Exceeding your High Temperature challenges
As part of the Saint-Gobain group we are among the 100 largest and most innovative companies worldwide. Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the wellbeing of each of us and the future of all. They can be found everywhere in our living places and our daily life: in buildings, transportation, infrastructure and in so many industrial applications.

In partnership with our subsidiaries specializing in high performance ceramics, as well as with R&D centers in France and the U.S.A., we have established a leading team of ceramic experts. This level of knowledge and experience is the result of over 100 years of development and production of refractory products.
At Saint-Gobain, we prioritize the development of the materials of tomorrow that will help you achieve your business objectives for competitiveness, innovation, health and safety. Our products meet the sustainability and energy saving challenges of today and tomorrow.

Through our history and achievements, we have become a worldwide leader for High Temperature applications which has positioned us a trusted partner capable of assisting you in directly addressing the challenges you face.

Saint-Gobain has developed NorFoam®, an innovative solution with remarkable properties thanks to an engineered microstructure and advanced phase composition.

NorFoam® is a fiber free and light-weight insulating refractory ceramic foam that combines the strength of insulating bricks with the insulation performance of ceramic fibers.
Because we are committed to tailor solutions for your distinct application, we have designed a complete NorFoam® product range to meet your exact needs.

**XPure®** contains more than 99.5% alumina which leads to a high chemical inertness and stability under oxidizing or reducing conditions (e.g., H₂, N₂, O₂, CO atmospheres).

**XPro®** offers a professional and all-round solution meant for general high temperature processes.

**Xtherm®** is the preferred solution to address insulation performance, thermal shock resistance, and severe thermal cycling solicitations.

### Key characteristics

<table>
<thead>
<tr>
<th></th>
<th>Premium solution for Inertness, purity, and stability</th>
<th>All-round solution</th>
<th>Tough solution for Insulation performance, Thermal shock resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hot face lining, setters, plates and kiln furniture, microwave heating, catalytic applications</td>
<td>Furnace lining, setters, spacers, kiln furniture, reheating furnace</td>
<td>Metallurgy applications, setters, kiln furniture, Fast-firing furnaces</td>
</tr>
</tbody>
</table>

### Typical applications

- Hot face lining, setters, plates and kiln furniture, microwave heating, catalytic applications
- Furnace lining, setters, spacers, kiln furniture, reheating furnace
- Metallurgy applications, setters, kiln furniture, Fast-firing furnaces

### Phases identification

<table>
<thead>
<tr>
<th></th>
<th>XPure</th>
<th>XPro</th>
<th>Xtherm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximal use temperature (Continuous Peak)</td>
<td>1800°C</td>
<td>1750°C</td>
<td>1700°C</td>
</tr>
<tr>
<td>Density (kg/m³)</td>
<td>700</td>
<td>700</td>
<td>750</td>
</tr>
<tr>
<td>Porosity (%)</td>
<td>82</td>
<td>82</td>
<td>82</td>
</tr>
</tbody>
</table>

### Thermal conductivity

- **XPure**: 0.84, 0.80, 0.75
- **XPro**: 0.78, 0.70, 0.65
- **Xtherm**: 0.60, 0.50, 0.40

### Dimensions (mm)

- **XPure**: 600 x 350 x 25/50/75/100
- **XPro**: or special sizes/shapes on request

*Note: This brochure can be subjected to modifications. All technical data given are in accordance with accepted test methods. They are also subjected to normal manufacturing variations and depend on operating conditions.*
A new alternative to traditional solutions

- Peak temperatures up to 1800°C
- Excellent insulation performance
- Fiber free: EHS compliant
- No organic binders
- Chemical inertness
- No dust emission during production, installation, use or dismantling
- Resistant to oxidizing and reducing atmosphere
- Low density
- Optimal mechanical properties compared to low density firebricks and ceramic fibers
- Convenient handling
- Rapid installation
- Extended lifespan, ablation resistant
- Easy machining
- High thermal stability

Excellent insulating performance

It has been decades since ceramic fibers were established as the standard solution on the high temperature market. Until now, no suitable alternative was available.

