



中国建材

Sinoma

Sinoma

*Advanced
Nitride Ceramics*



中材高新氮化物陶瓷有限公司

Sinoma Advanced Nitride Ceramics Co., Ltd.



打造国际一流专业化氮化物陶瓷科技企业
 Build a world-class professional nitride ceramic technology enterprise

INTRODUCTION

简介

中材高新氮化物陶瓷有限公司是隶属于中国建材集团的国家级高新技术企业。

公司主要从事氮化硅、碳化硅、氧化锆、氧化铝等先进陶瓷材料的研究和生产。尤其是在氮化硅陶瓷方面的研究和生产始于 20 世纪 70 年代，是国内最早从事氮化硅陶瓷领域研究的单位之一，获得 65 项相关发明专利，技术和生产实力居国内领先水平，生产规模在国内居于首位。

公司拥有先进的研发、生产和加工设备，完善的检测设备，以及高效并经验丰富的生产研发团队，能够快速为客户提供有效的解决方案，特殊部件可按客户实际需求提供定制产品。

Sinoma Advanced Nitride Ceramics Co., Ltd. is a national high-tech enterprise affiliated to China National Building Materials Group (CNBM).

Sinoma is mainly engaged in the research and production of advanced ceramic materials such as silicon nitride, silicon carbide, zirconia, and alumina. In particular, the research and production of silicon nitride ceramics began in the 1970s. Sinoma is one of the earliest units engaged in the research of silicon nitride ceramics in China, and has obtained 65 related invention patents. Its technology and production strength are at the leading level and the scale of production ranks first in China.

Sinoma has advanced R&D, production and processing equipment, complete testing equipment, and an efficient and experienced production R&D team, which can quickly provide customers with effective solutions and customized products according to customer demands.

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中材氮化物发展史

Sinoma Silicon Nitride Development

1978	在山东成立 Sailon 项目组 Sailon project team established in Shandong
1980	RBSN,R-RBSN,HP-SN 无压烧结氮化硅研制成功 Pressureless sintering Si ₃ N ₄ developed successfully
1984	成立氮化硅研究室 Silicon nitride lab was set up
1986	柴油机气门研制成功 Silicon nitride diesel engine valve developed successfully 第一家采用压滤成型工艺研制涡轮转子,并取得成功 First one adopted pressure filtration technology and developed the turbine rotor successfully
1989	国内首家从事 GPS 氮化硅轴承球研制,并取得成功 First R&D silicon nitride bearing ball in GPS tech and achieve to success
1992	完成涡轮转子考核、验收 Finished the assessment and acceptance for turbo rotor
1995	完成柴油机气门验收考核 Finished the review and acceptance for diesel engine valve
1996	建成年产 80W 粒氮化硅陶瓷轴承球中试生产线 Built a pilot-scale production line of silicon nitride bearing ball with capacity 800,000 pcs/year
2008	建成年产 12 吨氮化硅陶瓷轴承球生产线 Built a production line of silicon nitride bearing ball, 12T/year
2011	成立中材高氮化物陶瓷有限公司 Sinoma Advanced Nitride Ceramics Co.,Ltd. Established in Shandong
2014	“太阳能多晶硅生长炉用氮化硅陶瓷绝缘复合组件”荣获中国建材联合会科技进步二等奖、北京市科技进步三等奖 Si ₃ N ₄ ceramic insulation composite components used in solar polycrystalline reduction furnace acquired the 'Second Prize of Technology Progress by China Building Materials Federation'
2015	中材高氮化物陶瓷有限公司氮化硅陶瓷轴承球生产线全线贯通 Silicon nitride bearing ball production line established and put in to production in Sinoma Advanced Nitride Ceramics Co., Ltd. 热等静压 (HIP) 氮化硅陶瓷球正式推向市场 HIP Si ₃ N ₄ balls officially to the market
2016	获得国家级“高新技术企业”称号 Acquired the state-level 'High-tech enterprise' title 通过 ISO/TS 16949-2009 汽车质量体系审核 Pass ISO/TS 16949-2009 certification “超 (超) 临界工业锅炉用氮化硅陶瓷垫片系列产品”荣获中国建材联合会技术发明二等奖 “Si ₃ N ₄ 绝缘复合组件系列产品在超临界锅炉”荣获“第二届中国建材联合会科技进步奖” “Si ₃ N ₄ 绝缘复合组件系列产品在超临界锅炉”荣获“第二届中国建材联合会科技进步奖”
2017	“年产 100 吨氮化硅陶瓷制品”生产线奠基 Lay a Foundation for production line "Si ₃ N ₄ ceramic products 100T/Year"
2019	“年产 100 吨氮化硅陶瓷制品”生产线建成投产 "100 tons per year silicon nitride ceramic products" production line completed and put into operation

