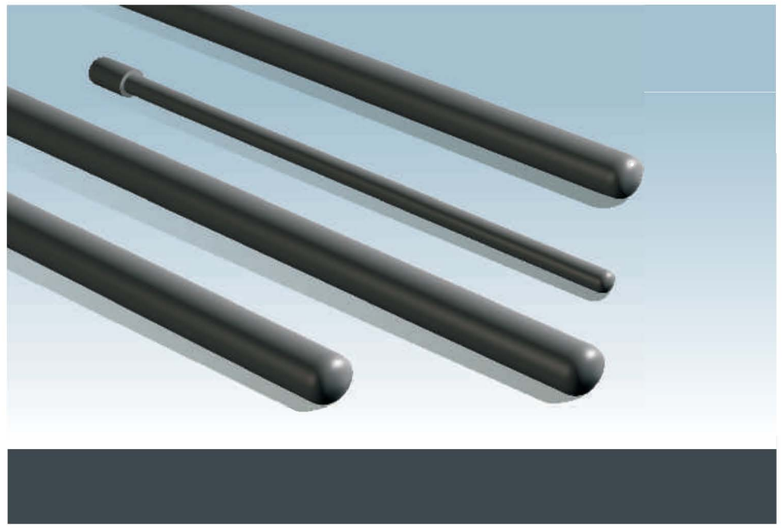
SISIC Cooling Air pipe

冷风管

SISIC/SSIC Thermal Couple Protection Tube

热电偶保护管



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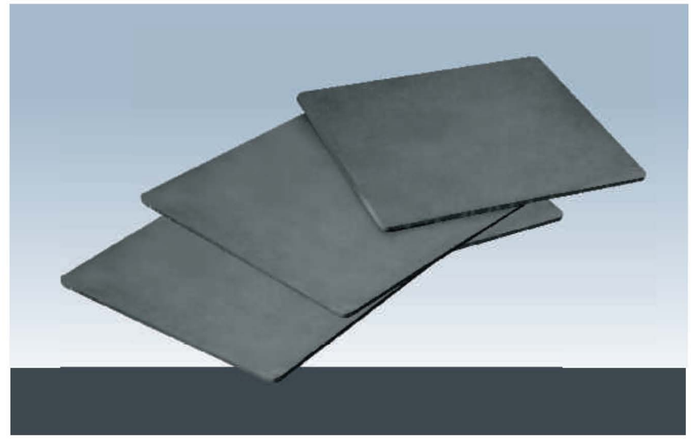
SISIC Batt

板材



SISIC/SSIC Crucible. Sagger

坩埚、匣钵

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SISIC
Radiation Pipe

辐射管

碳化硅辐射管具有耐高温，导热好，耐急冷急热，抗氧化，抗热震性好，使用寿命长，是钢铁冶炼行业最理想的隔焰导热材料。

SISIC radiation pipe is high temperature tolerance, high thermal conductivity, low coefficient of thermal expansion, oxidation resistance, thermal shock resistance, long application life. They are the best materials in steel metallurgy industry.

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SISIC
Radiation Pipe

辐射管

SISIC
Heat Exchanger

换热器

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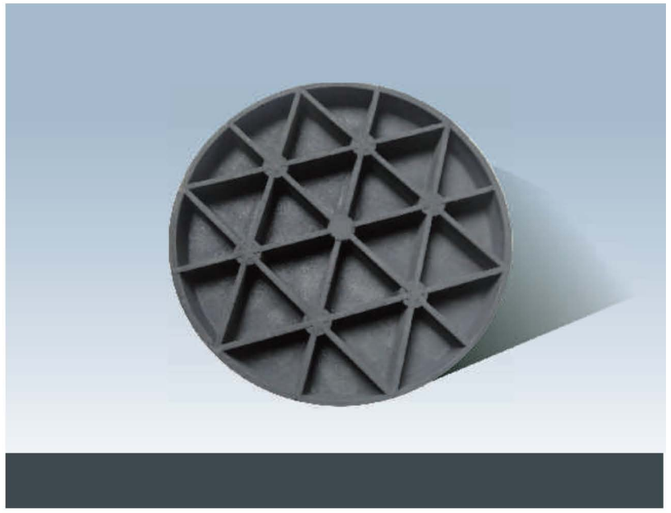
SSIC Photovoltaic products

