Advanced Fibrous Ceramics

ZYW

High Temperature Yttria Stabilized Woven Zirconia Cloth

The Unrivaled Industry Leader of ZrO_2 Insulation

Offered in Two Constructions

- **ZYW-15 (Square Weave)**
- **ZYW-30A (Satin Weave)**

Easily Cut to Size

ZYW Features

- Temperature Rating to as High as 2200 °C
- Phase Stabilized with 10 wt% Yttria
- High Purity
- Low Thermal Conductivity (K)
- 100% Inorganic, No Off-Gassing or Odors
- Excellent in Corrosive, Oxidizing & Reducing Atmospheres
- High Porosity
- Very Light Weight
- Wrappable
- 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 ceramic textile insulation can withstand temperatures in excess of 2000 °C.

Product Information

Zircar Zirconium Oxide Cloths Type ZYW are flexible textiles composed of yttria stabilized zirconia fibers that offer extreme temperature and chemical resistance in a flexible form. ZYW cloths provide the lowest thermal conductivity of any commercially available refractory material in their class. They are manufactured using the original ZIRCAR process at our plant in Florida, NY, USA and are constructed of continuous individual filaments mechanically interlocked in a woven structure.

ZYW ceramic textiles are ideal for temperatures up to 2200 °C and are suitable for applications such as high energy battery separators, thermal insulation in crystal growing furnaces, and hot gas filtration. The fine capillary and pore structure of ZYW, in combination with the hydrophilic nature of zirconia, impart excellent wetting, solution retention, and wicking characteristics to these materials. The cloths require neither binders nor supporting wires to maintain their construction and will comply somewhat to both tensile and compressive forces due to the mechanical interlocking of the fibers.

ZYW can be rigidized with ZR-RIG and cemented with ZR-CEM into composites or rigid shapes.

ZYW-15 is 15 mil thick square weave.
ZYW-30A is 25 mil thick satin weave.

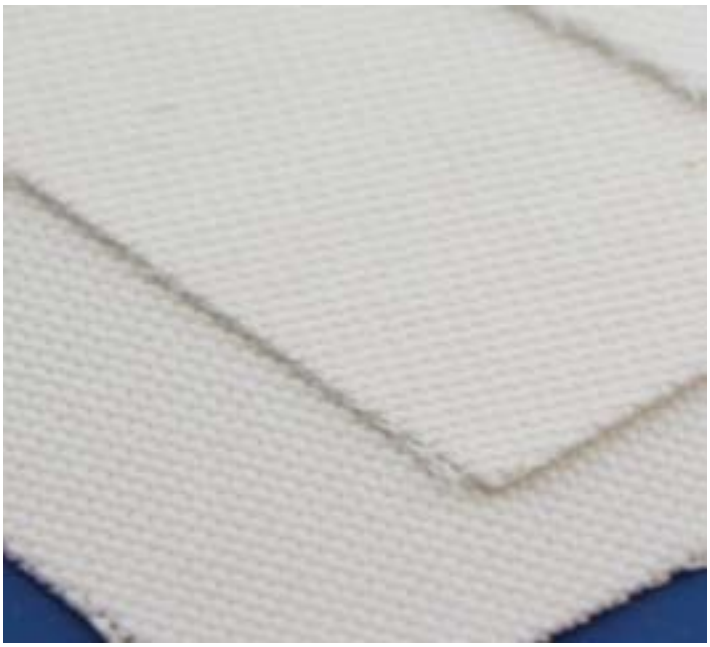
For more information,
phone: (845) 651-3040
email: sales@zircarzirconia.com
website: www.zircarzirconia.com

ZYW Chemical Resistance

Zircar ZYW has exceptional resistance to molten alkali metal chlorides and carbonates at temperatures as high as 700 °C and to aqueous solutions of alkali metal hydroxides at temperatures as high as 220 °C. These materials will tolerate exposure to a mineral acid at its boiling point for short lengths of time. Extensive contact with hot phosphoric acid, however, causes embrittlement and stiffening due to the formation of zirconium phosphate.

Molten metals such as copper, aluminum, iron steel, etc., do not wet ZYW and therefore cause little change in either the chemical or the physical nature of these products through many hours of exposure.

ZYW has excellent wicking and wetting solution retention characteristics due to the fine capillary and pore structure of weave in combination with the hydrophilic nature of zirconia and the serrated surface of the individual fibers in the threads.



