



Zircar Zirconia, Inc.
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ZIRCONIA CLOTH TYPE ZYK-15



Zirconia Cloth Type ZYK-15 is available in 18" x 24" x 0.015" sheets.

FEATURES

- Low Thermal Conductivity
- High Purity
- Extreme High Temperature Stability
- Fibers Stabilized with ~10 wt% Yttria
- Can be Cemented with Zircar Zirconia Cement Type ZR-CEM
- Can be Rigidized with Zircar Zirconia Rigidizer Type ZR-RIG
- Easily Cut to Size
- Available 'off the shelf'

Zirconia Cloth Type **ZYK-15** is a tricot knit cloth nominally 0.012" thick composed of yttria-stabilized zirconia fibers. This material offers extreme temperature and chemical resistance in a flexible form and provides the lowest thermal conductivity of any commercially available refractory fiber material. **ZYK-15** cloth is ideal for temperatures up to 2200°C. The melting temperature is 2590°C. It is suitable for applications such as high energy battery separators, thermal insulation in crystal growing furnaces, and for the filtration of hot gases.

ZYK-15 is a true textile constructed of essentially continuous individual filaments fabricated in a tricot knit form. It requires neither binders nor supporting wires in its construction and will comply somewhat to both tensile and compressive forces due to the mechanical interlocking of their fibers. Elongation of 4 to 8% before breaking allows **ZYK-15** to conform to irregular surfaces. **ZYK-15** 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.

The fine capillary and pore structure of **ZYK-15**, in combination with the hydrophilic nature of zirconia and the serrated surface of the individual fibers in the knit threads, impart excellent wetting solution retention and wicking characteristics to this material.

Zircar Zirconia, Inc.
PO Box 287
Florida, NY 10921-0287
USA

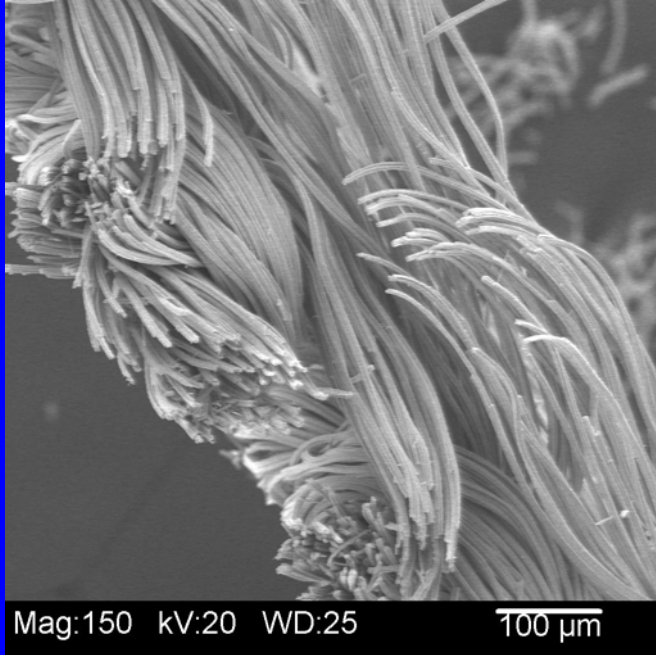
Tel: 845-651-3040
Fax: 845-651-0074
email: sales@zircarzirconia.com
web: www.zircarzirconia.com

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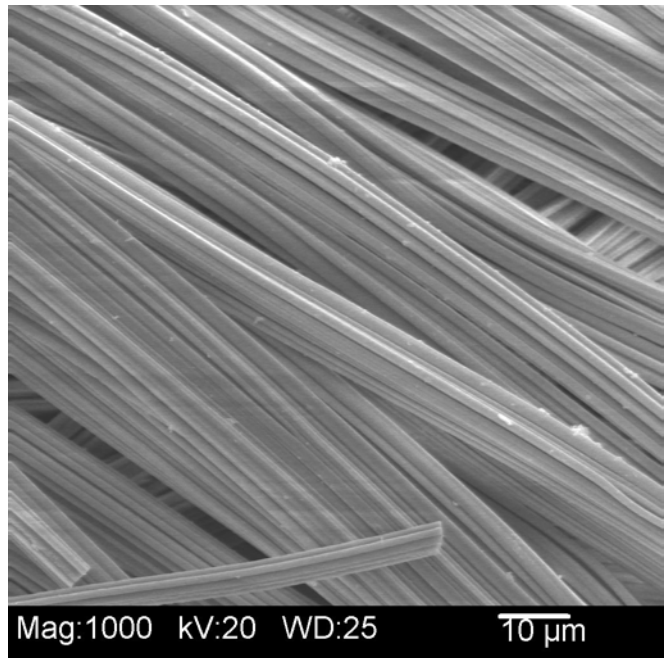


