The fascinating world of Tosoh Zirconia
... where value and potential are limited only by one's imagination
The unlimited possibilities for Zirconia

Zirconia is a unique advanced ceramic – a chemical compound having the formula ZrO₂. Products manufactured from Tosoh’s yttria-stabilized zirconia (YSZ) powder exhibit superior mechanical properties such as high strength and flexibility. As a technological breakthrough, YSZ surpasses the strength limitations of traditional fine ceramics. Heat insulating properties and oxygen-ion conductivity indicate zirconia has potential for use in a wide variety of applications – everything from telecommunications to the new energy of the future and environmental products.

Market share - proof of quality
Tosoh is a pioneer in the development of YSZ and has become a major supplier to the world. Earning a solid reputation for consistent high purity and quality that customers can depend on, Tosoh continues to focus resources in R&D and customer services for the ultimate evolution of Zirconia.

Grinding Media

SUPERIOR STRENGTH and DURABILITY.
Tosoh’s zirconia grinding media is primarily spherical and comes in a variety of sizes from 0.03 mm to 25 mm. It is used to process materials for not only machines and industrial parts, but also plays a vital role in the production of materials that comprise the micron-thin layers of electronics for mobile phones, as well as the processing of pigments in printing inks.

Indispensable for fiber-optic networks (ferrules, sleeves)
The information age of today and tomorrow is being built on global fiber-optic networks. Zirconia is an indispensable material used in the connectors within those networks.

STRONG, FLEXIBLE, and EASY to PROCESS. Zirconia is rapidly becoming the world standard for fiber-optic connectors – providing the maximum amount of data transmission with minimal loss.
Environmentally friendly and energy conservation

OXYGEN-ION CONDUCTIVITY is a UNIQUE QUALITY of zirconia. This fascinating characteristic makes zirconia useful in environmental applications for solid oxide fuel cells, which generate pollution-free electricity, as well as oxygen and NOx sensors used in the automotive field.

The future of ZIRCONIA IS JUST BEGINNING...
Using the latest hydrolysis processes and nano-technologies, Tosoh produced the TZ Series of zirconia powders. Through complete control over materials and production processes, Tosoh can maintain consistent high purity and quality. The TZ Series, the ultimate zirconia powder, delivers added value and product improvements for the customer.

**Basic Grades**

- **TZ-3Y-E**
  Partially-stabilized zirconia powder with uniform dispersion of 3 mol % yttria. TZ-3Y-E exhibits superior sintering properties and higher aging resistance at a lower sintering temperature of 1300°C. Sintered bodies produced with TZ-3Y-E show a fine crystal grain structure resulting in greater improvements in strength, fracture toughness, as well as resistance to wear and aging. TZ-3Y-E has numerous applications such as materials for industrial parts and everyday products.

- **TZ-4Y, TZ-6Y, TZ-8Y, TZ-10Y**
  Fully stabilized zirconia powder with uniform dispersion of 4~10 mol % yttria. Sintered bodies produced from these powders exhibit oxygen-ion conductivity and heat insulating. These grades have proven to be suitable for use in oxygen sensor applications, electrolytes in solid oxide fuel cells, materials for heat insulation, and many others.

**Legend for grade names**

- □ Example □ □ - □ □ □ □ □ + □
  - □ : mol % of yttria
  - □ : easy moldability grades
  - □ : ATZ grades - 20 wt% alumina
  - □ : binder grades
  - □ : easy sintering grades

**Easy Moldability Grades “S”**

“S” grades have a smaller surface area that contributes to a smooth flow for the compound or slurry during injection molding, tape casting, and other molding methods. Therefore, “S” grades are highly recommended for producing large parts with a mechanical press or CIP.

**Binder Grades “B”**

Tosoh’s binder added grades are perfect for mechanical pressing and CIP. “B” grades can be used “as is,” thereby eliminating the binder addition and spray drying steps in customers’ processes.

**ATZ Grades “A”**

“A” grades contain uniformly dispersed 3 mol % yttria, 20 wt% alumina, and exhibit extremely high mechanical strength after HIPing. This grade is most commonly used to produce industrial parts used in high strength, high wear resistance applications.

**Color Zirconia**

Tosoh’s color zirconia shows a deep tone that emulates jewels. Also it can be used for optical anti-reflection and other mechanical parts.

Tosoh also supplies a high purity, non-stabilized zirconia powder, TZ-0. For the development of custom powders, please contact the nearest Tosoh sales office.
## Powder Characteristics and Properties

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### Tosoh Zirconia Process

1. Zircon sand
2. \( \text{ZrOCl}_2 \cdot 8\text{H}_2\text{O} \)
3. \( \text{YCl}_3 \)
4. Hydrolysis
30 micron with Great Potential

Zirconia Fine Beads TZ-B Series

Tosoh’s high-end manufacturing technology has yielded Zirconia Fine Beads that exhibit superior strength and fracture toughness. The TZ-B Series is now used in many applications such as blasting, shot peening, and placing sand.

Advantages

- Due to the TZ-B Series’ well shaped round surface and narrow size distribution, elaborate blasting can be achieved without damaging products.
- Through its high density and superior hardness, the TZ-B Series needs less processing time than common metal or glass beads.
- The TZ-B Series’ higher crushing strength and wear resistance results in less bead loss.
- The TZ-B Series is resistant to rust and corrosion.

Typical Applications

- Shot blasting (matte finishing, deburring, etc.)
- Shot peening
- Filler for various resins
- Placing sand (sintering, annealing)
- Spacer

Properties of TZ-B90

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Durability Comparison

Test data shows the result of shot blasting SUS304 using various types of beads equivalent to TZ-B90. During the 50 blasts, the crushing ratio of TZ-B90 hardly rose. This shows the superior crushing strength that the TZ-B Series provides.
Tosoh supplies optical fiber connector ferrule blanks and various injection molded components produced by Tosoh Ceramics Co., Ltd. Starting material for the Tosoh zirconia compound PXA Series is based on yttria-stabilized zirconia (YSZ) powder. Tosoh offers customized special compounds to realize customer’s need, such as ceramic compounds based on materials other than zirconia. Please contact the nearest Tosoh sales office for more information.