Properties & Characteristics

ZYW Properties	**ZYW-15**	**ZYW-30A**
Nominal Thickness, mils	15	25
Bulk Density, g / cc (pcf)	1.02 (64)	0.94 (59)
Porosity, %	87	83
Melting Point, °C (°F)	2590 (4694)	2590 (4694)
Tensile Strength, g / cm width (lb / inch width)	154 (0.9)	872 (5)
Nominal Weight / Area, grams / meter^2 (oz / yd^2)	291 (8.6)	772 (22)
Continuous Maximum Use Limit, °C (°F)*	2200 (3992)	2200 (3992)
Specific Heat, J / kgK @ 93 °C (BTU / lb oF @ 200 °F)	544 (0.13)	544 (0.13)
Specific Heat, J / kgK @ 2370 °C (BTU / lb oF @ 4298 °F)	754 (0.18)	754 (0.18)
Vapor Pressure @ 1370 °C (2498 °F), Torr	8 x 10^{-12}	8 x 10^{-12}
% Shrinkage after 1 hr. @ 1650 °C (3002 °F) isothermal soak	5.5	3.9
Chemical Composition (nominal)		
Oxide	**Wt%**	
ZrO_2**	90	90
Y_2O_3	10	10
Trace Impurities	<0.25	<0.25

*Maximum use temperature is dependent on variables such as thermal and mechanical stresses, and the chemical envirenment that the material experiences.
**1-2 wt% hafnia occurs naturally with zirconia and does not affect performance.

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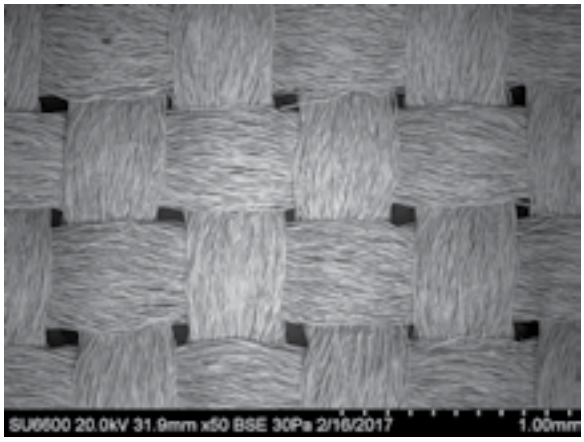
What Makes Our Zirconia Unique?

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 yttria stabilized zirconia fibers are bundled in filament threads which are mechanically woven requiring no binder that would add contaminants and diminish purity and functionality. The serrated fiber cross section produced through the ZIRCAR process is unique to all our zirconia fibers. The serration provides additional porosity making Zircar zirconia the lowest thermal conductivity insulation available, for service over 1000 °C.

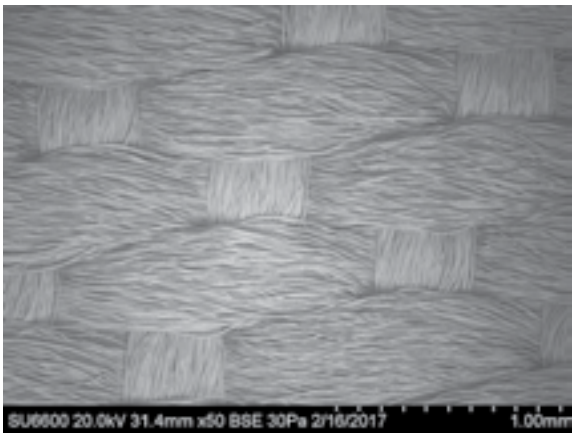
At high temperatures, heat transfer by radiation dominates over conduction and convection. Zircar zirconia fibers are the best in the industry at reflecting and radiating heat while not storing it. They facilitate steep temperature gradients and outperform all others when challenged with extreme temperatures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

Our unique zirconia fibers are available in many forms in addition to ZYW.