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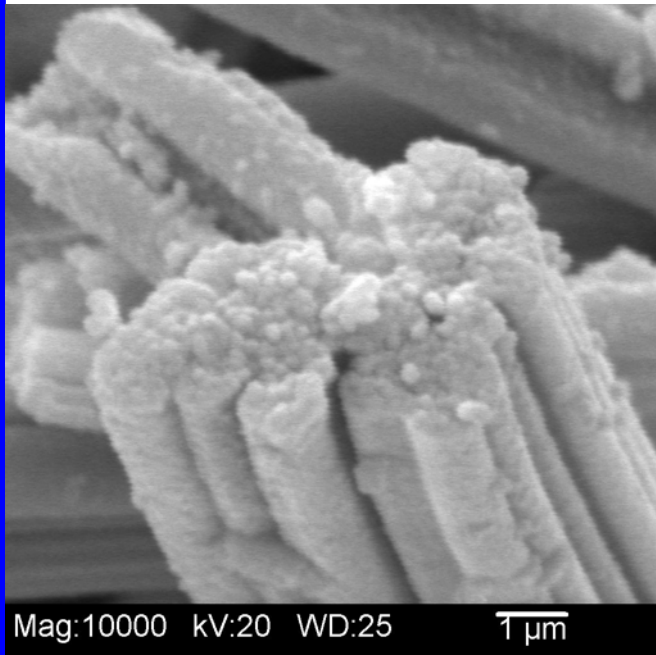
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Zirconia Cloth Type **ZYK** has the unique advantage of being a knit structure. This structure is tied together and irregular shapes can be cut that do not unravel. The SEM photomicrograph to the left shows the cut edge of Type **ZYK** and the individual filaments of the tied together threads.



The SEM photomicrograph above shows individual fibers arranged mostly parallel to each other in a thread. These filaments show the serrated nature of all Zircar zirconia fibers.



The SEM photomicrograph to the left shows the end of an individual fiber in Type **ZYK**. The individual submicron crystallites which make up the near theoretical density fiber can be seen clearly.

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APPLICATION INFORMATION

- **ZYK-15** is used as separators in nickel-hydrogen batteries. These battery separators are die cut from sheets of **ZYK-15** and then 100% visually inspected on a light box. Each lot is chemically analyzed and parts from each sheet are measured and weighed to assure that the parts supplied meet the requirements of the satellite builders.
- **ZYK-15** is an effective high temperature insulation for applications where space is at a premium. Its high strength allows for repeated flexing at temperatures below 2500°F.
- **ZYK-15** 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.
- **ZYK-15** can be coated with **ZR-RIG** to create thin walled, rigid fibrous zirconia tubes, and other shapes.
- **ZYK-15** is an effective separator for high temperature fuel cells.
- **ZYK-15** is an effective reinforcement for ablative materials used in nozzles, nose tips and heat shields.
- Other applications for **ZYK-15** include filter media for hot gases, catalyst supports, corrosion resistant wrapping, and flexible setter cloths at elevated temperatures.

CHEMICAL RESISTANCE

Zircar zirconia cloths type **ZYK-15** have exceptional resistance to molten alkali metal chlorides and carbonates at temperatures as high as 1300°F and to aqueous solutions of alkali metal hydroxides at temperatures as high as 450°F. 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 and therefore cause little change in either the chemical or the physical nature of these products in spite of many hours of exposure.

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PROPERTIES & CHARACTERISTICS

Nominal Composition, Wt%	
ZrO ₂ *	90
Y ₂ O ₃	10
Trace Impurities	<0.25
Nominal Thickness, mils	12
Bulk Porosity, %	85
Bulk Density, gram/cc (pcf)	0.68 (42.5)
Tensile Strength, gram/cm width (pound / inch width)	166 (0.93)
Nominal Weight / Area, gram/meter ² (oz/yd ²)	207 (6.1)
Melting Point, °C (°F)	2590 (4694)
Continuous Maximum Use Temperature**, °C (°F)	2200 (3992)
Specific Heat J/kgK (BTU / lb-°F) @ 93°C (200 °F)	544 (0.13)
Specific Heat J/kgK (BTU / lb-°F) @ 2370°C (4298 °F)	754 (0.18)
Vapor Pressure @ 1370°C (2498°F)	8 x 10 ⁻¹² Torr
Shrinkage, 1 hr.@ 1650°C (3002°F) isothermal soak	4.3%

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

** Maximum use temperature is dependent on variables such as thermal and mechanical stresses, and the chemical environment that the material experiences.

ORDERING INFORMATION

Zirconia Cloth Type **ZYK-15** is sold in a standard size sheet listed below along with the ordering item number. Our manufacturing process is such that **ZYK-15** is made only in sheets. We cannot make 'rolls'. Non-standard sheet sizes and die - cut parts are quoted on an individual basis - please inquire.

Standard Size	Item Number
ZYK-15, 18" x 24"	CC001

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