

# ZYF-100A

## Low Sodium Yttria Stabilized Zirconia Felt

ZYF is the Flagship Product of  
Zircar Zirconia, Inc.

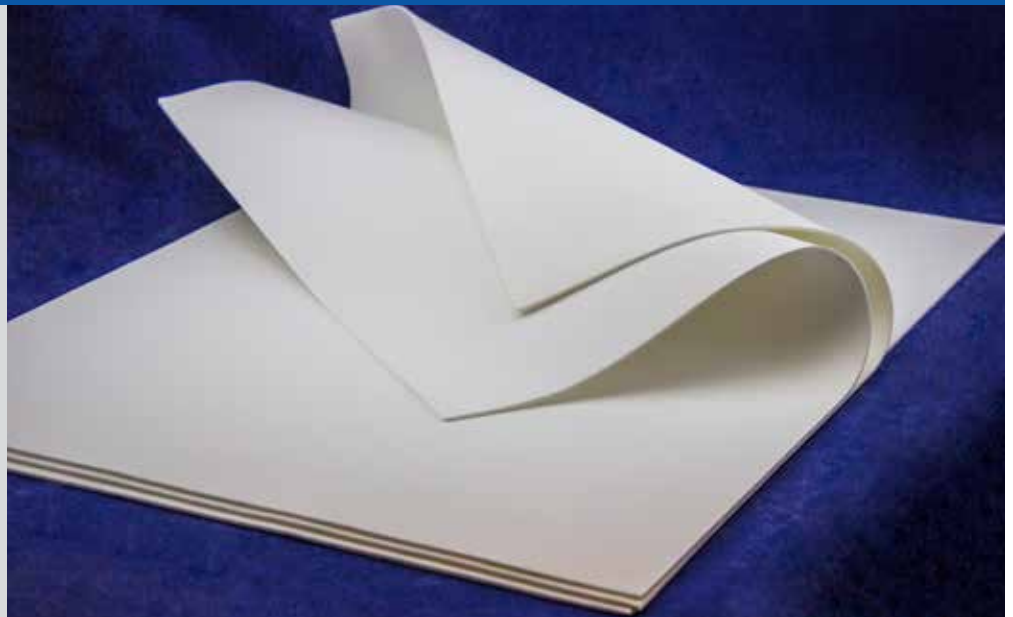
### ZYF-100A Features

- Temperature Rating to as High as 2000 °C
- Phase Stabilized with 10 wt% Yttria
- High Purity
- Very Low Concentration of Na<sub>2</sub>O
- Low Thermal Conductivity (K)
- 100% Inorganic, No Off-Gassing or Odors
- Excellent in Corrosive, Oxidizing & Reducing Atmospheres
- Flexible to 1350 °C
- High Porosity
- Very Light Weight
- Wrappable
- Easy to Cut
- Machinable
- Can be Die Cut
- Can be Cemented or Rigidized with ZR-CEM or ZR-RIG

### 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



### Thin... Flexible... Foldable... Wrappable...

Fibrous ZrO<sub>2</sub> ceramic felt insulation that can withstand temperatures in excess of 2000 °C.

### Product Information

**Zircar** Zirconium Oxide Felt Type ZYF-100A is processed to have a lower sodium content than ZYF-100. It is the best choice for sodium intolerant glass manufacturing. It 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-100A is a ceramic textile made using the original ZIRCAR Process at our plant in Florida, NY, USA. It 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. ZYF-100A is a general use insulation with properties that excel at extremely high temperatures and in severe environments such as corrosive, oxidizing and reducing atmospheres.

We use the highest purity materials in our products. The products contain only minimal trace oxides and no organics that off-gas when heated. Because **Zircar** zirconia fibers are yttria stabilized, they do not undergo the disruptive phase transition of pure zirconia. ZYF-100A is non-reactive to alkali vapors, salts or strong hot solutions and is not wet by most molten metals. It has low adsorption surface area and vapor pressure, making it useful in high vacuum.