荣誉 Honor

1998	Φ3-5mm 氮化硅陶瓷轴承球 “国家重点新产品”称号 Si ₃ N ₄ ceramic bearing ball "National Important New Products"
2010	太阳能多晶硅还原炉电极磁环 “国家重点新产品”称号 Si ₃ N ₄ Electrode magnet ring used in solar polycrystalline silicon reduction furnace "National Important New Products"
2011	获得“全国建材行业技术创新奖二等奖” Won "The Second Prize of Technical Innovation by China Building Materials Industry"
2013	风电轴承用氮化硅陶瓷球获得“国家重点新产品”称号 Si ₃ N ₄ ball used for Wind power bearing won "National Important New Products"
2014	太阳能多晶硅还原炉用氮化硅陶瓷绝缘复合组件 “中国建材联合会科技进步二等奖” Si ₃ N ₄ ceramic insulation composite components used in solar polycrystalline reduction furnace won "Second Prize of Technology Progress by China Building Materials Federation"
2016	被认定为高新技术企业 As a high-tech enterprise
2019	被认定为山东省“专精特新”中小企业 Is identified as Shandong Province "specialized special new" small and medium-sized enterprises enterprises furnace won "Second Prize of Technology Progress by China Building Materials Federation"
2020	入选淄博市瞪羚企业 Into the Gazelle Corporation of Zibo

INNOVATION CAPABILITY 创新能力

研发、证书 R&D and Certificate

氮化硅陶瓷方面的研究和生产始于 20 世纪 70 年代,是国内最早的单位,四十多年来,连续承担了从“六五”到“十一五”国家重点科技攻关、“863”高技术计划等项目五十多项,获得中国建材联合会科技进步二等奖等十余项奖励,申请/授权发明专利 65 项,技术和生产实力居国内领先水平。

Sinoma is the earliest unit in China who started the research and production of silicon nitride ceramics in the 1970s. For more than 40 years, Sinoma has undertaken over 50 projects related to national key scientific and technological research. Sinoma has obtained more than ten awards including the Second Prize of Science and Technology Progress of China Building Materials Federation, and 65 invention patents under application or authorized. The technology and production strength are at the leading level in China.

发明专利证书 Certificate of patent



工业应用 Industry Application

中材高新氮化物陶瓷提供以氮化硅为代表的先进陶瓷材料，具有高强度、耐高温、优良的抗热震、无磁、绝缘等特性，公司产品广泛用于精密轴承、新能源、高导热基片、冶金化工。

Sinoma offers modern ceramics that have excellent properties in high strength, high temperature resistance and high abrasion resistance. Our products widely used in precision bearing, new energy, high thermal conductivity substrate and metallurgical & chemical industry.

精密轴承 Precision bearing



混合轴承	Hybrid bearing
机床主轴轴承	Machine tool spindle bearing
纺机轴承	Textile machinery bearing
牙钻轴承	Dental bearing

可再生能源 Renewable

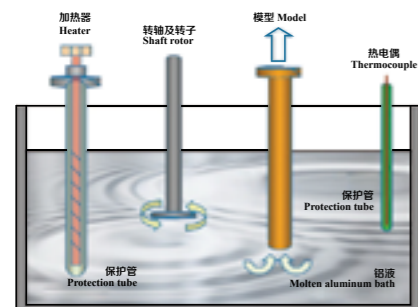
风力发电机绝缘轴承
Wind driven generator insulation bearing

