SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

WEAR RESISTANT TECHNOLOGIES

SAINT-GOBAIN

Derwent Top 100 Global Innovator 2021

Clarivate Analytics

SAINT-GOBAIN

1 in 4 products did not exist 5 years ago

166.000+ employees

sales of **€ 44.2** billion

represented in **75** countries

-23% carbon emissions reduction (vs. 2017 on scope 1+2)

8 main R&D centres

OUR MISSION

Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the well-being of each of us and the future of all.

OUR PURPOSE

MAKING THE WORLD A BETTER HOME.

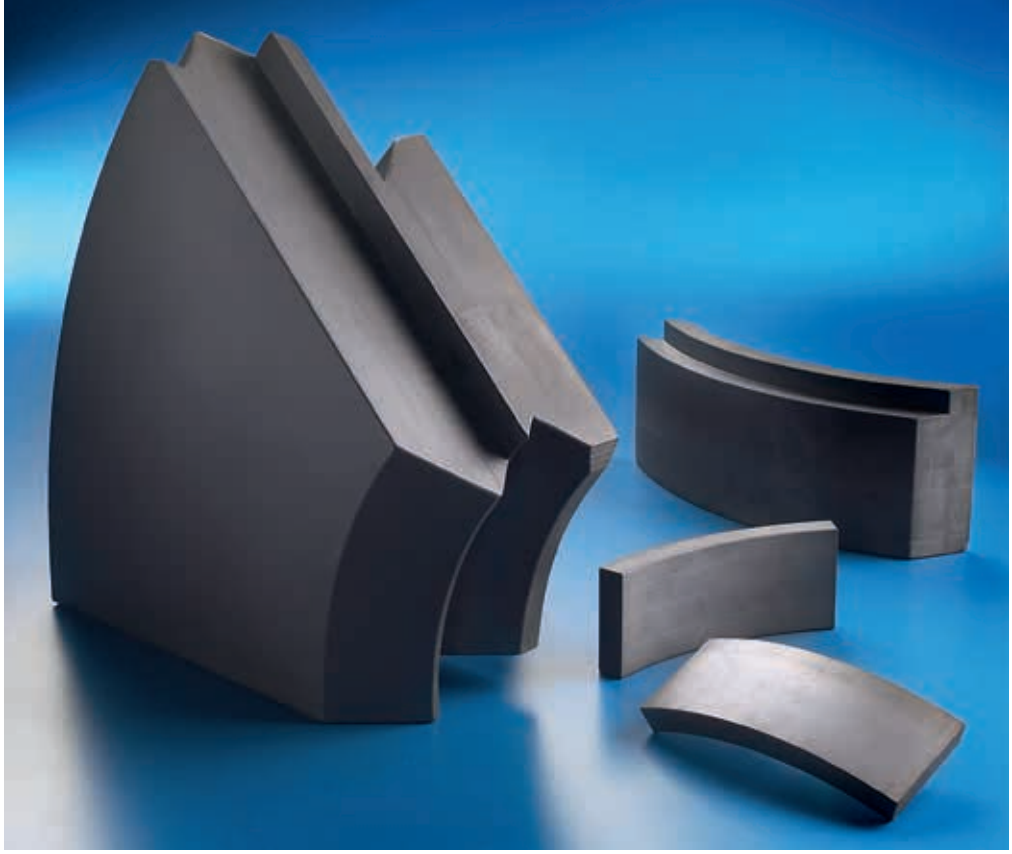
SAINT-GOBAIN

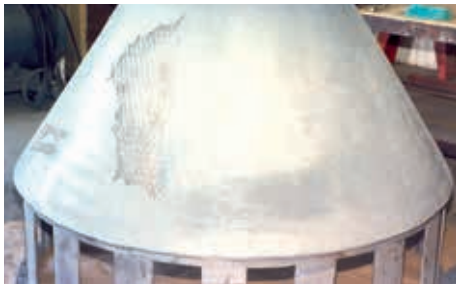
PERFORMANCE CERAMICS & REFRACTORIES

OUR MISSION

To design, develop and **supply solutions** and **services** for **extreme operating industrial conditions.** Our **engineered ceramics** and **refractory** products are manufactured to the **highest industrial standards** and deliver **enhanced performance** while **minimizing environmental impact.**

PIONEERING CERAMIC SOLUTIONS FOR EXTREME INDUSTRIAL APPLICATIONS AND A GREENER WORLD.