光伏产品

SSIC Reflector Substrate

反射镜基板



SSIC Csntilever Paddles

悬臂桨

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SISIC
Ceramic Bush

耐磨衬套件

SISIC
The lining of the slurry pump housing

渣浆泵壳内衬

SISIC
Hydrocyclone Liner

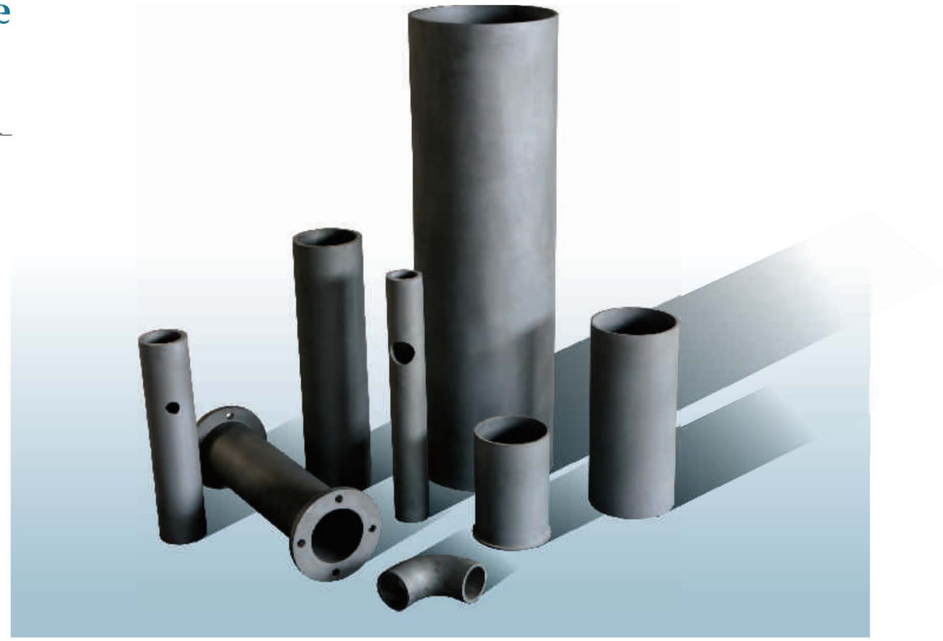
旋流器内衬

SISIC
pump impeller

叶轮

SISIC
Liner Tube

耐磨管道件



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SISIC Silicon carbide composite polyurethane bushing

碳化硅复合聚氨酯衬套

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SISIC Sand Mill Inner Barrel

砂磨机内筒

碳化硅陶瓷砂磨机内筒具有重量轻、硬度高、耐腐蚀、耐高温等特性,比传统的氧化锆陶瓷更耐冲刷和磨损（极低的磨耗量可防止物料污染）。导热系数为130W/M·K（20℃），是散热效果最好的陶瓷材料，有利于设备运行过程中对温升的控制。筒体采用整体浇注或等静压成型技术，可将砂磨机内腔与外部壳体有效隔离,使其不受物料和介质的冲刷和腐蚀。使用寿命是一般耐磨材料的5-10倍，综合运行成本较低。

Silicon carbide ceramic sand mill inner barrel with light weight, high hardness, corrosion resistance, high temperature resistance and other properties. It's better than traditional Zirconia ceramics in resistance to erosion and wear(low abrasion value can prevent material from pollution).The coefficient of thermal conductivity is 130 W/m.k (20℃),it is the best cooling effect ceramic material which has the advantages to control the temperature rise in the process of equipment operation. The barrel is through the casting or isostatic pressing molding forming technology , can be effective isolation lumen and outer shell, make it is not subject to corrosion and scouring. Service life is 5 to 10 times of general wear-resisting material, integrated operation cost is low.

