Glass and Ceramics for Science and Industry

SHAPAL™ Hi-M SOFT
MACHINABLE ALUMINIUM NITRIDE CERAMIC

Ceramic materials are distinguished from metals and polymers by their unique characteristics. Unfortunately, two of these characteristics, brittleness and hardness, make them difficult to machine and this can limit their applications.

Grades of ceramic have been developed which can be machined, but they are not suitable for all engineering applications due to their low flexural strength. *SHAPAL™Hi-M soft* was developed by Tokuyama Corporation to specifically address these issues and is a machinable ceramic which offers both high mechanical strength and thermal conductivity.

SHAPAL™Hi-M soft is based upon the first translucent aluminium nitride developed by Tokuyama Soda Co. Ltd. and is a composite sintered body of AlN and BN. This material has unique characteristics which make it suitable for a wide range of applications. Goodfellow Ceramic and Glass Division are able to offer *SHAPAL™Hi-M soft* as rods, sheets and finished components.

Characteristics of *SHAPALTM-M soft*

> Excellent machinability
High precision, close tolerance components can be machined from *SHAPAL™Hi-M soft* using a wide range of techniques including drilling, grinding, turning and milling.

> High Thermal Conductivity
The thermal conductivity of *SHAPAL™Hi-M soft* is approximately 5x that of alumina.

> High Mechanical Strength
SHAPAL™Hi-M soft has a flexural strength of 30kg/mm2 which is comparable to that of alumina



In addition to the above mechanical properties, *SHAPAL™Hi-M soft* offers the following:

> Excellent electrical insulation
> Low thermal expansion
> Low dielectric loss
> Excellent high temperature properties
> Suitability for vacuum applications

Typical Applications:

	Prototyping & small volume production	Vacuum components
	Electrical components	Jigs & Fixtures
	Heat sinks	Crucibles for vacum applications

For more information and advice please discuss your application with our sales staff.

SHAPAL™Hi-M soft is a trademark of Tokuyama Corp.

→ www.goodfellow-ceramics.com → ceramic@goodfellow.com

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USA
Goodfellow Corporation
Tel: +1 800 821 2870
Fax: +1 800 283 2020

France
Goodfellow SARL
Tel: 0800 917 241 (n° vert)
or +44 1480 424813
Fax: 0800 917 313 (n° vert)
or +44 1480 424900

Germany
Goodfellow GmbH
Tel: 0800 1000 579 (freecall)
or +44 1480 424810
Fax: 0800 1000 580 (freecall)
or +44 1480 424900

People's Republic of China
Goodfellow Shanghai Office
Tel: +86 21 6112 1560
Fax: +86 21 6130 4901

UK and all other countries
Goodfellow Cambridge Ltd
Tel: 0800 151 3115 (Freephone)
or +44 (0)1480 424888
Fax: 0800 151 3225 (Freephone)
or +44 (0)1480 424988

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SHAPAL™ Hi-M SOFT - PROPERTIES
MACHINABLE ALUMINIUM NITRIDE CERAMIC

Property/Test Conditions	Shapal™ Hi-M soft	Units
GENERAL		
Density Corrected to 4°C	**2.88**	g/cm³
Porosity 25°C	**0**	%
ELECTRICAL		
Volume Resistivity 25°C, DC	**1.0×10^{15}**	Ωcm
Dissipation Factor (tan δ) 25°C, 1MHz	**10×10^{-4}**	
Dielectric Constant (ε) 25°C, 1MHz	**6.8**	
Dielectric Strength	**65**	kV/mm
THERMAL		
Thermal Expansion Coefficient RT~400°C	**4.8×10^{-6}**	/°C
Thermal Expansion Coefficient RT~600°C	**4.9×10^{-6}**	/°C
Thermal Expansion Coefficient RT~800°C	**5.0×10^{-6}**	/°C
Thermal Conductivity 25°C	**92**	W/mK
Maximum Use Temp. (in air)	**1000**	°C
Maximum Use Temp (in non-oxidizing atmosphere)	**1900**	°C
Thermal Shock Resistance Δt water quench	**400**	°C
MECHANICAL		
Bending Strength 25°C	**300**	MPa
Compressive Strength 25°C	**100**	kg/mm²
Young's Modulus 25°C	**1.8×10^{4}**	kg/mm²
Poisson's Ratio 25°C	**0.31**	
Vickers Hardness (Hv) 25°C, 300g	**380**	kg/mm²
CHEMICAL DURABILITY		
Resistance to Acid 10%HCl 24Hrs, 25°C	**0.2**	mg/cm² wt loss
Resistance to Base 10%NaOH 24Hrs, 25°C	**60**	mg/cm² wt loss

IMPURITIES	C	300ppm	Ca	1300ppm	Cr	1ppm
	Mg	1ppm	Ni	2ppm	Fe	8ppm
	Si	40ppm	O	0.9%	Ti	<20ppm

Properties shown are typical values, they are not absolute material properties, and should be used for guidance only. It is recommended that materials and components are tested for their suitability for a specific application.

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