WEAR RESISTANT TECHNOLOGIES

Saint-Gobain's Wear Resistant products and solutions are developed with a focus to serve applications across various markets that need resistance to numerous types of wear.

Our expertise in material science combined with in-depth knowledge of application, design, manufacturing engineering and installation expertise enables us to offer customized ceramic material solutions for various applications across a multitude of industries.

The applications we support are relevant across a wide range of industries. A few of them are listed below.

KEY MARKETS

- MINING & MINERAL PROCESSING
- IRON MAKING
- CHEMICAL PROCESSING
- COAL FIRED POWER
- POWDER & BULK SOLIDS
- GRAIN HANDLING
- CEMENT
- RECYCLING
- AGGREGATES
- ASPHALT
- PULP & PAPER
- ENVIRONMENT

ULTRA FINE SINTERED ALPHA-ALUMINA OXIDE (Al_2O_3)

Ultra fine-grain, sintered high grade pressed alumina for various types of abrasion.

DURAFRAX®

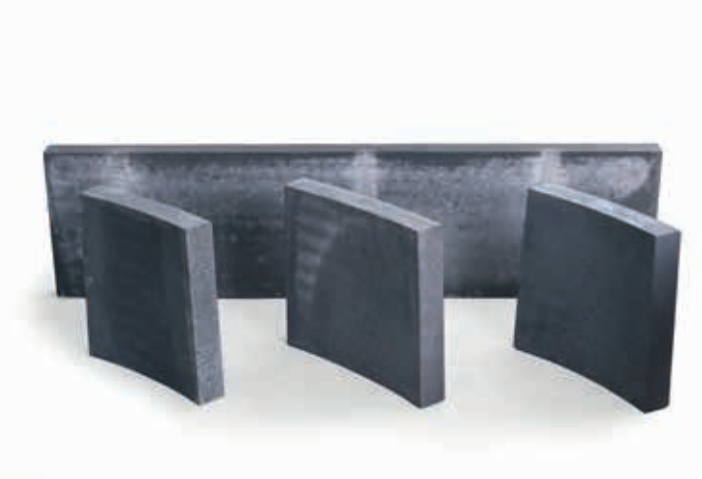
- versatile material suitable for a range of applications
- most cost effective wear resistant material
- FDA approved for grain & food processing

NITRIDE BONDED SILICON CARBIDE (NBSiC)

High performance dense NBSiC ceramic refractory with complex shapes‘ capabilities.

CRYSTON® (MAX. 1590°C) & CAST REFRAX® (MAX. 1450°C) - CAST

- good wear-resistant cast material
- large and complex shape capabilities
- good thermal shock resistance



CRYSTON® TW - CAST

- improved wear and thermal shock resistance over a standard NBSiC
- thin wall components

REFRAX® 20 - PRESSED

- good wear-resistant pressed material
- improved oxidation and thermal shock resistance due to higher porosity
- capable of tighter tolerances due to pressed forms
- lower price than Cast SiCs

REACTION BONDED SILICON CARBIDE (RBSiC / SiSiC)

Premium cast silicon carbide material provides excellent wear resistance and is engineered to resist oxidation and thermal shock.

NORFRAX® RB (MAX. 1350°C) & SILIT® SKD (MAX. 1380°C)

- better wear resistant cast material
- good chemical resistance to molton salts (Na+), Chlorine, Sulphur and Nitrogen Oxides
- large and complex shape capabilities

