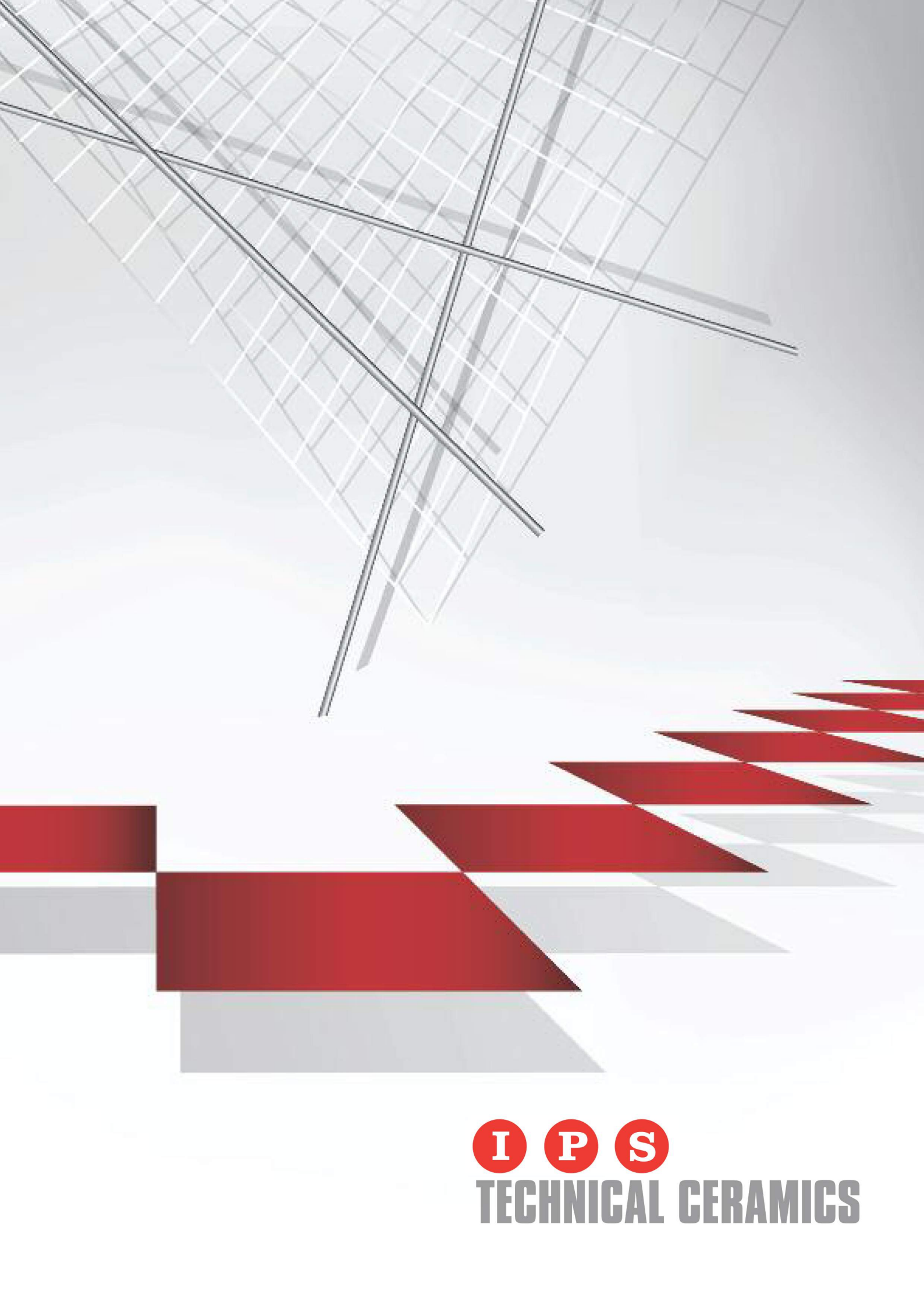


IPS

TECHNICAL CERAMICS

IPS TECHNICAL CERAMICS

Technical ceramics are fast becoming the essential enabler for our modern, high performance lifestyle. Their impressive combination of properties has seen them replace metals in key areas for high-tech consumer products, demanding engineering applications and in process equipment for aggressive conditions.