太阳能多晶硅还原炉用绝缘组件
Solar energy polycrystalline silicon reduction furnace insulation components



高导热基片 High thermal conductivity substrate

混合动力汽车 PCU Hybrid electric vehicle PCU



冶金化工 Metallurgical & chemical industry

轮毂铸铝	Aluminum casting hub
浸入式加热熔化保温炉	Immersion heating & melting & holding furnace
低压铸铝行业	Aluminum foundry & casting industry



陶瓷轴承系列 (球、滚子、轴承)

Ceramic Bearing Series (Balls, Rollers, Bearings)

Sinoma 陶瓷轴承系列包括：球、滚子、轴承，采用多种原料，可提供各种尺寸型号。我们拥有大量精密陶瓷球、滚子和轴承产品库存，随时准备发货。

Sinoma ceramic bearing series included balls, rollers and bearings in various materials and dimensions. We have large stock of precision ceramic balls, rollers and bearings prepared for delivery at any time.

原料	MATERIAL
氮化硅	Si ₃ N ₄
氧化铝	Al ₂ O ₃
氧化锆	ZrO ₂
碳化硅	SiC

氮化硅陶瓷材料特性 Silicon nitride ceramic material properties

1. 绝缘、无磁 Insulation Non- magnetic
2. 较高的抗热冲击性能 High thermal shock resistance
3. 较高的断裂韧性 High fracture toughness
4. 高硬度 High hardness
5. 耐高温稳定性 High temperature resistance
在高达 1000℃ 高温环境中能稳定保持其机械性能 Work in 1000℃ high temperature with stable mechanical property
6. 耐腐蚀 Corrosion resistant
7. 低密度 Significantly lower density
8. 耐磨损 Excellent wear resistance
9. 热膨胀系数小 Low coefficient of thermal expansion

陶瓷轴承系列 (球、滚子、轴承) Ceramic Bearing Series (Balls, Rollers, Bearings)

产品	PRODUCTS
陶瓷球	Ceramic ball
陶瓷滚子	Ceramic roller
全陶瓷轴承	Full ceramic bearing
混合陶瓷轴承	Hybrid bearing

产品名称 PRODUCT NAME	尺寸 SIZE	等级 GRADE	烧结工艺 SINTER TECHNOLOGY	
			GPS	HIP
氮化硅陶瓷球 Si ₃ N ₄ Ceramic Balls	Φ0.4mm - Φ101.6mm	G3-G200	GPS	HIP
氮化硅陶瓷滚子 Si ₃ N ₄ Ceramic Rollers	Φ3×3 - Φ40×40mm	GII-GIII	GPS	HIP



陶瓷球 Ceramic ball



陶瓷滚子 Ceramic roller



全陶瓷轴承 Full ceramic bearing



混合陶瓷轴承 Hybrid bearing

氧化铝陶瓷材料特性 Alumina Oxide Ceramic Material Properties

1. 高硬度 High hardness
2. 高温下, 耐强酸强碱 High resistant to strong acid and alkali in high temperature
3. 耐磨损 Excellent wear resistance
4. 高纯度 High purity
5. 电绝缘体 Electrical insulator

氧化铝球纯度 ALUMINA OXIDE PURITY			球尺寸 BALL SIZE	球等级 BALL GRADE
99%	99.3%	99.6%	Φ0.4 - Φ76.2mm	G10-G100



氧化锆陶瓷材料特性 Zirconia Oxide Ceramic Material Properties

1. 高密度 High density
2. 低热导率 Low thermal conductivity
3. 高断裂韧性 High fracture toughness
4. 耐强酸强碱 High resistant in strong and acid alkali
5. 高抗弯强度 High bending strength
6. 电绝缘体 Electrical insulator

氧化锆球颜色分类 ZIRCONIA BALL COLOR		球尺寸 BALL SIZE	球等级 BALL GRADE
白色 White	黄色 Yellow	Φ0.4—Φ101.6mm	G10-G100



氧化锆全陶瓷轴承 Full ZrO₂ Ceramic Bearings

轴承特性 Bearing Properties

无磁，电绝缘；	non-magnetic and electrically insulating;
耐酸，耐碱；	resistant to acids & alkalis;
耐水，耐咸水；	resistant to water, salt water;
满球适合 400 摄氏度环境使用；	suitable for 400° C if full complement;
比普通钢制轴承轻近 20%。	light - approximately 20% of the weight of steel bearings.

