

### High performance + economic price = Combat Grade A.

Suggested for all but the most severe refractory and electrical applications, Combat Solid Boron Nitride Grade A is a high-performance material best used in a dry or inert environment to prevent hydration. Among its many advantages, Grade A's glassy B<sub>2</sub>O<sub>3</sub> binder creates a hard and dense yet fully machinable product, allowing for enormous customization and applicable use.

**CHEMICALLY:** Excellent resistance to most corrosive agents. Further, metals will not wet or adhere to it, permitting easy cleaning of deposited metals.

**THERMALLY:** Outstanding thermal shock resistance—the combination of thermal conductivity and low thermal expansion combine to provide long life service where severe thermal cycling is common. Grade A also provides excellent thermal conductivity—allowing the dissipation of localized hot spots, prolonging the life of components in the most severe areas.

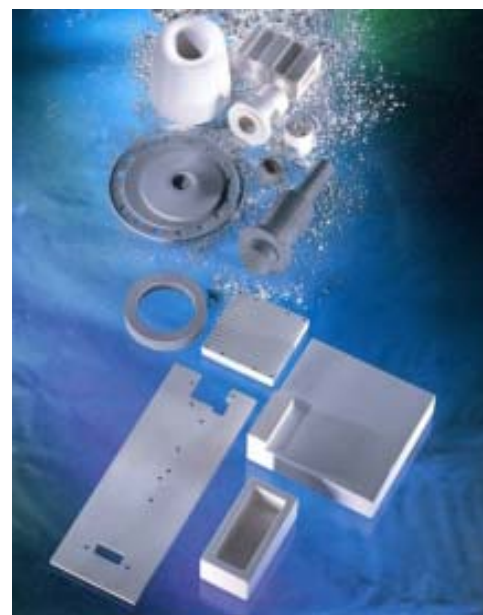
**ELECTRICALLY:** Low dielectric constant material.

**MACHINABILITY:** Like other grades of Combat Boron Nitride, Grade HP can be machined using standard high speed “tool steel” equipment. Machining by grinding may be used if preferred or stringent tolerances are required.

#### Typical Properties of Combat Solid Boron Nitride Grade A

Binder:	Boric Acid
Binder Melting Point:	550°C
<b>Maximum Use Temperature:</b>	
Oxidizing vs. Inert:	850°C(1800°C)
Specific Heat @ 700°C (J/g°C):	1.610
Dielectric Strength (V/mil):	2400
Hardness-Knoop (kg/mm <sup>2</sup> ):	15.51- 24.19
<b>Pressing Direction:</b>	<b>Para (Perp)</b>
Resistivity Ohm-cm RT:	>10 <sup>14</sup> (>10 <sup>15</sup> )
Loss Tangent @ 8.8 GHz:	.0017 (.0005)
Dielectric Constant @ RT:	4.58 (4.15)
<b>Thermal Conductivity</b>	
(W/m/K) @ 25°C:	30.13 (33.71)
<b>Thermal Expansion Coefficient</b>	
(RT to 1500°C) (in/in/°C x 10 <sup>-6</sup> ):	11.85 (3.12)
<b>Flexural Strength (psi)*</b>	
@ 25°C :	11000 (16400)
@ 1500°C:	900 (1380)
<b>Compressive Strength</b>	
@ 25°C:	20780 (27060)
Density (g/cc minimum):	2.00
% Open Porosity:	2.84%
Oxygen – max.:	4.0%
B <sub>2</sub> O <sub>3</sub> – max.:	4.5%
Calcium – max.:	0.1%
Other Impurities – max.:	0.2%

\*Based on 4-pt bend test—Sample size = 51mm x 4mm x 3mm.



### Applications:

Some common applications are listed below:



High temperature electrical insulators and vacuum furnace supports which require electrical resistivity, high temperature strength, thermal shock resistance and low chemical reactivity.



Crucibles and containers for high purity molten metals



Insulators and source fixtures for ion implantation systems which require high temperature purity and electrical insulation.



Radar components and antenna windows which require exacting electrical and thermal properties.

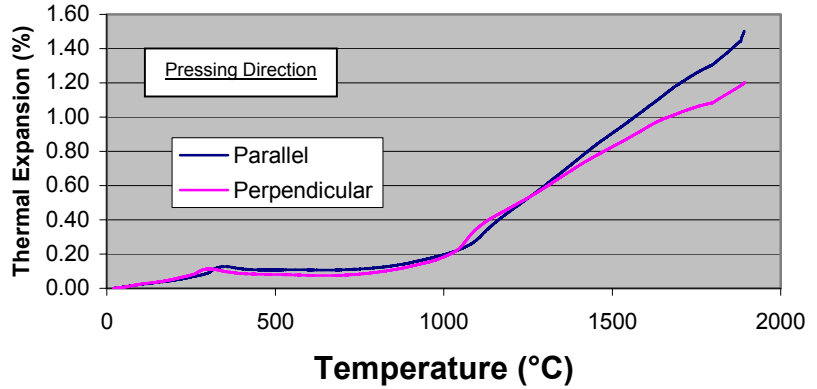


Setterplates for the processing of other advanced materials which require stable, inert surfaces.



Nozzles for powdered metal spraying.

### Combat Solid Boron Nitride Grade A Thermal Expansion as Function of Pressing Direction



#### Available as Finished Parts or Machinable Blanks

Saint-Gobain Ceramics can provide custom machining of Combat Solid Boron Nitride for complex shapes based on customer specifications. Solid bars, rods and plates are also available for customers who desire to fabricate their own custom shapes using conventional machine shop tools.

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