Technical ceramics offer many advantages over alternative materials, not least their excellent performance at elevated temperatures and high mechanical strengths. They are resistant to abrasion, corrosion and chemical attack, giving increased durability in extreme conditions. Compared to metals, technical ceramics are lightweight and electrically and thermally insulating.

IPS Ceramics is a relatively new company but one with a long history in this industry. Established in its present form in 2009, it evolved from the merger of several leading manufacturers of high temperature ceramics, all bringing a bank of expertise stretching back over 60 years.

Today's IPS team collectively boasts over 200 years of experience in ceramic technology, including design, material selection/specification and manufacturing. We can rapidly and expertly evaluate possible technical ceramic solutions for your specific application or a whole host of manufacturing, engineering and laboratory demands.

IPS collaborates with other quality manufacturers in both Europe and Asia to offer flexibility in production. Our technical ceramics are formed in a variety of ways, typically by extrusion, injection moulding, casting or pressing, so that components can be designed from the start to meet your specific needs.

The main technical ceramics in our range are high alumina, silicon carbide and steatite; however, recent additions include aluminium nitride and TZP-zirconia, and we can source most technical ceramic materials if you have a particular requirement. IPS Ceramics is also very well known around the world as a major supplier of kiln furniture systems based on mullite-cordierite materials.

IPS CERAMICS

Our high purity alumina materials are fired to over 1600°C (2900°F) to give fully dense ceramics that exhibit high mechanical strength and stiffness and are often used as a replacement for metallic components. High hardness makes alumina ideal for the manufacture of wear-resistant products.

Thermal stability is another strong feature – these ceramics can be used in both oxidizing and reducing atmospheres up to 1600°C (2900°F) and in vacuum furnaces up to 2000°C (3600°F). Alumina is also widely used as an electrically insulating material, particularly the higher purity grades which have enhanced resistivity.

Additionally, high purity alumina is ideal for applications where resistance to corrosive substances is required. It offers good resistance to strong acids and alkalis at elevated temperatures. The all-round strong performance of alumina has long been proven in a number of demanding applications including the automotive, aerospace, defence, medical, electrical and heat treatment industries.

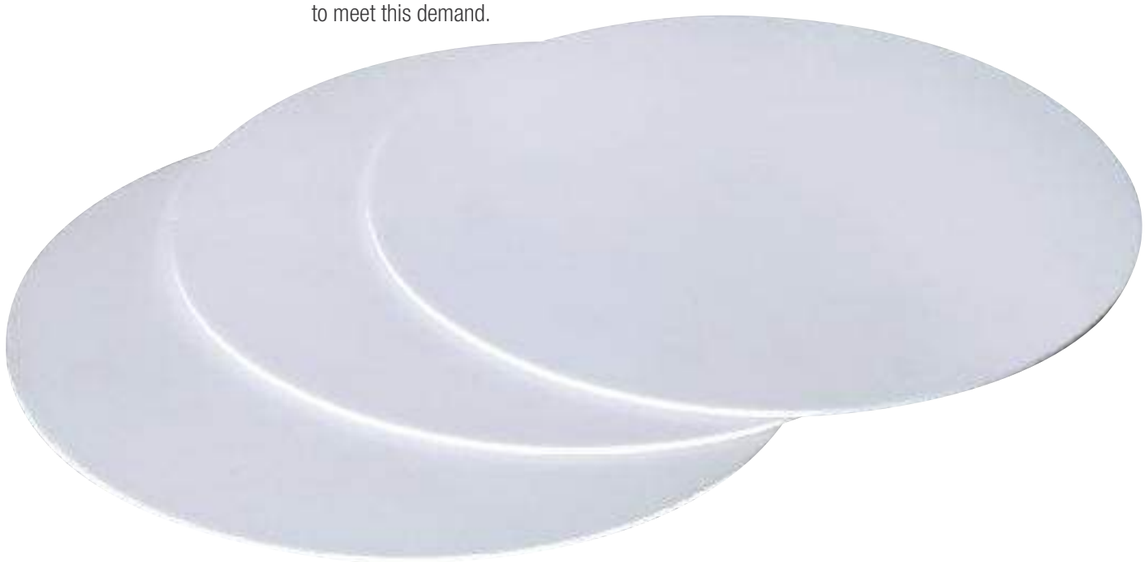
This is a highly flexible material when it comes to product development and we are constantly working with design engineers and system manufacturers to come up with new applications. These components can be threaded, perforated, rebated, slotted, hollowed or tapered to suit thousands of design and performance demands. Complex shapes are often achievable.