While offering mechanical properties aimed to approach the insulating firebricks’ features (IFBs), NorFoam® products also exhibit thermal conductivity close to ceramic fibers (RCFs).

![Thermal conductivity graph]

Thermal shock resistance

NorFoam® XPro® and Xtherm® are the preferred solution to address thermal shock resistance and severe thermal cycling applications.

Their unique composition makes them the first choice for applications with extreme temperature variations and high thermal insulation needs.

Gas ablation resistance

NorFoam® has been designed as a worry free solution so you can stay focused on your day-to-day operations.

Gas ablation can degrade your furnace lining which lead to extra-costs and potential contamination of your products. NorFoam® demonstrates remarkable resistance to gas ablation which lead to an optimal lifetime and ensuring your product quality.
A combination of safety and versatility

Health & safety

At Saint-Gobain, we are conscious that our customers' major concerns lie in employees' health conditions and environmental sustainability.

NorFoam® was born from the idea that everyone should work in a health-conscious environment. Consequently, NorFoam® does not contain any fiber components or organic binders, nor does it generate any harmful dust. Our product is completely HSE friendly during handling, machining, installation, use and dismantling.

Optimal solution for easy installation and maintenance

Lining installation and maintenance are complex tasks that should have the lowest impact on production. NorFoam® is the solution that reduces outage time and turns installation into a more convenient operation.

Like ceramic fibers, NorFoam® can be dry machined which allows for greater efficiency avoiding drying processes prior to installation.

As NorFoam® is fully EHS compliant. Furnaces and kilns do not have to be confined and ventilated during maintenance operations.

Operators do not need to wear specific equipment other than usual Personal Protective Equipment.

Adaptable integration

NorFoam® is the perfect solution when looking to replace refractory fibers or refractory insulating bricks, whether it is an existing equipment or a new installation.

Our products can be used with a wide variety of fixing systems such as anchors, self-locking designs or mortars allowing you to enlarge your design opportunities.

Enlarge your design possibilities

Conceptualizing the exact design you need comes down to inspiration. Very often however intrinsic mechanical properties of the material limit your design options.

NorFoam®'s superior mechanical strength allows you to achieve your inspiration while maintaining a high-quality surface finish with complex design possibilities and tight tolerances.
Boost your productivity and efficiency

Productivity and efficiency are key elements in achieving success. Improvements in these areas gives you the significant competitive advantage. NorFoam® relieves your furnace of countless limitations.

The benefits of NorFoam®

Case study: lining replacement by the NorFoam® solution in a high temperature periodic kiln (12m³)

<table>
<thead>
<tr>
<th>Measure</th>
<th>IFB</th>
<th>NorFoam®</th>
<th>Improvements with NorFoam®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total installed hot face</td>
<td>4 450 kg</td>
<td>1 300 kg</td>
<td>-70% of installed weight</td>
</tr>
<tr>
<td>Total hot face volume</td>
<td>3.00 m³</td>
<td>1.85 m³</td>
<td>-37% reduced insulating volume</td>
</tr>
<tr>
<td>Heating-cooling speed</td>
<td>30 °C/h</td>
<td>50 °C/h</td>
<td>+65% faster</td>
</tr>
<tr>
<td>Cycle duration</td>
<td>5 days</td>
<td>4 days</td>
<td>+20% faster</td>
</tr>
<tr>
<td>Energy consumption/cycle</td>
<td>4 750 kWh</td>
<td>1 400 kWh</td>
<td>-70% reduced energy cost</td>
</tr>
<tr>
<td>Firing cycle/year</td>
<td>78</td>
<td>89</td>
<td>+14% more cycles/year</td>
</tr>
</tbody>
</table>

NorFoam® will drastically increase your productivity and efficiency as compared to insulating firebricks (IFBs) solutions.

Its low thermal inertia allows energy savings, reduction of cycles duration, faster heating/cooling speeds and many more advantages.

Add up positive effects

NorFoam® offers a combination of two positive effects when it replaces IFBs.

For the same insulation power, NorFoam® lightens your furnace lining.

For the same thickness, NorFoam® reduces cold face temperature.

Values given from case study
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