材料选择 Material Selection

内外圈：氧化锆陶瓷材料
保持器：聚四氟乙烯、玻璃纤维增强的尼龙 66、特种工程塑料、不锈钢、黄铜等
滚动体材料：氧化锆、氮化硅
Inner&Outer Ring: ZrO ₂
Cage: PTFE, GRPA66, PEEK, PI, AISI SUS316 SUS304, Cu ...
Rolling Element: ZrO ₂ , Si ₃ N ₄



深沟球轴承
Deep Groove Ball Bearings



角接触球轴承
Angular Contact Ball Bearings



外球面轴承 Insert Ball Bearings



调心球轴承 Self-Aligning Ball Bearings



推力球轴承 Thrust Ball Bearings

应用领域 Application

产品适用于半导体行业、液晶面板、医疗行业、食品行业、化工行业、窑炉、玻璃行业等。
Suitable for the industry of semiconductor, LCD panel, medical, chemical, kiln, glass, etc.

氮化硅全陶瓷轴承 Full Si₃N₄ Bearings

轴承特性 Bearing Properties

无磁，电绝缘；	non-magnetic and electrically insulating;
耐水，耐盐水；	resistant to water, salt water;
满球适合 800 摄氏度环境使用；	suitable for 800° C if full complement;
比普通钢制轴承轻近 60%。	very light-approx 60% of the weight of steel bearings.



满装球轴承
Full Ceramic Ball Bearings

材料选择 Material Selection

内外圈：氮化硅陶瓷材料	Inner&Outer Ring: Si ₃ N ₄
保持器：聚四氟乙烯、玻璃纤维增强的尼龙 66、特种工程塑料	Cage: PTFE, GRPA66, PEEK, PI
滚动体材料：氮化硅	Rolling Element: Si ₃ N ₄

应用领域 Application

产品适用于电镀设备、清洗机械、医疗器械、低温工程、光学仪器、高速机床、高速电机、印刷机械、食品加工机械。
Suitable for the industry of electroplating apparatus, cleaning machinery, medical apparatus and instruments, cryoengineering, optical instrument, high-speed machine tool, high-speed electric machine, foodstuff processing machinery.



深沟球轴承
Deep Groove Ball Bearings

不锈钢陶瓷球轴承 Stainless Steel Ceramic Ball Bearings

轴承特性 Bearing Properties

陶瓷球的自润滑性；
无磁；
比用不锈钢球寿命更长；
清洁无污染；
可在液体中使用；
配上高温保持架或满球装配能适用更高温度。
Ceramic balls for non-lube application;
Non-magnetic;
Potentially longer life than stainless balls;
Hygienic;
Can run in liquids;
High temperature models available with higher temperature cage or without cage (Full complement).



材料选择 Material Selection

内外圈 :AISI SUS316L、SUS304、AISI SUS420
保持器 :AISI SUS316L(316)、SUS304、AISI SUS 420
滚动体材料 : 氮化硅
Inner&Outer Ring: AISI SUS316L、SUS304、AISI SUS420
Cage: AISI SUS316L(316)、SUS304、AISI SUS 420
Rolling Element: Si ₃ N ₄



不锈钢满球轴承
Stainless Full Ceramic Ball Bearings

应用领域 Application

产品适用于食品加工、医疗器械、药品机械等领域。
Suitable for the industry of food processing, medical apparatus and instruments, medicine-making machine, etc.

