

Powder Loaded ZYF High Temperature Filled Zirconia Felts

ZYF is the Flagship Product of
Zircar Zirconia, Inc.

Three Treated ZYF Types:

- **Type ZYF-A Alumina**
- **Type ZYF-S Silica**
- **Type ZYF-Z Zirconia**

Treated ZYF Features

- High Purity Rigidizers and Fillers
- Custom Treatments Available
- More Rigid and Dense Structures than Non-Treated ZYF
- 100% Inorganic - No Binders
- Designed for Uses in Extremely Corrosive, High Temperature Environments
- High Porosity
- Easy to Cut
- Machinable
- Can Be Die Cut

The **Zircar** Fibrous Ceramics Advantage

Low Mass,
Low Heat Storage &
Low Thermoconductivity
means
High Thermal Shock Resistance,
High Insulation Performance,
Higher System Efficiency &
Lower Energy Costs



Rigidized... Loaded... Filled Zirconia Felt...

Fibrous zirconium oxide felts are filled with various inorganic powders to different loading concentrations to modify felt performance.

Product Information

Zircar Felt Type ZYF is an excellent all-purpose high temperature insulation that can be used as a separator, wrapper, fixture, gasket, cushion, pillow, pad, barrier, cover, layering or packing material in high temperature applications. ZYF is a ceramic textile made using the original ZIRCAR Process at our plant in Florida, NY, USA. ZYF is a flexible, light weight, porous, needled felt comprised of 4 to 6 micron diameter fibers and is nearly 100% zirconia phase stabilized with yttria. The fibers are mechanically interlocked and retain their flexible nature up to 1350 °C. The properties of ZYF are modified by filling the open porosity with various inorganic powders.

Any of our ZYF products can be custom treated to your specifications.

ZYF-A2.13 is filled with alumina powder and high fired to a rigid board.

ZYF-S.75G is filled with 0.75g of silica powder per 1g of ZYF, remaining pliable.

ZYF-Z1.5G is filled with 1.5g of zirconia powder per 1g of ZYF and dyed green for identification.

For more information,
phone: (845) 651-3040
email: sales@zircarzirconia.com
website: www.zircarzirconia.com

Properties & Characteristics

Properties (Nominal)	ZYF-A2.13	ZYF-S.75G	ZYF-Z.1.5G
Thickness, inch	0.160 +/- 0.035	0.10 +/- 0.03	0.10 +/- 0.03
Bulk Porosity, %	94	88	89
Bulk Density, lb/ft ³ (g/cm ³)	20 (0.32)	30 (0.48)	40 (0.64)
Tensile Strength, lb/in width	7.0	1.7	1.1
Weight/Area, lb/ft ²	0.21	0.22	0.31
Maximum Use Temperature, °C (°F) ⁽¹⁾	1600 (2912)	1600 (2912)	2000 (3632)
Minimum Wrapping Diameter Before Breaking	3 Feet	2 Inches	1 Foot
Linear Shrinkage, 1 hr. @ 1650 °C Isothermal Soak, %	1.5	5	14

Chemical Composition (Nominal)

Oxide	Wt%		
ZrO ₂ ⁽²⁾	87+	51+	89+
Y ₂ O ₃	10	5	10
Al ₂ O ₃	2 +/- 1	<0.01	<0.01
SiO ₂	<0.02	43	<0.01

⁽¹⁾ Maximum use temperature is dependent on variables such as the chemical environment and stresses; both thermal and mechanical.

⁽²⁾ 1-2 wt% hafnia occurs naturally with zirconia and does not affect performance.

What Makes Our Zirconia Unique?

All zirconia has very low specific heat, half as much as alumina. **Zircar** zirconia provides the additional benefit of being highly porous and pure. The 4-6 micron diameter yttria stabilized zirconia fibers are mechanically interlocked requiring no binders that would add contaminants and diminish purity and functionality. The serrated fiber cross section produced through the original ZIRCAR Process is unique to all **Zircar** zirconia fibers. The serration provides additional porosity making our zirconia the lowest thermal conductivity insulation available, for service over 1000 °C.

Filling the ZYF porosity with inorganic powders will modify properties such as strength, rigidity, maximum operating temperature and density.

In the micrograph on the right, ZYF-S shows serrated ZYF fibers with silica powder filling the spaces between.

Product Micrographs



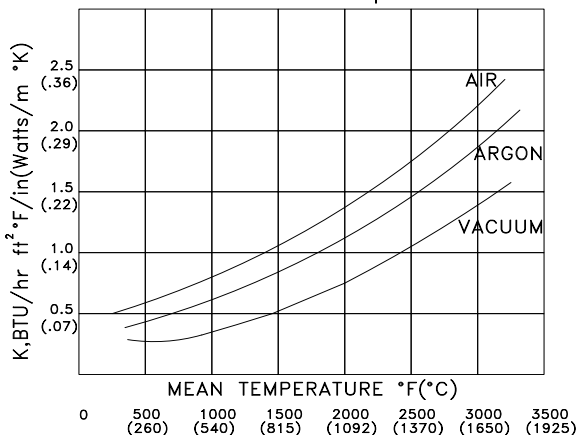
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Facts About Our Zirconium Oxide