HIGH PURITY ALUMINA

IPS CERAMICS

Our IPSAL range of premium quality high purity alumina is offered in various grades right up to 99.7% alumina content. These products can be glazed or unglazed and they also lend themselves to other surface treatments where required, such as precision grinding and lapping.

It is also relatively simple to alter the characteristics of the ceramic body to achieve, for instance, coloured products. These are required in a number of important industries and IPS continues to meet this demand.



HIGH PURITY ALUMINA

IPS CERAMICS

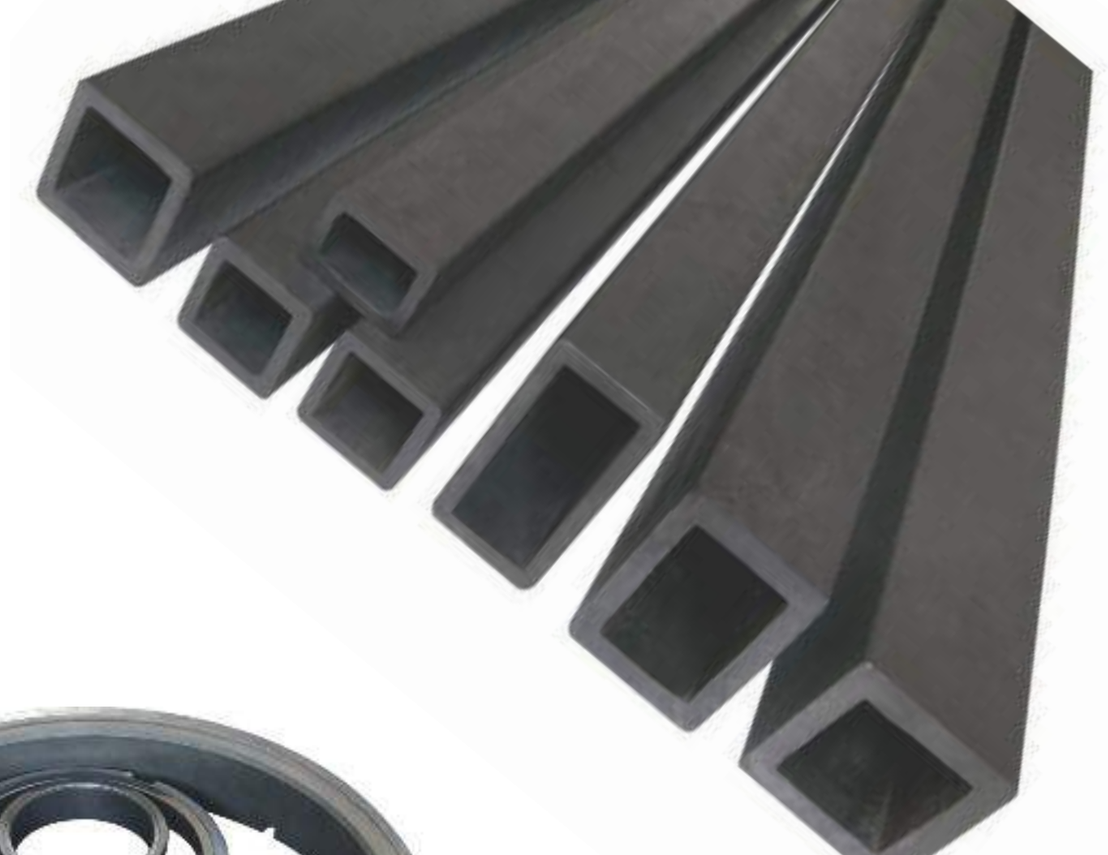
	Max use Temperature	Density	Open Porosity	Bending Strength	Modulus of Elasticity	Thermal Conductivity	Coefficient of Thermal Expansion	Volume Resistance	Dielectric Constant	Dielectric Strength
	°C / °F	g/cm^3	%	MPa	GPa	W/mK	10^{-6} /K	(Ω.cm)	–	(kV/mm)
Alumina 92%	1400 / 2550	3.6	<0.5	150	300	20	7.0	$>10^{14}$	8	10
Alumina 95%	1450 / 2650	3.7	<0.5	175	300	25	8.0	$>10^{14}$	9	20
Alumina 99%	1600 / 2900	3.8	<0.5	200	300	25	8.0	$>10^{14}$	10	30