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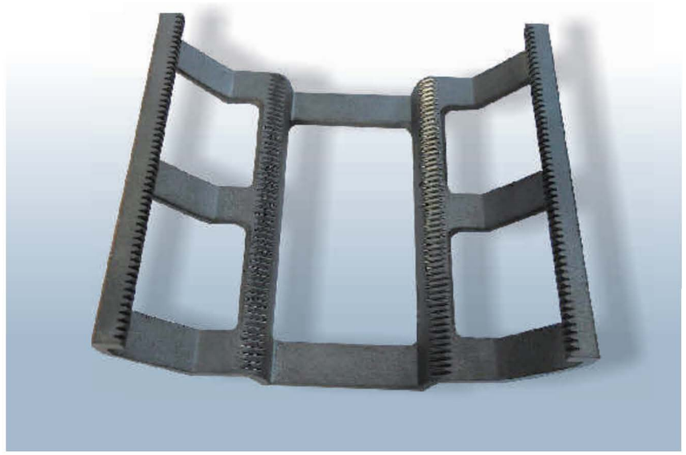
Precision Silicon Carbide Ceramics Parts For Semiconductor Equipment

半导体设备应用精密碳化硅陶瓷件

电机支架
Motor Bracket



晶舟
Wafer Boat

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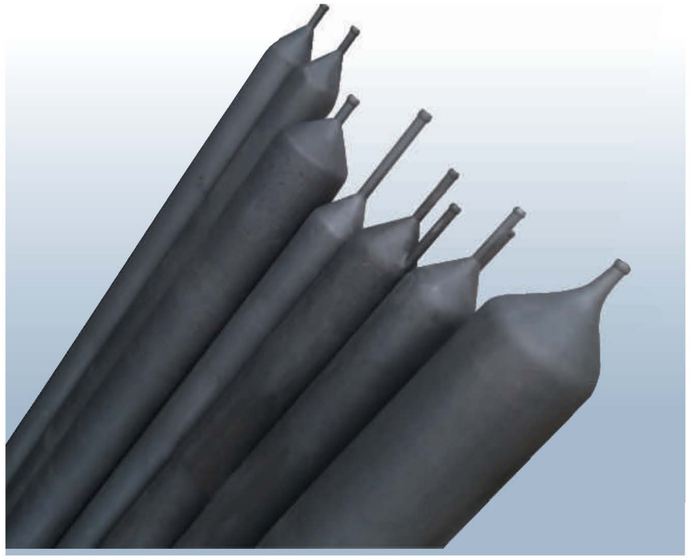
导轨
Guide Frame

吸盘
Chuck

SISIC Kiln Tubes

炉管



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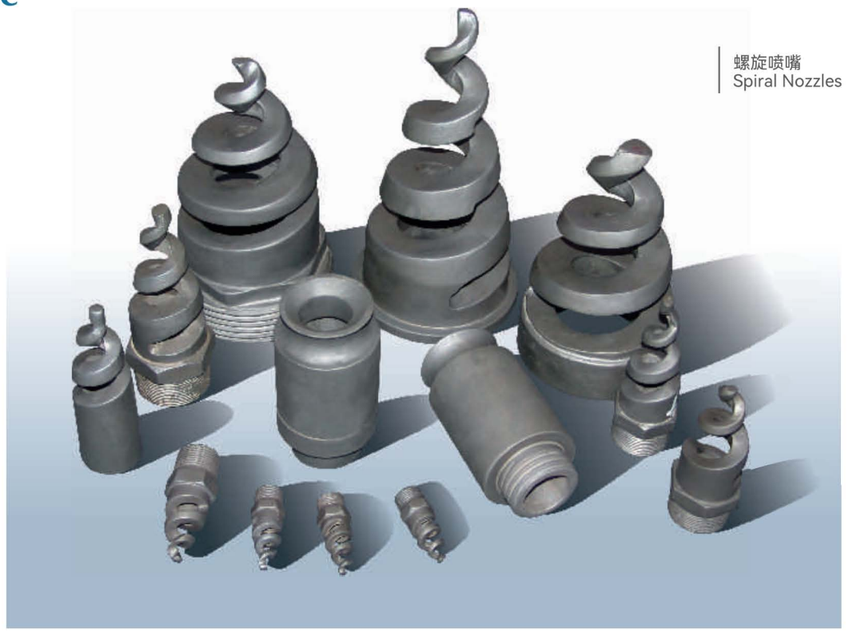
SISIC Desulfurization Spray Nozzle

