



Superior Injection Molding Capabilities for Complex Designs



Removing Technological Barriers for Over 100 Years

From the specialized porcelain labware first made in 1914 to modern electronic devices, CoorsTek uses advanced technology, materials, and manufacturing capabilities to remove technological barriers for design engineers worldwide.

Injection Molding

CoorsTek has deep expertise and proven results manufacturing volume production quantities using ceramic injection molding at multiple facilities around the globe. Ideal for the mass production of complex components, injection molding offers significant benefits over conventional methods:

- Cost-effective techniques
- High-volume manufacturing runs
- Production of net or near-net shape parts with tolerances to 0.5%
- Application-specific materials
- Flexible design freedom without high labor and manufacturing costs introduced by machining

Injection molding eliminates the need for secondary operations normally required to produce complex geometrical shapes. The more complex the shape, the more advantageous injection molding will be over other fabrication methods.

Optical Design Control

In addition to meeting your physical, thermal, electrical, and chemical performance requirements, CoorsTek components can meet your optical needs with translucent, transparent, reflective, colored, or opaque ceramic materials.

Superior Materials

CoorsTek offers a broad range of high strength, high performance ceramic materials ideal for complex injection molded designs. CoorsTek engineers work with our customers to select the best material for individual applications.

CoorsTek is capable of molding a wide range of materials including different grades of alumina, zirconia, steatite, aluminum nitride, silicon nitride, and magnesium oxide. See chart below for a listing of some available materials and properties.

| PROPERTIES | UNITS | ALUMINA 96 - 99.5 AD-96 Nom. 96% Al ₂ O ₃ | ALUMINA 99.98 Nom. 99.98% Al ₂ O ₃ | ALUMINUM NITRIDE AlN | SINTERED SILICON NITRIDE Si ₃ N ₄ | ZTA 90/10 IM Zirconia Toughened Alumina | YTZP Y ₂ O ₃ Partially Stabilized Zirconia |
|--|------------------------------|---|---|-------------------------------------|--|--|--|
| Density | g/cm ³ | 3.72 - 3.9 | 3.98 | 3.26 - 3.32 | — | 4.09 | 6.02 |
| Color | — | WHITE / IVORY | IVORY | — | — | WHITE | WHITE |
| Flexural Strength (MOR), 20 °C | MPa (psi x 10 ³) | 358 (52) - 379 (55) | 285 | 300 - 350 | 600 - 1000 | 623 (90) | 1240 (180) |
| Elastic Modulus, 20° C | GPa (psi x 10 ⁶) | 303 (44) - 370 (54) | 390 | 310 | — | 366 (52) | 210 (30) |
| Compressive Strength, 20 °C | MPa (psi x 10 ³) | 2068 (300) - 2600 (377) | 2500 | > 2 - 2.1 | — | 4000 (580) | 2500 (363) |
| Hardness, Knoop 1000 g | kg/mm ² | 11.5 (1175) - 14.1 (1440) | — | — | — | 1777 | 1300 |
| Fracture Toughness, K _{IC} notched beam | MPam ^{1/2} | 4-5 | 4-5 | 3.35 ± 0.2 | 6.5 - 7.5 | 6 | 13 |
| Thermal Conductivity, 20 °C | W/m K | 24.7 - 30 | 35 | 80 - 205 | 19 - 80 | 27 | 2.2 |
| Coefficient of Thermal Expansion, 25-1000 °C | 1 X 10 ⁻⁶ /°C | 8.2 | 8.0 | 3.3 - 5.6 | 3.0 - 3.7 | 8.3 | 10.3 |
| Thermal Shock Resistance, Δ T | °C | 250 - 200 | 200 | Excellent | — | 300 | — |
| Maximum Use Temperature, no load | °C | 1700 - 1750 | 1800 | 800 | 1150 - 1400 | 1500 | 1500 |
| Volume Resistivity, 25 °C | Ω-cm | > 10 ¹⁴ | > 10 ¹⁴ | 10 ¹¹ - 10 ¹⁴ | 10 ¹⁰ - 10 ¹² | > 10 ¹⁴ | > 10 ¹⁵ |

Custom Finishing & Assembly

CoorsTek provides a complete range of precision finishing options to make your technical ceramic component a functional part or assembly, including metallization, surface treatment, bonding, and specialized testing and packaging.

Ceramic Joining Technology

With ceramic joining technology, CoorsTek introduces even greater design freedom for alumina and zirconia designs with hollow cores or undercuts. Parts are combined using a proprietary process to form a monolithic product without a detectable interface layer, ensuring the join has the same strength and characteristics as the intrinsic ceramic.

Design Assistance

To ensure optimal product performance in your application, CoorsTek engineers offer expert assistance through each phase of the injection mold manufacturing process, from component design and material selection to prototyping and production validation.

General Design Guidelines

- Thin, uniform cross sections are most suitable.
- External tapers and undercuts are permissible; internal contours and undercuts are feasible.
- Flat surfaces are ideal for processing support, but virtually any shape can be accommodated.

Thermal Shock Resistance – Tests are run by quenching samples into water from various elevated temperatures. The change in temperature where a sharp decrease in flexural strength is observed is listed as DTC.

The chart is intended to illustrate typical properties. Property values vary with method of manufacture, size, and shape of part. Data contained herein is not to be construed as absolute and does not constitute a representation or warranty for which CoorsTek assumes legal responsibility.

About CoorsTek

With manufacturing operations in 50 locations across four continents, CoorsTek is the international partner of choice for companies requiring the unique, high-performance properties of engineered technical ceramics. For over 100 years, industry leaders have turned to CoorsTek for solutions to the world's most perplexing engineering and manufacturing challenges. We meet these challenges with unsurpassed expertise in materials engineering, broad research & development capabilities, operational excellence, and a commitment to building reliable, collaborative relationships.

Using over half the world's known elements in our 300+ proprietary ceramic formulations, CoorsTek manufactures complex, high-strength components for virtually every industry in the global marketplace. CoorsTek material offerings include aluminas, carbides, nitrides, quartz, silicates, yttrias, and zirconias. We also offer a broad selection of specialty materials to meet application-specific requirements. Combined with a vast range of manufacturing and finishing capabilities, immense manufacturing capacity, guaranteed quality, and localized service across the globe, CoorsTek delivers outstanding value with every product.

Contact a CoorsTek engineer today or visit coorstek.com to learn more.

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