高温轴承 High Temperature Bearings

轴承特性 Bearing Properties

能适用 150 摄氏度到 500 摄氏度的环境；
径向间隙正常 C0 或 C3；
使用寿命长，维护费用低。
Suitable for temperature from 150 ~ 500°C ;
Radial clearance: Normal C0 or C3;
Long service life and low maintenance cost

材料选择 Material Selection

内外圈 :AISI52100 (GCr15)
保持器 : 尼龙
滚动体材料 : 氮化硅、氧化锆
Inner&Outer Ring: AISI52100 (GCr15)
Cage: Peek
Rolling Element: Si ₃ N ₄ 、ZrO ₂

应用领域 Application

产品适用于工业烘炉、玻璃工厂、输送带、烘干机、窑炉、窑车、干燥机等。
Suitable for the industry of industrial ovens, glass plants, conveyors, dryers, kilns, kiln cars, veneer dryers, etc.



深沟球轴承 Deep Groove Ball Bearings

太阳能系列 Solar Energy Series

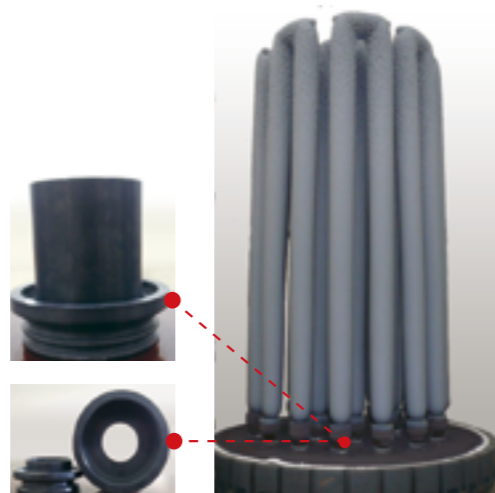
产品 Products

产品多用于多晶硅还原炉:

1. 高压电极绝缘环
2. 电极隔热罩
3. 保护套
4. 绝缘套筒等

Products used in polycrystalline silicon reduction furnace :

1. High voltage electrode insulating ring ;
2. Electrode heat shield;
3. Protective sheath;
4. Insulating sleeve and etc.



特性 Characteristic

高致密、高强度，优异的绝缘性、抗热震性和耐腐蚀性。
使用寿命更长，性价比高。比石英陶瓷同类产品寿命高 10 倍，氧化铝材料产品寿命长 5 倍以上，减少意外停炉损失。

High density, high strength, excellent insulativity, thermal shock resistance and corrosion resistance.
Long service life, highly cost effective. Above 10 times of service life than similar quartz ceramic products, above 5 times of service life than alumina products, reduce the loss for unexpected furnace shut down.



氮化硅绝缘环
Silicon nitride insulating ring



氮化硅隔热罩
Silicon nitride thermal shields



氮化硅密封圈
Silicon nitride sealing ring



氮化硅半环
Silicon nitride half ring



氮化硅绝缘套筒
Silicon nitride insulating sleeve



氮化硅绝缘环
Silicon nitride insulating ring

铸造系列 Casting Series

低压铸铝用氮化硅陶瓷升液管 Riser tube applied for aluminum Foundry & Casting

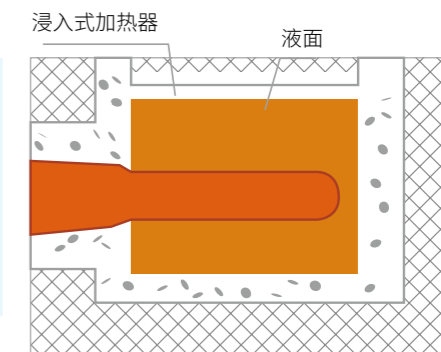


- > 优异的耐高温和抗热震性能，可长期在 900°C 铝液中使用。
- > 高致密性及优良的化学稳定性，铝熔液无反应，可减少管道絮渣及表面附着物，提升产品使用寿命，降低维护成本。

- > Excellent performance at high temperature resistance and thermal shock resistance, long time use in temperature 900°C in molten aluminum.
- > High density, excellent chemistry stability, do not react with molten aluminum, reduce pipe flocculant slag, increase product service life and reduce maintenance cost.