Proven Technology and Achievements

Zirconia Compounds for Injection Molding PXA® Series

Tosoh, in addition to powder production, is an injection molding compound manufacturer with extensive experience in the mass production of sintered bodies. Based on this know-how, Tosoh has developed the PXA Series delivering high quality, easy sintering, and superior handling features.

Advantages

- Besides easy de-waxing and sintering, and superior handling features, the PXA Series minimizes shrinkage variance.
- Due to the high quality of Tosoh’s zirconia powders, the PXA Series exhibits great strength, fracture toughness and wear resistance.
- Tosoh has developed the recycling process of unused green bodies based on the PXA Series.

Standard Grades

- **PXA-100P**
  Compound for de-waxing in air; extensively used for ferrule blanks.
- **PXA-201P**
  Compound for de-waxing in nitrogen with good flow; used for precision parts as well as larger parts with an irregular shape. De-waxing in nitrogen is recommended for these larger parts.
- **PXA-211P**
  Compound for de-waxing in air; performance equivalent to PXA-100P. Flow is equivalent to PXA-201P.
- **PXA-230 Series**
  These compounds can be de-waxed in air and feature excellent de-waxing properties with good flow.

Special Grades

- **PXA-300 Series**
  Color zirconia compounds.
- **PXA-400 Series**
  Zirconia compounds based on fully stabilized zirconia powder.
- **PXA-800 Series**
  Ceramics compounds other than zirconia.
Jewel-like Dignity and Elegance

Color Zirconia

Integrity and depth of color in zirconia exudes elegance equal to precious stones. Superior wear resistance means the brightness never fades. Color Zirconia will provide the sparkle that customers need for development of new products. In addition to colored powder, compounds for injection molding and sintered products are also available.

Typical Applications

- Watch parts (case, band)
- Exterior parts for cellular phones
- Optical anti-reflection parts for image recognition
- Various machine parts

TZ-Black

Color stability can be achieved within a wide sintering temperature range.

TZ-Blue
TZ-Yellow

Tosoh can develop special compounds to suit customers' needs. Please contact the nearest Tosoh sales office for more information.

Hollow Balls for Jewelry

Zirconia Hollow Ball

Using unique molding technologies, Tosoh has developed Zirconia Hollow Ball. Zirconia Hollow Ball is perfect for jewelry such as necklaces or other accessories.
Eco-Products with Superior Grinding Efficiency

Zirconia Grinding and Dispersion Media YTZ®

YTZ® Grinding Media, produced from yttria-stabilized zirconia powder, exhibits high crushing strength, fracture toughness and wear resistance. It is produced by Nikkato Corporation, one of Japan’s leading ceramic manufacturers and a pioneer in the development of strength-enhanced zirconia ceramics. Starting with the raw materials, YTZ® Grinding Media has been researched and examined from all possible perspectives to produce superior quality.

Ceramic Media Properties

Due to the unique properties of ceramics, YTZ® Grinding Media is resistant to rust and corrosion, and thus compatible with water-based processing.

Additionally, YTZ® Grinding Media, produced from yttria-stabilized zirconia “YSZ” powder, exhibits superior grinding efficiency because of higher density, and has superior wear resistance due to high crushing strength and fracture durability.

YTZ® Qualities

YSZ powder used for materials is produced through the latest hydrolysis process, known as the “Tosoh process” and achieves consistent high quality.

YTZ® Grinding Media consists of high purity YSZ without any kind of heavy metals. Moreover YTZ® Grinding Media exhibits high wear resistance, which combined with its smooth surface minimizes product contamination from both media wear and mill parts.

Available Sizes

- Ball (⌀, mm) 0.03(30micron), 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.65, 0.8, 1, 1.5, 2, 3, 5, 10, 15, 20, 25
- Cylinder (inch) 3/8, 1/2

Please contact the nearest Tosoh sales office for requests for different sizes.

YTZ® Properties

YTZ® Grinding Media is almost perfectly spherical with narrow size distribution. This provides precision in grinding and dispersion.

YTZ® Grinding Media consists of extremely uniform fine grains and has virtually no internal defects, resulting in outstanding wear resistance. The risk of media chipping as well as media replacement is minimized, resulting in significant cost and waste reduction.
Typical Applications

Through its comprehensive quality system, YTZ® Grinding Media has a solid reputation for the grinding and dispersion of pharmaceutical and foodstuffs as well as those of ultra-fine materials for electronic parts or inks.

- Dielectric, piezoelectric and magnetic materials
- Pigment, inks, dyes, paint and coating materials
- High purity advanced ceramic materials, frits and glazes
- Pharmaceutical, dental, cosmetic and foodstuffs

Environment, Safety and Comprehensive Quality System

- YTZ® Grinding Media is produced under a stringent audit system, and has obtained ISO9001 quality assurance and ISO14001 environmental management system certification.

- Traceability

YTZ® Grinding Media can be completely traced from raw materials to the finished products.

Grinding Efficiency and Wear Resistance

The test data above is a result of wet milling BaTiO₃ powder with a starting surface area of 1.8m²/g. Grinding was conducted with several types of media in a vertical sand mill over a set period of time. As can be seen, YTZ® has superior grinding efficiency with the highest wear resistance. The highest surface area of the ground material was achieved with YTZ® over the same period of time under identical conditions. This is a clear indication of the high milling efficiency that YTZ® provides.