For more information,  
phone: (845) 651-3040  
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website: [www.zircarzirconia.com](http://www.zircarzirconia.com)

## Properties & Characteristics

ZYF-100A Properties (Nominal)	ZYF-100A
Thickness, inch	0.1
Bulk Porosity, %	96
Bulk Density, lb/ft <sup>3</sup>	15
Tensile Strength, lb/in width	4
Melting Point, °C (°F)	2593 (4700)
Maximum Use Temperature, °C (°F) <sup>(1)</sup>	2000 (3632)
Minimum Wrapping Diameter Before Breaking, inch	0.75
Vapor Pressure @ 2500 °F Torr	8 x 10 <sup>-12</sup>
Linear Shrinkage After 1 hr. @ 3000 °F Isothermal Soak, % (Perpendicular to Thickness)	6
<b>Specific Heat BTU / lb - °F</b>	
@200 °F	.13
@4300 °F	.18
<b>Chemical Composition (Nominal)</b>	
<b>Oxide</b>	
ZrO <sub>2</sub> <sup>(2)</sup>	90
Y <sub>2</sub> O <sub>3</sub>	10
Na <sub>2</sub> O	<500 ppm

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

<sup>(2)</sup> 1-2% weight hafnia (HfO<sub>2</sub>) occurs naturally with zirconia (ZrO<sub>2</sub>) 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 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.

At high temperatures, heat transfer by radiation dominates over conduction and convection. **Zircar** zirconia fibers are the best in the industry at reflecting and radiating heat while not storing it. They facilitate steep temperature gradients and outperform all others when challenged with extreme temperatures and severe environments.

Our unique zirconia fiber products are available in many forms in addition to felt.

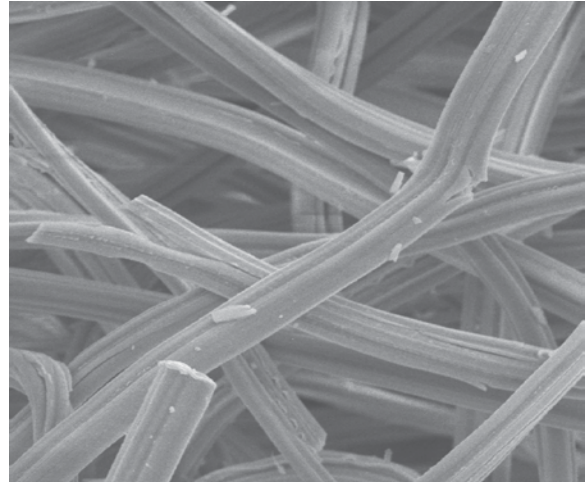
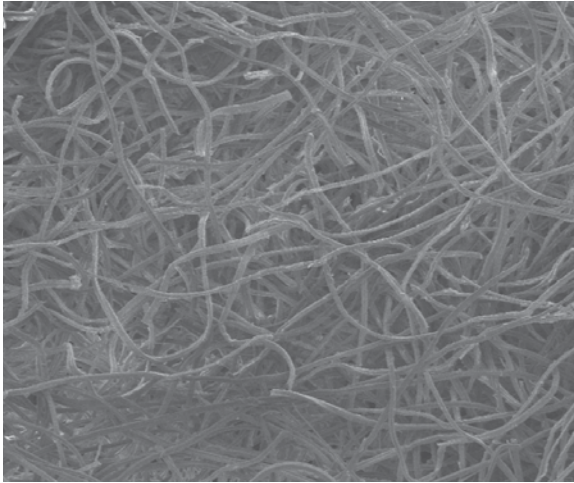


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## What Makes Our Zirconia Unique? (cont.)