浸入式加热熔化保温炉用氮化硅陶瓷加热器保护管和热电偶保护管 Silicon nitride heater protection tube and thermocouple protection tube applied for immersion heating & melting & holding furnace

- > 优异的绝缘性能保证加热体与外部环境的良好绝缘。
- > 优异的高温强度和耐热冲击性能，保证在铝液中熔化、冷却环境下长期使用。
- > 良好的导热性能，提升了热效率的传递。
- > 与铝液的不浸润性，可大幅降低管体表面的铝附着物。



- > Excellent insulation performance, highly ensured the excellent insulativity of heating element and external environment.
- > Excellent performance at high-temperature resistance and thermal shock resistance performance, long time use in molten aluminum and cooling environment.
- > Excellent heat conduction resistance, improved thermal efficiency's transmit.
- > Non-infiltrate into molten aluminum can substantially reduce the attachments on the surface of tube significantly.



QUALITY ASSURANCE



连续变焦显微镜：检测单体陶瓷球表面缺陷
Continual zoom microscope: Detection of single ceramic ball surface defect.

质量保证



粗糙度轮廓仪
检测单体陶瓷球表面粗糙度

Roughness and contour meter
Detection of single ceramic ball surface roughness.



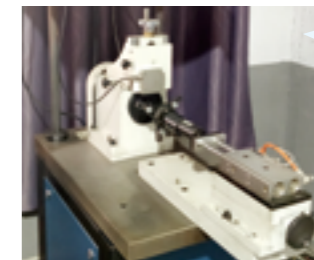
钢球振动测量仪
检测单体球振动值

Steel ball vibrometer
Detection of single ceramic ball vibration.



SKF 圆度波纹度仪
检测单体陶瓷球球形误差

SKF Roundness waviness meter
Detection of single ceramic ball sphere deviation.



轴承振动测量仪
用于测量轴承的振动

Bearing vibration measuring instrument
Used for measuring vibration of bearings.



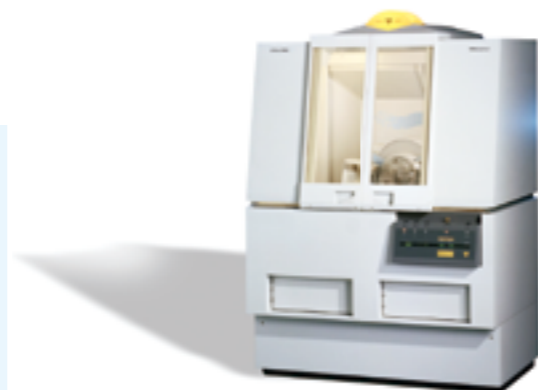
激光热导仪 *Laser thermal conductance instrument*

用于氮化硅、氧化铝、氧化锆等陶瓷材料的热导系数测定。
Applied for testing the thermal conductivity of ceramics materials, including Si_3N_4 、 Al_2O_3 、 ZrO_2 .

X 射线衍射仪 *X-ray diffraction*

利用 X 射线照射，通过对衍射图谱的分析，进行物相分析、确定晶粒尺寸。

Analyzing X-ray diffraction spectrogram, we can confirm what the material belongs to, and we can confirm the size of the grain.



陶瓷高温万能材料试验机
用于测试陶瓷材料在高温状态下的力学性能。

High temperature universal testing machine
Applied for testing the mechanical properties of ceramics material in high temperature.



激光衍射粒度分析仪
用于测量轴承的振动

laser diffraction particle size analyser
Applied for measuring size distribution of micrometer powders.



高温抗折试验机
用于陶瓷材料的高温抗折强度的测试

High temperature bending test machine
Applied for testing bending strength of ceramics in high temperature.



数显维氏显微硬度仪
用于检测固体材料的维氏硬度

Digital micro hardness tester
Applied for testing Vickers hardness of solid materials.

