CIM-Alumina-Zirconia

Ceramic Injection Molding Powders

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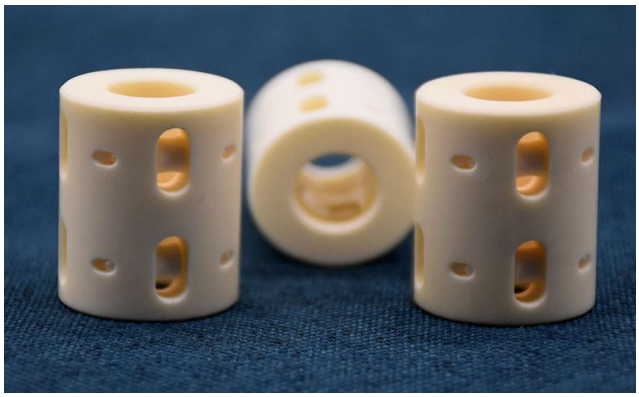
Technical Data: Alumina-Zirconia

Product Description

Alumina-Zirconia Ceramic Injection Molding (CIM) service is a cutting-edge manufacturing process that harnesses the exceptional properties of alumina-zirconia ceramic for diverse applications. Through the CIM process, powdered alumina is mixed with binders and injected into precision molds, where it undergoes controlled heating and sintering, resulting in intricate, high-precision CIM components.



CIM Alumina-Zirconia combines the strengths of both alumina and zirconia ceramics. This hybrid material exhibits enhanced toughness and wear resistance, making it suitable for applications requiring exceptional durability in challenging environments. The key features of CIM Alumina-Zirconia include its ability to withstand high mechanical stresses, resist wear and abrasion, and maintain its integrity under extreme temperatures. Primary applications of CIM Alumina-Zirconia span across diverse industries. It finds use in joint replacements and orthopedic implants in the medical field, benefiting from its mechanical strength and biocompatibility. Additionally, in industrial settings, CIM Alumina-Zirconia excels as wear-resistant components, such as pump parts, valves, and cutting tools, due to its ability to withstand harsh conditions and maintain precision even under heavy usage.

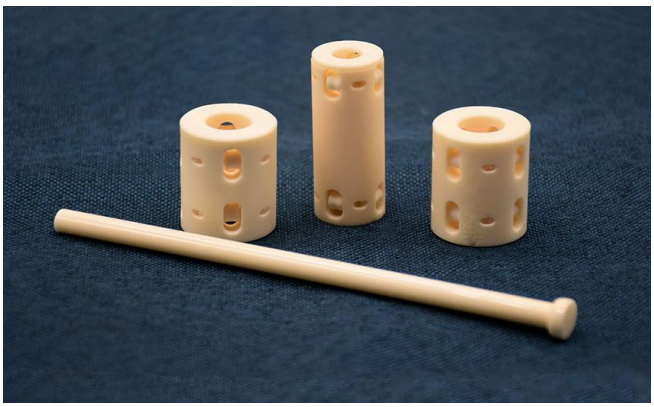
Physical and Mechanical

Properties	Fracture Toughness	Flexural Strength	Impact Strength	Hardness	Young's Modulus	Elastic Modulus	Thermal Expansion	Compressive Strength	Density
	(MPa√m)	Mpa	(J/m)	(HRA)	(GPa)	(GPa)	(10^-6/°C)	(MPa)	g/cm³
CIM Alumina-Zirconia	8.5	500	5	82	250	280	9	1800	4.2

Typical Properties

Fracture Toughness

The Fracture Toughness of CIM-Alumina-Zirconia parts is a remarkable 8.5 MPa√m. This value reflects their exceptional resistance to crack propagation and fractures, making them ideal for applications subjected to mechanical stresses and impacts. The combination of alumina and zirconia in the material composition contributes to this high fracture toughness, providing the parts with the ability to withstand and dissipate energy from sudden forces or impacts. The microstructure of CIM-Alumina-Zirconia also plays a role, with a well-controlled microstructure enhancing fracture resistance.



In the aerospace industry, components like turbine blades and structural elements require materials that can withstand the rigors of flight, including vibrations, rapid temperature changes, and potential impacts. Similarly, the automotive sector relies on these properties for engine components and safety systems, such as airbag deployment mechanisms. CIM-Alumina-Zirconia parts also find use in medical implants and prosthetics, where the ability to endure impacts and mechanical stresses ensures the longevity and reliability of the implants.