### Product Micrographs



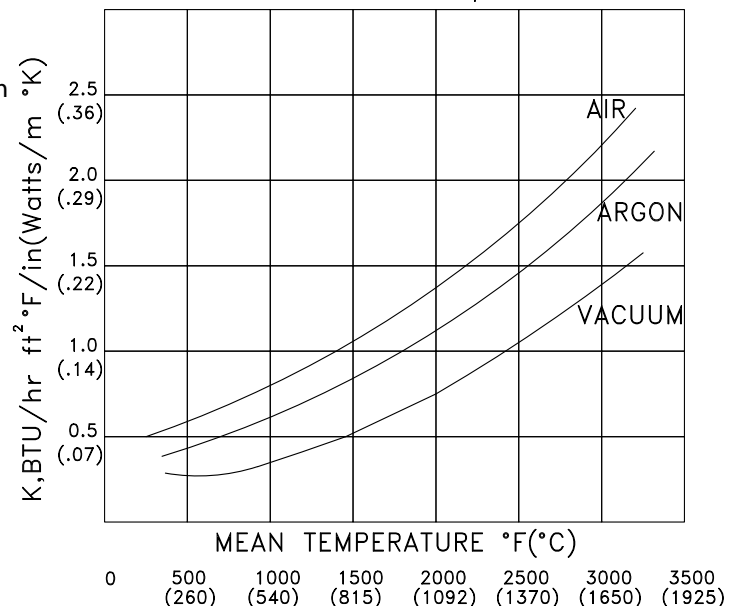
Micrographs showing the serrated structure and mechanical interlock of ZYF fibers. The micrograph on the left is magnified by 100x while the micrograph on the right is magnified by 1000x.

### Facts About Our Zirconium Oxide

- **Zircar**  $ZrO_2$  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,  $HfO_2$ , 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.
- Upon heating unstabilized zirconia undergoes disruptive phase changes. At room temperature unstabilized  $ZrO_2$  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**  $ZrO_2$  is phase stabilized with 10 wt%  $Y_2O_3$ .

Thermal Conductivity of  
**Zircar** Type ZYF  
in Various Atmospheres



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## Applications

### ALL-PURPOSE

ZYF-100A 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.

### GLASS MELTING

ZYF-100A is specifically processed to reduce sodium oxide concentration for glass formulations that are susceptible to devitrification from sodium.

### HIGH TEMPERATURE SETTER

ZYF-100A is used in powder metal sintering in vacuum and hydrogen atmospheres, quartz glass melting and hot working operations.

### HIGH TEMPERATURE SHIELD/COVER

Molybdenum elements in rapid cycle furnaces will shed aggressive silica glass during high temperature heat treatment. Routine use of ZYF-100A will protect your silica susceptible ware from the damage molybdenum elements cause.

### HIGH TEMPERATURE INSULATION

Used between layers of refractory metal heat shields to improve insulation performance in vacuum furnaces and hot isostatic presses.

### CRYSTAL GROWTH

ZYF-100A acts as thermal insulation and a cushioning barrier as well as a platform for iridium recovery in the Czochralski method of oxide crystal growing. In this method an iridium crucible is often used to contain the melt. Iridium, a precious metal in the platinum group vaporizes at high temperature. A layer of ZYF-100A wrapped around the iridium crucible creates a physical barrier between the fragile crucible and the backup insulation. The steep thermal gradient across the ZYF-100A causes condensation of the iridium into the felt from which it can then be easily segregated and recovered.

### ELECTROLYTIC CELL GASKET

ZYF-100A is unaffected by long term exposure to KOH and is used as a separator/gasket in batteries and fuel cells using alkali electrolytes.

## Product Samples & Standard Sizes

Please contact our Sales Department for pricing and availability.

### To Place an Order

Call: 845-651-3040

email: [sales@zircarzirconia.com](mailto:sales@zircarzirconia.com)

### Type ZYF-100A

Size	ZYF-100A
1.8"x 2.8"	SAMPLE-CB7
18"x 24"	CB048

## ZYF Custom Capabilities

ZYF & ZYF-100A can be customized for your application.

- Custom Sheet Sizes
- Die Cut Parts
- Rigidized with Zirconia or Alumina
- Layered/Sintered/Laminated Configurations
- Powder Loaded
  - Silica ZYF-S
  - Zirconia ZYF-Z
  - Alumina ZYF-A
  - Lanthanum Strontium Manganite ZYF-LSM
  - Custom Powder



Layered and Laminated into a Custom Curve

Die Cut into Custom Shapes and Sizes



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