IPS Ceramics offers all the principal types of silicon carbide, a long lasting, rugged, dependable performer in many challenging environments. Our products are made to tight dimensional tolerances and have excellent load-bearing ability at higher temperatures (SiC is often the first choice for applications in the range 1300°C/2400°F to 1650ºC/3000ºF).

Silicon carbide components provide outstanding thermal shock resistance but unlike traditional ceramics they also combine low density with high mechanical strength. Additionally, these products offer extreme hardness/abrasion resistance and outstanding chemical stability in aggressive environments.

SILICON CARBIDE

IPS CERAMICS



The growing range of IPS silicon carbide components offers the industrial engineer high level performance in a number of crucial areas and is a fine example of the dynamic ability of ceramics to come up with solutions in new areas of manufacture and processing.

The latest addition to our silicon carbide family is the sintered variety (SSiC) which exhibits extremely good thermal conductivity while at the same time offering low thermal expansion characteristics. A very high degree of polishing is obtainable with SSiC and this makes it an impressive performer in terms of sliding/friction and in any application where an ultra-hard and super wear resistant surface is required.

This is a material which is increasingly finding a place in very many industrial and R&D applications and we see only an enhanced role for this ceramic in the future.

	Max use Temperature	Density	Open Porosity	Bending Strength	Modulus of Elasticity	Thermal Conductivity	Coefficient of Thermal Expansion
	°C / °F	g/cm^3	%	MPa	GPa	W/mK	10^{-6} /K
SiSiC (RBSiC)	1380 / 2500	3.1	<0.5	250	325	45	4.5
NBSiC	1450 / 2650	2.8	<1.0	160	200	15	5.0
ReSiC	1650 / 3000	2.7	15	90	250	25	4.8
Sintered SiC	1600 / 2900	3.1	<0.5	400	425	70	4.1

SILICON CARBIDE

IPS CERAMICS

Steatite is used extensively in the electrical and electronic industries. High grade steatite ceramics are low-loss materials which exhibit excellent dielectric and mechanical properties. Wherever good electrical insulation is required, including high voltages and at elevated temperatures (up to 1200ºC/2200ºF) then steatite should be considered.

Steatite's low contraction on firing allows us to produce components to precise tolerances. It is sintered at 1350°C (2450°F) resulting in excellent strength and density. Good wear and corrosion resistance are also features.

Both small and highly detailed shapes can be achieved while cost efficient production techniques make this a good material for volume manufactured components. As with the alumina ranges, steatite parts can be supplied either glazed or unglazed.

	Max use Temperature	Density	Open Porosity	Bending Strength	Modulus of Elasticity	Thermal Conductivity	Coefficient of Thermal Expansion	Volume Resistance	Dielectric Constant	Dielectric Strength
	°C / °F	g/cm^3	%	MPa	GPa	W/mK	10^{-6} /K	(Ω.cm)	–	(kV/mm)
Steatite	1200 / 2200	2.8	<0.5	140	100	2.5	8.0	10^{12}	6	20

STEATITE

IPS CERAMICS

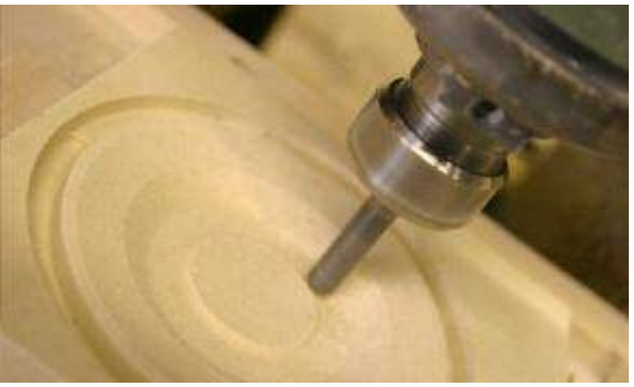
Aluminium nitride is a specialist material for the most demanding applications. It has the highest thermal conductivity of any ceramic material, on a par with most metals. However, it also provides electrical insulation. This makes it the 'top-of-the-range' choice for the most demanding of heat-sink applications.