Note

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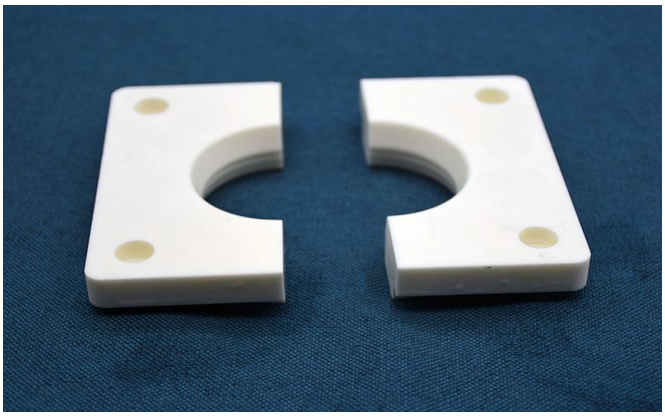
Typical Properties

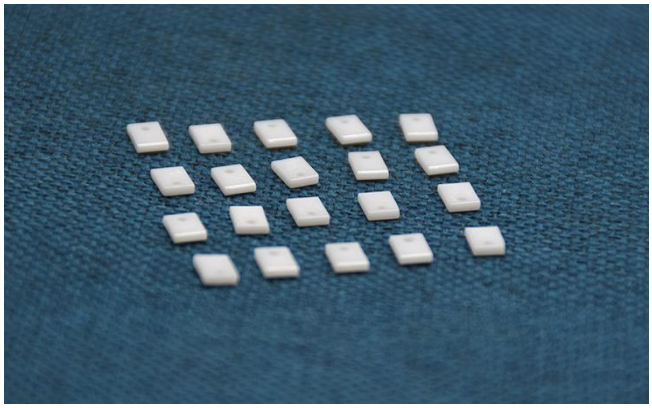
Flexural Strength

The Flexural Strength of CIM-Alumina-Zirconia parts is an impressive 900 MPa, reflecting their ability to withstand bending forces and resist deformation under applied loads. This remarkable flexural strength results from the synergistic properties of alumina and zirconia, which work together to create a material with exceptional mechanical stability.



Alumina-Zirconia CIM parts find crucial applications in industries that demand outstanding Flexural Strength Properties. In the manufacturing sector, these parts are utilized in cutting tools and machining components that endure significant mechanical forces during high-speed operations. In aerospace and defense, alumina-zirconia components excel as structural elements due to their ability to withstand variations in temperature and mechanical stresses. Moreover, these parts contribute to the construction of medical equipment and devices, such as surgical tools and implants, where maintaining shape and function under pressure is essential.

Impact Strength

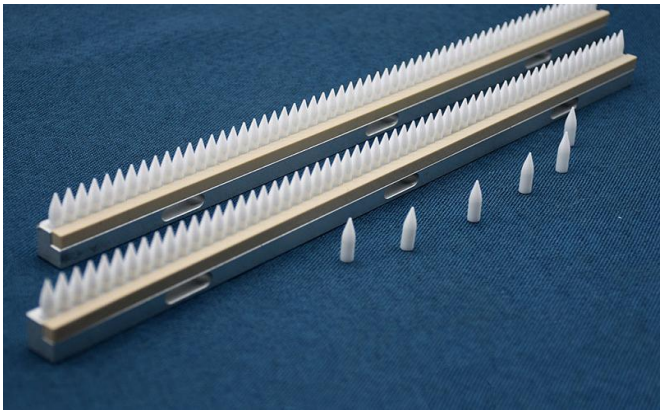


The Impact Resistance of CIM-Alumina-Zirconia parts is crucial, allowing them to withstand sudden shocks and impacts without fracturing. This property results from the combination of alumina and zirconia, which contribute to the material's toughness and ability to absorb energy.

Alumina-Zirconia CIM parts find applications in industries where impact resistance is paramount. In the automotive sector, these parts contribute to safety systems, such as airbag deployment mechanisms, where the ability to absorb impact energy is critical. Additionally, in industrial machinery and equipment, alumina-zirconia components are used in components subjected to vibrations and mechanical shocks, ensuring that the parts can endure harsh operating conditions while maintaining their structural integrity.

Hardness

The hardness of CIM-Alumina-Zirconia parts is 9 Mohs. This means it is more complex than most metals but softer than some gemstones. The hardness of a material is its resistance to scratching or indentation. CIM-Alumina-Zirconia parts are complex because they have a solid atomic structure. The atoms in the material are tightly packed, making it difficult to be displaced.



The hardness of CIM-Alumina-Zirconia parts makes them ideal for applications where they will be exposed to wear and abrasion. These applications include Bearings, Seals, Cutting tools, Jewelry, and Medical implants. Applications that require Hardness Properties of Alumina-Zirconia CIM parts: Wear-resistant parts: Alumina-zirconia CIM parts are resistant to wear and abrasion, making them ideal for applications where they will be exposed to these conditions. For example, they can be used in bearings and seals.

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