HAMMERFRAX®

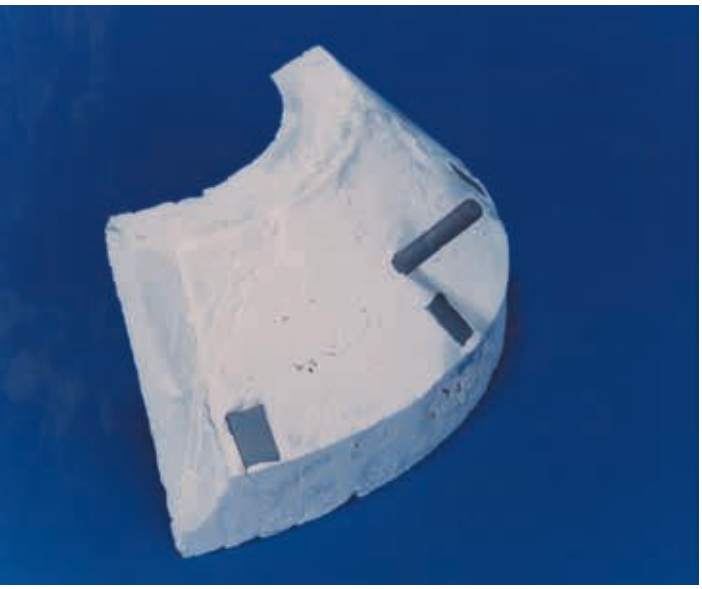
A patented product, it is an ultra-premium silicon carbide material engineered to resist abrasion and mechanical shock.

- best wear resistance over other standard SiSiCs
- large and complex shapes with exceptional dimensional accuracy

HEXOLOY®

Premium sintered alpha silicon carbide pressed or extruded to customizable complex shapes providing maximum performance.

- superior resistance to wear, corrosion and oxidation
- extreme hardness and mechanical resistance
- excellent resistance to thermal shock
- customized complex and intricate shapes
- maximum use temperature 1900°C



ALUMINA ZIRCONIA SILICA (AZS)

Fused cast product with its interlocking crystalline structure, provides resistance to heavy impact, sliding abrasive wear and thermal shock.

ZAC / CORGUARD®

- highest impact resistant material with exceptional abrasion resistance, edge and fracture toughness
- interlocking grains and impervious structure provides high corrosion resistance to acid and acid bases
- largest shape capability in our portfolio

MONOLITHIC CASTABLES

WEARFRAX®

Silicon carbide and alumina based range of products that can be rammed/troweled/poured and primarily used to provide abrasion resistance in low and high temperature applications where traditional refractory bricks are either not feasible or cost effective.

WEARFRAX® RS58L & RA57L

- easy preparation and installation
- no curing spray needed after installation
- 24 hour ambient temperature cure
- designed to withstand thermal shock

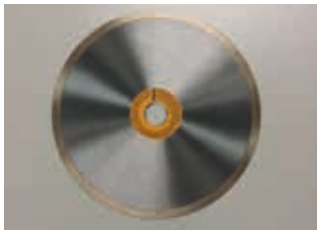
ACCESSORIES

WEARPAK®

Adhesives, Mortar and Wearing compounds offered in various viscosity/grades to suit every application need.

WEARFIX®

A ZAC ceramic based wearing compound used to improve joint wear or as a filling material for improved performance.



DIAMOND SAW BLADES

Designed for easy on site jobs, offered in 8“, 10“, 14“ and 20“ dia.

DIAMOND FLAP DISCS

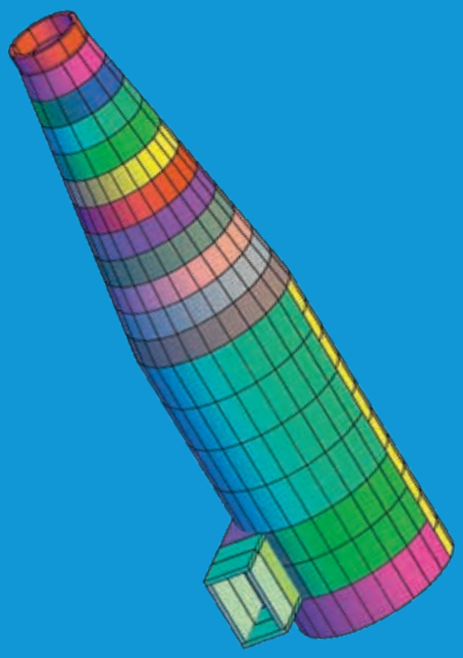
Diamond impregnated discs for fast removal, chamfering edges or smoothing surfaces wet or dry.

