



1MG.008 Ceramic Substrates

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Alumina

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Final Advanced Materials supplies a wide variety of substrates: alumina, zirconia, and aluminium nitride. All our substrates are produced by laser cutting. It is possible to order plates in standard dimensions, or for parts to be cut to a customized design, whether for a prototype or for series production.

Final Advanced Materials has machining facilities which guarantee ISO 9001-certified quality. Our tooling and our expertise permit the production of the most complex components from your plans.

Facilities:

- Laser machines with appropriate cutting heads for different materials.
- Automated laser machines with video-based dimensional control systems.
- Programming facility for all commonly employed data formats (dxf, dwg, iges, cadl, stl, etc.).

Available materials:

- 99 % porous alumina Al_2O_3
- 96 and 99.6 % high-density alumina Al_2O_3
- Zirconia ZrO_2
- Aluminium nitride AlN

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Applications

- Sintering equipment
- Oven construction elements
- Medical technology
- Electronic sensors
- Catalyser
- Filtration of liquids

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Benefits

- Hardness
- High mechanical strength
- Dimensional stability, even at high temperatures
- High resistance to wear and corrosion
- Electrically insulating
- Resistance to chemical products
- High-temperature withstand
- Dielectric and ferro-electric properties
- Very low adherence
- Exceptional flatness
- Low thermal conduction

Comparative Table

Property	Ceramic	Metal	Polymer
Hardness	High	Low	Bad
Elastic Modulus	High	Good	Low
Resistance to High Temperature	High	Low	Bad
Thermal Expansion	Low	Good	Good
Malleability	Low	Good	Good
Corrosion Resistance	Good	Low	Low
Erosion Resistance	Good	Low	Low
Electrical Conductivity	Low	Good	Low
Density	Average	High	Low
Thermal Conductivity	Average	Good	Low

Products

Alumina

Alumina substrates are highly rated for their good chemical and mechanical resistance. They can be employed for the construction of furnaces, in medical technologies, in electronic sensors, in catalysers, in SOFC fuel cells and for the filtration of liquids.

Two types of alumina substrates are available:

Sintered High-Density Alumina

This substrate is available in the form of two products, the alumina content of which varies between 96 and 99.6 %. Whichever the product, these materials are distinguished by their high resistance to corrosion and abrasion. Moreover, they show good mechanical



strength, and can be employed as electrical insulators. They show very low adherence and, by nature, feature exceptional flatness. Finally, alumina substrates show good thermal conduction.

High-density alumina substrates are available in various thicknesses (0.15 – 0.25 – 0.38 – 0.5 – 0.76 – 1 – 1.27 – 1.52 – 2 mm) and in dimensions ranging from 50.8 x 50.8 mm to 168 x 168 mm.

Property	Unit	High Density Alumina	
Item N°		003-0200	003-0100
Alumina %	%	99.7	96
Colour		white	white
Density	g/cm ³	3.88	3.78
Max. Surface Roughness Rmax	µm	3	4
Average Surface Roughness Ra	µm	0.2	0.5
Flexural Strength	Mpa	500	400
Thermal Conductibility	W.m ⁻¹ .K ⁻¹	25	24
Dielectric Strength	kV/mm	> 10	> 10
Resistivity	Ω.m	10 ⁸	10 ⁶

Sintered Porous Alumina

A porous alumina substrate has mechanical, electrical and chemical properties which are similar to those of high density alumina. However, this product is distinguished by its lightness. Its porosity makes it a material of choice for the filtration of gases and liquids, and for the homogeneous diffusion of a fluid.

Porous alumina substrates are available in various thicknesses (1 – 1.5 - 2 mm) and in dimensions ranging from 100 x 100 mm to 168 x 168 mm.

Property	Unit	Porous Alumina
Item N°		237-0100
Alumina %	%	99
Porosity	%	40
Colour		white
Density	g/cm ³	2.56
Max. Surface Roughness Rmax	µm	12
Average Surface Roughness Ra	µm	0.7
Flexural Strength	MPa	~ 60

Aluminium Nitride

An aluminium nitride substrate is a semiconductor with a wide band gap (6.2 eV). This refractory and electrically insulating material has a very high thermal conductivity and shows good resistance to oxidation and abrasion.

**Ceramic Substrates**

Porous alumina substrates are available in various thicknesses (from 0.5 to 1.5 mm) and in dimensions of up to 138 x 190.5 mm.

Property		Unit	Aluminium Nitrid
Item N°			003-0300
Colour		/	grey
Density		g/cm ³	3.33
Max. Surface Roughness Rmax		µm	0.6
Grain Size		µm	4~6
Water Absorption		%	0
Elasticity Modulus (Young)		GPa	320
Flexural Strength		Mpa	360
Thermal Conductivity		W.m ⁻¹ .K ⁻¹	180
Specific Warmth		J.kg ⁻¹ .K ⁻¹	738
Thermal Expansion Coefficient	from 20 to 300 °C	10 ⁻⁶ .K ⁻¹	4.7
	from 20 to 600 °C		5.2
	from 20 to 1,000 °C		5.6
Electric Resistivity at 20 °C		Ω.m	10 ¹⁵
Dielectric Strength (thickness 1 mm)		kV/mm	16

Zirconium

ZYTC substrates are thin, rigid, tape cast structures composed of zirconia stabilized with yttria at targeted stabilization concentrations. ZYTC is our thinnest zirconia material and is ideally suited as a setter for sintering microelectronics, solid oxide fuel cells and thermal management applications under conditions of high temperatures and in varied atmospheres. ZYTC has been high fired and is tightly bonded resulting in a dust free, smooth gas tight surface. ZYTC is dimensionally stable to 1,500 °C. It has exceptional resistance to oxidizing and reducing atmospheres at high temperatures. Zirconia does, however, lose a small amount of oxygen at very high temperatures in vacuum and inert or reducing atmospheres. Although this reaction results in a colour change from white to grey, other properties remain essentially unchanged.

Property		Unit	Zirconium
Item N°			225-0651
Colour		/	white
Density		g/cm ³	5,85
Max. Surface Roughness Rmax	upper side	µm	7
	lower side		2
Average Surface Roughness Ra	upper side	µm	0.8
	lower side	µm	0.2
Flexural Strength (thickness 500 µm)		Mpa	> 1,000
Thermal Conductibility		W.m ⁻¹ .K ⁻¹	1.7
Dielectric Strength		kV/mm	> 30
Electrical Resistivity		Ω.m	10 ¹⁵
Thermal Expansion Coefficient from 20 to 600 °C		10 ⁻⁶ .K ⁻¹	10.5



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