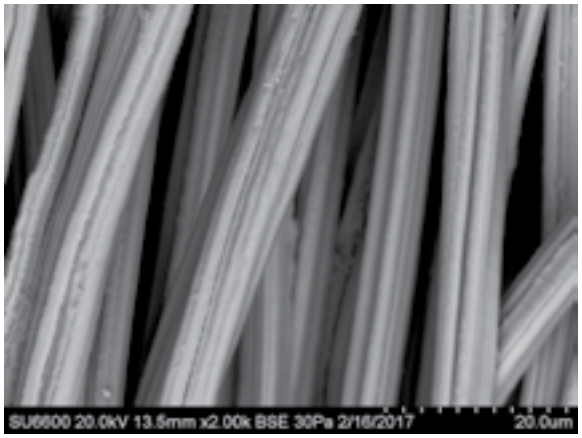
Product Micrographs



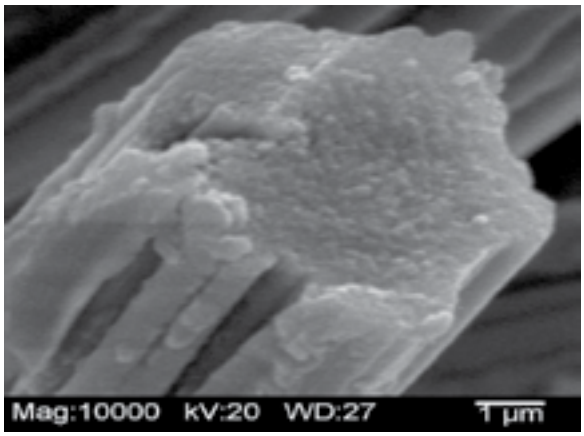
Also known as a 'plain weave', the square weave results from a simple, over one - under one, weaving pattern.



The micrograph Shows a view of ZYW-30A, satin weave zironia cloth.



The serrated shape which is common to all Zircar zirconia fibers can be seen in this image.



This Micrograph shows a ZYW-15 solid fiber with sub-micron grain.

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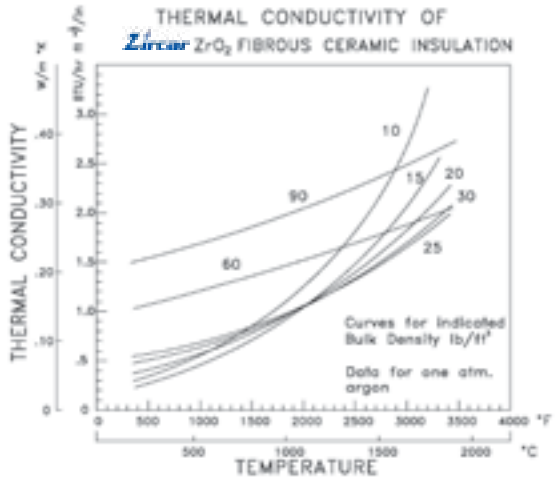
Facts About Our Zirconium Oxide

- Zircar ZrO_2 fibrous ceramics are manufactured using the original ZIRCAR Process which was devloped 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 structrual 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.

Applications

INSULATION
ZYW is an effective high temperature insulation for use in applications where space is at a premium. Its relative high strength allows repeated flexing at temperatures below 1350 °C.

HEAT SHIELDING
ZYW has found use as a high temperature heat shielding material. Its use can significantly reduce the number of conventional refractory metal shields needed in many applications and is not restricted to vacuum and inert or reducing environments.

SEPARATION
ZYW is an effective separator for high temperature fuel cells and high energy batteries.

FLEXIBILITY AND COMPRESSION
Elongation of 4 to 8% before breaking allows ZYW to conform to irregular surfaces. ZYW can be compressed up to two-thirds of its normal thickness and still recover a major fraction of its original dimension with little fiber damage.

RIGID SHAPES
ZYW can be coated with Zirconia Rigidizer, ZR-RIG, to create thin walled, rigid, fibrous zirconia tubes and other shapes. ZYW can also be wrapped around dense zirconia oxygen sensor tubes, held in place with ZR-RIG, for use as standoffs.

Other applications for ZYW include filter media for hot gases, catalyst supports, corrosion resistant wrapping, and flexible setter cloths at elevated temperatures.

Standard Product Sizes & Ordering

Please contact our Sales Department to discuss FREE SAMPLES, pricing and availability.
Call: 845-651-3040
email: sales@zircarzirconia.com

Type ZYW

Size	Item
ZYW-15 1.8" x 2.8"	SAMPLE-CD
ZYW-15 18" x 24"	CD001
ZYW-30A 1.8"x 2.8"	SAMPLE-CE
ZYW-30A 18" x 24"	CE001

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