脱硫喷嘴



螺旋喷嘴
Spiral Nozzles

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单向喷嘴
Single Directiom Nozzles

双向喷嘴
Double Directiom Nozzles

SISIC Special-shaped Parts

异型件

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SILICON CARBIDE PRODUCT

Parameter Comparison

不同材料碳化硅陶瓷制品参数比较

项目 Item	单位 Unit	指标 Data			
		反应烧结碳化硅 RBSiC(SiSiC)	氮化硅结合碳化硅 NBSiC	**无压烧结碳化硅 SSiC**	重结晶碳化硅 RSiC
碳化硅含量 SiC content	%	85	80	**99**	98.5
游离硅含量 Free Silicon content	%	15	0	**0**	0
最高使用温度 Max service temperature	℃	1380	1550	**1600**	1650
密度 Density	g/cm^3	3.02	2.72	**3.10**	2.60-2.74
气孔率 Open porosity	%	0	12	**0**	15
抗弯强度 Bending strength 20℃	Mpa	250	160	**380**	100
1200℃	Mpa	280	180	**400**	120
弹性模量 Modulus of elasticity 20℃	Gpa	330	220	**420**	240
1200℃	Gpa	300	/	**/**	200
热传导系数 Thermal conductivity 1200℃	W/m.k	45	15	**74**	10
热膨胀系数 Coefficient of thermal expansion	K-1x10-6	4.5	5.0	**4.1**	4.8
维氏硬度 HV	kg/m^{m2}	2500	2500	**2800**	/

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Test Data

不同材料
液体腐蚀测试数据

测试环境 Test Environment	腐蚀性失重 Corrosive weight loss (mg/cm^{2}yr)				
试剂浓度 (wt%) conc.Reagent	温度 (°c) temperature	无压烧结碳化硅 (不含硅) SSiC (No Free Si)	反应烧结碳化硅 (含12%硅) RBSiC(SiSiC) SiC (12% si)	碳化钨 (6%钴) Tungsten carbide (6% Co)	氧化铝 (99%) Aluminum OXide (99%)
98%H_2SO_4	100	1.8	55.0	>1000	65.0
50%NaOH	100	2.5	>1000	5.0	75.0
53%HF	25	<0.2	7.9	8.0	20.0
85%H_3PO_4	100	<0.2	8.8	55.0	>1000
70%HNO_3	100	<0.2	0.5	>1000	7.0
45%KOH	100	<0.2	>1000	3.0	60.0
25%HCl	70	<0.2	0.9	850	72.0
10%HF & HNO_3	25	<0.2	>1000	>1000	16.0

Explain
备注

- **测试时间 Test Time:**

进水125到300小时测试，不断搅拌。
125 to 300 hours of submersive testing, continuously stirred.

- **腐蚀失重指南 Corrosion Weight Loss Guide:**

>1000 mg/cm^2 yr	几天内完全破坏	Completely destroyed within days.
100 to 999 mg/cm^2 yr	不推荐使用超过一个月	Not recommended for servicegreater than a month
50 to 100 mg/cm^2 yr	不推荐使用超过一年	Not recommended for servicegreater than one year
10 to 49 mg/cm^2 yr	谨慎使用，基于特定的应用	Caution recommended, basedon the specific application.
03 to 9.9 mg/cm^2 yr	推荐长期使用	Recommended for long term service
<2 mg/cm^2 yr	推荐长期使用，基本无腐蚀	Recommended for long term service; no corrosion, other than as a result of surface cleaning, was evidenced.