陶瓷材料性能表 *Ceramic Material Performance Sheet*

特性项目 <i>Items</i>		材料 <i>Materials</i>		氧化铝 Al_2O_3			氧化锆 ZrO_2		氮化硅 Si_3N_4				
		No. 产品编号		SM-A99	SM-A993	SM-A996	SM-ZW	SM-ZY	SM-SG01	SM-SG02	SM-SH01	SM-SH02	
颜色 <i>Color</i>				白色 White	象牙色 White	象牙白 Whitish-Ivory	白色 White	黄色 Yellow	灰色 Gray	黑色 Black	灰色 Gray	黑色 Black	
氧化铝含量 <i>Alumina Content</i>	%			99.0	99.3	99.6	—	—	气压烧结 GPS	气压烧结 GPS	热等静压 HIP	热等静压 HIP	
主要特征 <i>Main Characteristics</i>				良好的金属化特性; 耐磨; Good for metallization	高耐等离子体腐蚀、高耐磨; Good anti-plasma property; High wear resistance	优秀的耐等离子腐蚀、高耐磨; Excellent anti-plasma property; High wear resistance	高机械强度、耐磨、耐热; High mechanical strength; Good wear and heat resistance	优秀的抗热冲击性能, 可应用中低温环境; 耐磨、耐腐蚀; Good thermal shock resistance; Good wear and corrosion resistance.	轻质、耐磨、耐高温、耐腐蚀; Good thermal shock resistance; Good wear and corrosion resistance.				
主要用途 <i>Main Applications</i>				IC 封装、电子部件、机械部件; IC packing; Electronic parts; Mechanical parts;	半导体设备部件; 耐磨损、耐腐蚀件; Semiconductor equipment parts; Wear&corrosion resistant parts;		耐磨、耐热部件, 如砂磨机行业; Wear and heat resistance parts;	中低温环境下的耐磨、耐腐蚀件; Hard wearing parts operating in relatively high temperatures;	耐热件、耐磨损件、耐腐蚀件; Heat wear; corrosion-resistant parts	耐腐蚀轴承, 电阻轴承, 高转速轴承, 耐高温轴承; Corrosion resistance bearings; electrical resistance bearings; high speed bearings; high temperature bearings			
密度 <i>Density</i>	g/cm^3	ASTM-C20		3.70	3.90	3.92	6.02	5.7	3.20	3.25	≥ 3.20	≥ 3.25	
吸水率 <i>Water Absorption</i>	%	ASTM-C373		0	0	0	0	0	0	0	0	0	
机械特性 <i>Mechanical Characteristics</i>	维氏硬度 <i>Vickers Hardness</i> (Load 5KG)	GPa	ASTM C1327-03	13.8	17.3	18.5	13.0	11.0	13.9	14.5	15.0	15.0	
	抗弯强度 <i>Flexural Strength</i>	MPa	ASTM C1161-02c	350	350	400	1250	400	610	700	≥ 900	≥ 1000	
	抗压强度 <i>Compressive Strength</i>	MPa	ASTM C773	2250	2450	2600	5690	2000	3200	3200	3900	3900	
	杨氏模量 <i>Young's Modulus of Elasticity</i>	GPa	ASTM C1198-01	330	360	380	210	200	300	310	300	310	
	泊松比 <i>Poisson's Ratio</i>	—	ASTM C1198-01	0.23	0.23	0.23	0.31	-	0.27	0.28	0.27	0.28	
	断裂韧性 <i>Fracture Toughness</i>	$MPa \cdot m^{1/2}$	ASTM C1421-01b (Kevron notched beam)	3	4-5	4-5	9-11	9-11	6-7	6-7	≥ 6	≥ 6	
热学特性 <i>Thermal Characteristics</i>	线膨胀系数 <i>Coefficient of Linear Thermal Expansion</i>	40-400°C	$\times 10^{-6}/^{\circ}C$	ASTM C372-94	7.1	8.2	8.2	10.0	8.0	3.3	3.5	3.3	3.5
	热传导率 <i>Thermal Conductivity</i>	20°C	W/(m·K)	ASTM C408-88	25	30	32	3	2	20	23	20	23
电学性能 <i>Electrical Characteristics</i>	体积电阻率 <i>Volume Resistivity</i>	20°C	$\Omega \cdot cm$	ASTM D257-99	$>10^{14}$	$>10^{15}$	$>10^{15}$	—	—	10^{14}	10^{14}	$\geq 10^{14}$	$\geq 10^{14}$
	介电常数 <i>Dielectric Constant</i> (1MHz)	—	—	ASTM D150-98 (1MHZ)	9.0	9.8	9.7	—	—	—	—	—	—