OVERVIEW

	Aluminum Oxide (Al_2O_3)	Silicon Carbide (SiC)					
	Alpha Al_2O_3	Nitride Bonded SiC				Reaction Bonded SiC	
	Durafrax®	Cryston®	Cryston® TW	Cast Refrax® 20	Refrax® 20	Norfrax® RB	Silit® SKD
Properties							
Density, g/cm³	3.52	2.77	2.77	2.77	2.62	3.05	3.00
Porosity, %	0	8	<1	15	16	0	0
Thermal Conductivity, W/m·K	18	16.3	23.7	13.8	16.3	125	35
Thermal Expansion, x10^-6/°C	8.3	3.2	4.3		4.7	4.3	4.5
Vickers Hardness, Gpa	9	23	11,6			22	
Abrasion Resistance C704	1.0	1.6	1.5	1.9	2.5	0.7	0.7
Max Use Temp, °C	1250	1590	1450	1450	1590	1350	1380
Performance							
Sliding Abrasion	Better	Good	Better	Good	Good	Better	Better
Erosion	Better	Good	Good	Good	Good	Better	Better
Impact	Good	Good	Good	Good	Good	Good	Good
Corrosion Resistance	Good	Good	Good	Good	Good	Better	Better
Thermal Shock	Good	Good	Better	Good	Good	Better	Better
Thermal Insulation	**Best**	**Best**	Better	**Best**	**Best**	Good	Good
Electrical Insulation	**Best**	Better	Better	Better	Better	Good	Good

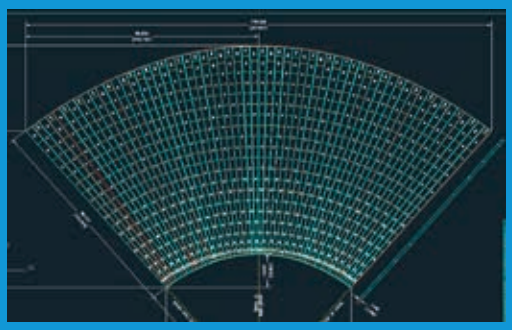
	Silicon Carbide (SiC)		Alumina Zirconia Silica	Castables	
	Reaction Bonded SiC	Sintered Alpha SiC	Fused Cast AZS	Silicon Carbide	Aluminum Oxide
	HAMMERfrax®	Hexoloy®	ZAC / Corguard®	Wearfrax® RS58L	Wearfrax® RA57L
Properties					
Density, g/cm³	3.04	3.10	3.49	2.45	2.80
Porosity, %	1	0	1.15		15.5
Thermal Conductivity, W/m·K		125,6			
Thermal Expansion, x10^-6/°C	4.3	4.02			
Vickers Hardness, Gpa	22		19.6		
Abrasion Resistance C704	0.7	0.4	1.1	7.5	6.5
Max Use Temp, °C	1350	1900	1650	500	500
Performance					
Sliding Abrasion	**Best**	**Best**	Good	Good	Good
Erosion	Better	**Best**	Better	Good	Good
Impact	Good	Good	**Best**	Good	Good
Corrosion Resistance	Better	**Best**	Better	Good	Good
Thermal Shock	Better	Good	Better	Good	Good
Thermal Insulation	Better	Good	**Best**	Better	Better
Electrical Insulation	Better	Good	Better	Better	Better

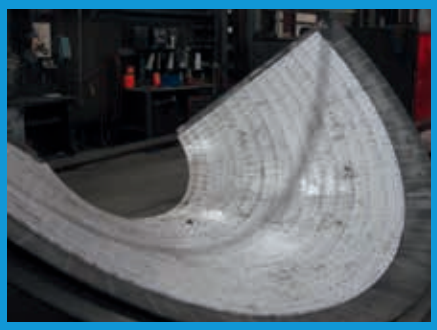
PRE-ENGINEERED CERAMIC SOLUTIONS



Saint-Gobain Performance Ceramics & Refractories offers Pre-Engineered solutions for Wear Resistant applications.

Our solutions are developed with a deeper understanding of the customer's needs, tailor-made to fit accurate requirements through Research & Development, Engineering Design of shapes, Application Engineering, Installation and Analysis. These solutions are made possible with state-of-the-art manufacturing processes and techniques that enable us to produce geometries from simple to complex, thus resulting in enhancing the overall performance of wear resistance to meet every customer need.





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