It is stable up to 1000ºC (1800°F) in air and 1900ºC (3450°F) in inert atmospheres. It also offers good corrosion resistance. The thermal expansion coefficient of aluminium nitride is lower than that of common heat-sink materials such as aluminium and alumina. The thermal expansion coefficient is a close match to the expansion of common semiconductor substrate materials, making it ideal for the mounting of large semiconductor devices.

Aluminium nitride is the very best ceramic commercially available for heat-sink applications. It is often used in microelectronics, lighting, power, optics and the ever growing field of renewable energy.

	Max use Temperature	Density	Open Porosity	Bending Strength	Modulus of Elasticity	Thermal Conductivity	Coefficient of Thermal Expansion
	°C / °F	g/cm^3	%	MPa	GPa	W/mK	10^{-6} /K
Aluminium Nitride	1000 / 1800	2.9	<0.5	300	175	90	5.0

ALUMINIUM NITRIDE

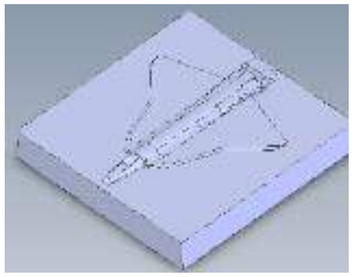


n addition to finished components, IPS Ceramics offers a custom specification, design and rapid prototyping service. Our design and technical staff have many years' experience in product development and we offer this contract service to a wide range of industries.

Sometimes this involves complex systems; alternatively we can assist with just a single component. Increasingly, user industries don't have these facilities in-house and our service provides a convenient solution.

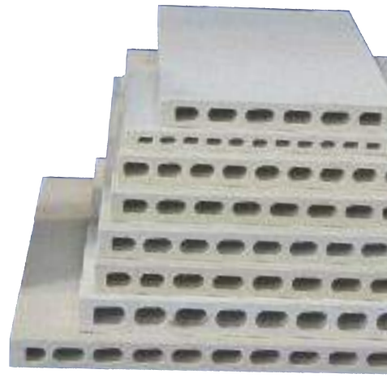
Our rapid prototyping service is unique in offering a product that can be fired repeatedly to temperatures up to 1300°C (2350°F). We can start with either your own CAD or SolidWorks design files, or with a bespoke design by our in-house team. We process the design to allow our precision CNC machining centre to cut your component from a blank made from our specially developed lightweight refractory ceramic material.

Our ceramic material has been pre-fired to ensure your machined component is dimensionally stable, and exhibits a low coefficient of thermal expansion to minimise size changes in use. Blanks are available from stock up to a size of 500mm x 500mm x 70mm (20in x 20in x 2.8in) allowing quite large prototypes to be machined.



CERAMIC DESIGN & PROTOTYPING

IPS CERAMICS



As well as being a leading supplier of technical ceramics, IPS Ceramics is also very well known around the world as a major supplier of kiln furniture systems based on mullite-cordierite materials. These refractories have extremely high thermal shock resistance and are load-bearing up to 1350ºC (2450°F).

Our range covers support systems – for firing and glazing pottery and sanitaryware, supports for sintering powdered metal components, technical ceramics and ferrites – through to complete kiln car superstructures, shapes for kiln and furnace construction and other specialised products.

Our manufacturing facility – IPS-Trend – produces one of the widest ranges of such products in the world. In response to increased demand in this area a new tunnel kiln and four new presses have just been installed.

For more details on this range of IPS products please contact us and ask for the IPS-Trend catalogue.

CORDIERITE

IPS Ceramics Ltd
www.ipsceramics.com

Head Office
Shelton New Road, Hartshill, Stoke-on-Trent,
Staffordshire, ST4 6EP, England.
T +44 1782 711511
enq@ipsceramics.com

Asia Office – Beijing, China
T +86 186 1039 6678
asia@ipsceramics.com

Europe Office – Rotterdam, Netherlands
T +31 611 421 049
europe@ipsceramics.com

IPS
TECHNICAL CERAMICS