- **Zircar** ZrO₂ fibrous ceramics are manufactured using the original ZIRCAR Process which was developed by Bernie H. Hamling (BHH) while at Union Carbide Corp. in Sterling Forest, NY. In 1974 BHH purchased the patents for the process and began ZIRCAR Products, Inc. Over the years the name ZIRCAR became synonymous with high quality advanced fibrous ceramics. In July 2000 Zircar Zirconia, Inc. purchased Bernie's zirconia business and to this day still uses his original process. Although Bernie is no longer with us, we think of him often and are grateful for the opportunity to continue his legacy in the ceramics industry. Thank you BHH.
- At very high temperatures in vacuum and inert or reducing atmospheres, zirconia loses a small amount of oxygen. The reaction results in a color change from white to gray but most other properties remain essentially unchanged and insulation effectiveness is not impaired.
- 1 to 2% hafnium oxide, HfO₂, occurs naturally with zirconium oxide. Hafnia is sometimes referred to as zirconia's twin because of structural similarities.
- Zirconia has the lowest thermal conductivity of any commercial refractory and is one of the most studied ceramic materials in the world.

Thermal Conductivity of
Zircar Type ZYF
in Various Atmospheres



- Upon heating unstabilized zirconia undergoes disruptive phase changes. At room temperature unstabilized ZrO₂ adopts a monoclinic crystal structure and transitions to tetragonal and cubic at higher temperatures. The volume expansion caused by the cubic to tetragonal to monoclinic transformation induces large stresses which cause cracking on cooling. The addition of yttria eliminates the phase transitions by stabilizing the tetragonal and cubic phases. **Zircar** ZrO₂ is phase stabilized with 10 wt% Y₂O₃.

Applications

ZYF-A

This thicker, rigidized felt was developed for use as a diffusion burner membrane for fuel fired heaters installed in long-haul trucks and high end passenger cars. In this application the liquid fuel, gasoline or diesel, is pumped onto one surface of a disk of felt. The fuel then wicks through to the opposite surface which is located in a combustion chamber and evaporates. The evaporated fuel is mixed with air and ignited providing an 'instant-on' heat in the vehicle which is independent of the engine heat.

ZYF-A2.13 is also used as a setter plate for vacuum sintering flat sheets of powdered metal materials. The felt remains flat during sintering because of its rigid structure.

ZYF-S & ZYF-Z

These heavy, loaded felts are used as gasket material in fuel cells. When compressed between the sealing surfaces of the fuel cell container they form a barrier that resists attack from the highly corrosive electrolyte. Although the two can be used in similar applications, ZYF-Z is used where a higher compressive strength may be needed.

Since ZYF-S and ZYF-Z are flexible, they can also be laminated to a form or shaped into large cylinders.

Product Samples



FREE SAMPLES

Call: 845-651-3040

email: sales@zircarzirconia.com

Product Type	Item #
ZYF-A2.13	SAMPLE-CB-1
ZYF-S.75G	SAMPLE-CB-2
ZYF-Z.1.5G	SAMPLE-CB-6

Samples measure 1.8" x 2.8"



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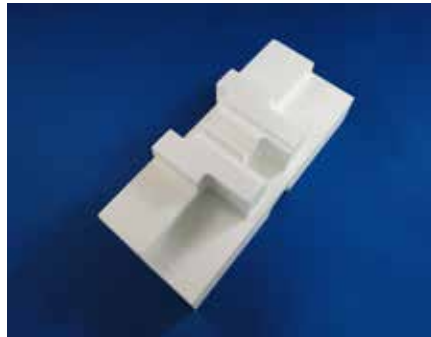
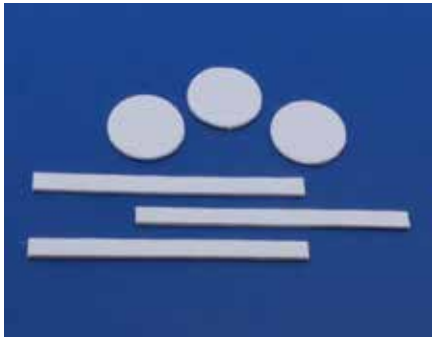
Custom Powder Loaded ZYF

Zircar will provide custom chemistry powder loaded ZYF to achieve your requirements. Our custom experience includes:

- Lanthanum Strontium Manganite
- A2.11
- S-8
- S-17
- Z-5

Zircar machines custom shapes to your design specifications. Our capabilities include:

- 3D CNC Machining
- Layered Configurations
- Lap Joined Boards and Cylinders
- Diamond Wire Splitting of Cylinders



Standard Product Sizes & Ordering

Treated ZYF is available in the standard sizes shown below. Please contact our Sales Department for pricing and availability.

To Place an Order

Call: 845-651-3040

email: sales@zircarzirconia.com

Treated ZYF

Size	Item Number		
	ZYF-A2.13	ZYF-S.75G	ZYF-Z.1.5G
8.5"x 16"x 0.16"Tk	CB039		
16"x 16"x 0.16"Tk	CB050		
18"x 24"x 0.10"Tk		CB008	CB036



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