陶瓷球规格表 Ceramic Ball Specification Sheet

轴承球尺寸 Bearing Ball Size

Metric Size (mm)	Inch Sizes	Weight (g/pc)	Pcs/kg
1		0.0031	318471
1.50		0.0057	176929
1.588	1/16	0.0067	149115
2		0.0134	74624
2.381	3/32	0.023	44238
3.175	1/8	0.054	18657
3.5		0.072	13927
3.969	5/32	0.105	9551
4.763	3/16	0.181	5526
5		0.209	4777
5.556	7/32	0.287	3482
5.953	15/64	0.353	2831

Metric Size (mm)	Inch Sizes	Weight (g/pc)	Pcs/kg
6.35	1/4	0.429	2332
6.747	17/64	0.514	1944
7.144	9/32	0.611	1638
7.938	5/16	0.838	1194
8.731	11/32	1.115	897
9.525	3/8	1.447	691
10.318	13/32	1.840	544
11.113	7/16	2.298	435
11.509	29/64	2.553	392
11.905	15/32	2.826	354
12.303	31/64	3.119	321
12.7	1/2	3.430	292

Metric Size (mm)	Inch Sizes	Weight (g/pc)	Pcs/kg
13.494	17/32	4.115	243
14.288	9/16	4.885	205
15.081	19/32	5.744	174
15.875	5/8	6.700	149
16.668	21/32	7.755	129
17.463	11/16	8.918	112
18.256	23/32	10.189	98
19.05	3/4	11.577	86
19.844	25/32	13.086	76
20.638	13/16	14.721	68
22.225	7/8	18.385	54
23.812	15/16	22.611	44

Metric Size (mm)	Inch Sizes	Weight (g/pc)	Pcs/kg
25.4	1	27.443	36
26.988	1-1/16	32.919	30
28.575	1-1/8	39.074	26
30.163	1-3/16	45.957	22
31.75	1-1/4	53.559	19
33.338	1-5/16	62.051	16
34.925	1-3/8	71.341	14
36.512	1-7/16	81.515	12
38.1	1-1/2	92.620	11
41.275	1-5/8	117.758	8
47.625	1-7/8	180.898	6
50.8	2	219.543	5



陶瓷球等级公差 Ceramic Ball Grade&Tolerance

Grade	Gauge	Ball Subgauges	Ball Subgauge Interval	Ball Diameter Variation V_{Dws} max. μm	Ball Lot Diameter Variation V_{Dws} max. μm	Deviation From Spherical Form Δ_{RSw} max. μm	Surface Roughness R_a max. μm
G3	±5	±0.2	0.1	0.08	0.13	0.08	0.01
G5	±5	±0.4	0.2	0.13	0.25	0.13	0.014
G10	±9	±0.4	0.2	0.25	0.5	0.25	0.020
G16	±10	±0.8	0.4	0.4	0.8	0.4	0.025
G20	±10	±0.8	0.4	0.5	1	0.5	0.032
G24	±12	±0.8	0.4	0.6	1.2	0.6	0.040
G28	±12	±0.8	0.4	0.7	1.4	0.7	0.050
G40	±16	±1.6	0.8	1	2	1	0.060
G60	±18	±2.4	1.2	1.5	3	1.5	0.080
G100	±40	±4	2	2.5	5	2.5	0.100
G200	±60	±6	3	5	10	5	0.150

引用国际标准 Citing Corresponding International Standards	ISO 3290-2 ISO 26602	滚动轴承 - 球 - 陶瓷球 Rolling Bearings-Balls Part2: Ceramic Balls 精密陶瓷 (先进陶瓷, 先进技术陶瓷) - 氮化硅材料滚动轴承球 Fine ceramics (advanced ceramics, advanced technical ceramics)-Silicon nitride materials for rolling bearing balls
国家标准 Government Standards	GB/T 31703-2015	陶瓷球轴承 - 氮化硅球 Ceramic ball bearing-silicon nitride ball





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