PERFORMANCE CERAMICS & REFRACTORIES

Saint-Gobain Performance Ceramics & Refractories leads the industry in design, development and production of engineered ceramics and refractory products for extreme operating conditions and high temperature applications. Every product and material is designed to maximize performance and durability while minimizing environmental impact.

We strive to deliver value through our global technical expertise in material science, manufacturing technology, design engineering and the long-term partnerships we form with our customers. Our employees are committed to delivering the best solutions and services to meet the unique material and engineering needs of our customers.

Our ability to deliver custom-made solutions for every application is further enhanced by our R&D centres, manufacturing plants, sales and application engineering specialists who are positioned strategically across the globe.

TOGETHER, WE MAKE THE MATERIAL DIFFERENCE.

SAINT-GOBAIN TODAY

TOP 100 GLOBAL INNOVATORS

1 product out of 4 sold by Saint-Gobain today didn't exist 5 years ago

Nearly 400 patents filed in 2017

3700 Researchers

One of the top 100 industrial groups in the world

2018 net sales €41.8 Billion

Present in 68 countries
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 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 (Al₂O₃)

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. 1.590°C) & CAST REFRAX® (MAX. 1.450°C) - CAST
- good wear-resistant cast material
- large & complex shape capabilities
- good thermal shock resistance

CRYSTON® TW - CAST
- improved wear & thermal shock resistance over a standard NBSiC
- thin wall components

REFRAX® 20 - PRESSED
- good wear-resistant pressed material
- improved oxidation & 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. 1.350°C) & SILIT® SKD (MAX. 1.380°C)**
- better wear resistant cast material
- good chemical resistance to molton salts (Na+), Chlorine, Sulphur & Nitrogen Oxides
- large & 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 & 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 & intricate shapes
- maximum use temperature 1.900°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 & fracture toughness
- interlocking grains & impervious structure provide high corrosion resistance to acid and acid bases
- largest shape capability in our portfolio

CASTABLES

Silicon Carbide & Alumina based trowelable, wearing compounds are used to provide abrasion resistance in low and high temperature applications where traditional refractory bricks are either not feasible or cost-effective.

**CARBOFRAX® 50 & ALFRAX® 50**
- easy preparation and installation
- no curing spray needed after installation
- 24 hr ambient temperature cure
- designed to withstand thermal shock
- higher temperature resistant products available

ACCESSORIES

**WEARPAK**
Adhesives, Mortar & 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.
<table>
<thead>
<tr>
<th>Properties</th>
<th>Silica Carbide (SiC)</th>
<th>Alumina Zirconia Silica</th>
<th>Castables</th>
</tr>
</thead>
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<tr>
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<td>Reaction Bonded SiC</td>
<td>Sintered Alpha SiC</td>
<td>Fused Cast AZS</td>
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<tr>
<td></td>
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<td>Silicon</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Aluminum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Oxide</td>
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<td>4.02</td>
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<tr>
<td>Vickers Hardness, Gpa</td>
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<td>Abrasion Resistance C704</td>
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<tr>
<td>Max Use Temp, °C</td>
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<td>1900</td>
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<td>Best</td>
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</tr>
<tr>
<td>Erosion</td>
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### OVERVIEW

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<td>Norfrax' RB</td>
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<td></td>
<td></td>
<td></td>
<td>Silit' SKD</td>
</tr>
</tbody>
</table>

| Density, g/cm³      | 3.52                 | 2.60                   | 2.77                | 2.60                | 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                |                     |                     |                     |                    |
| 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                |

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

Our solutions developed with a deeper understanding of the customer’s needs, are tailor-made to fit accurate requirements through Research & Development, Engineering Design of shapes, Application Engineering, Installations & 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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