



SAINT-GOBAIN BORON NITRIDE

POWDER SOLUTIONS



SAINT-GOBAIN BORON NITRIDE POWDER SOLUTIONS

Functional Fillers & Additives to Enable High Performance Solutions in Demanding Applications

Saint-Gobain Boron Nitride Powder Solutions merge the key properties of hexagonal boron nitride (hBN) and over 60 years of manufacturing expertise to offer a complete portfolio of hBN powders.

With a variety of engineered particle shapes and sizes available, Saint-Gobain Boron Nitride Powder Solutions enable our customers to maximize the benefits of boron nitride in a wide array of markets and applications.

OUR PARTICLE OFFERING

PLATELET PARTICLES

Average diameter from **1 to 30 μm**



Due to its lamellar crystal structure, the simplest form of hBN particles are platelets. Three classes of platelet powders are included in the Saint-Gobain Boron Nitride Powder Solutions portfolio to provide a balance of form and function.

Platelets provide the best value for:

- › High shear mixing operations
- › Lubrication enhancement
- › Applications that require fine particles

ENGINEERED AGGLOMERATES

Average particle sizes from **35 to 350 μm**



In many cases, the high aspect ratio and surface area of BN platelets can pose processing challenges. Saint-Gobain Boron Nitride Powder Solutions offers a range of engineered agglomerated powders with varied size, shape and density to maximize value.

Benefits include:

- › More isotropic thermal properties
- › Improved flowability for easy handling
- › Enhanced particle packing

Thermal Conductivity

30 / 300
thru-plane in-plane
W/mK

Dielectric Strength

80
kV/mm

Dielectric Constant

4

Coefficient of Friction

< 0.3

Mohs Hardness

1.5

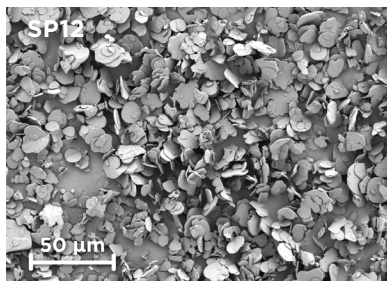


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Powder Class Descriptions

Powder Class

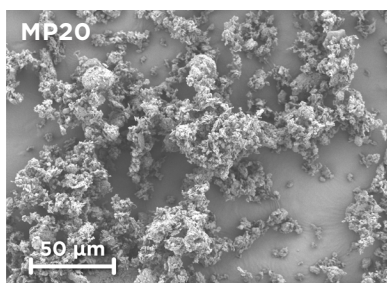
Applications



Standard Platelets

Standard Platelets powders are high purity single crystals of BN with no agglomeration and tight size distribution around the D50.

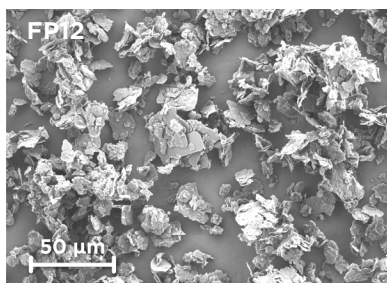
- › Dielectric thermal filler
- › Potting compound
- › Polymer processing aid
- › Lubricant additive
- › Mold release
- › Nucleation aid
- › Cosmetic formulations



Modified Platelets

MP20 and MP50 are made of submicron BN crystals with different oxygen levels. MP05 is a higher density, slightly agglomerated particle of high purity platelets.

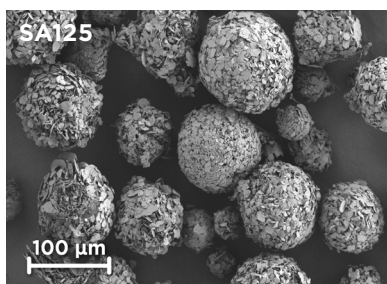
- › Powder metal additive
- › Polymer processing aid
- › Lubricant additive



Flowable Platelets

Free-flowing, loosely agglomerated powder. Well suited for cost sensitive, high volume thermal filler applications, like thermally conductive thermoplastics.

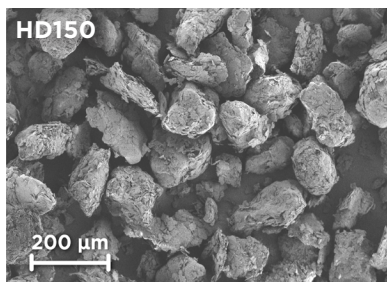
- › Dielectric thermal filler
- › Thermoplastic filler



Spherical Agglomerates

Agglomerate powders with tight size distributions and spherical morphology for excellent packing and flowability. Provides higher through-plane thermal conductivity than platelet powders.

- › High performance dielectric thermal filler
- › Potting compound filler
- › Thermal spray powder feed



High Density Agglomerates

Tightly packed platelets in strong, blocky-shaped agglomerates. Best thermal filler option when high through-plane thermal conductivity is needed.

- › High performance dielectric thermal filler
- › Potting compound filler
- › Thermal spray powder feed

**Typical Powder Properties**

d10 μm	d50 μm	d90 μm	Tap Density g/cm ³	Surface Area m ² /g	BN Content %	B ₂ O ₃ %	O ₂ %
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Standard Platelets

SP1	0.3	1.2	3.5	0.20	18	98.2	0.15	1.7
SP2	0.6	2.2	4.2	0.20	12	98.6	0.06	1.3
SP5	3.3	5.5	10	0.30	9.0	99.3	0.10	0.6
SP6	3.9	6.5	12	0.45	8.0	99.6	0.04	0.4
SP8	4.2	8.5	19	0.45	2.8	99.3	0.02	0.7
SP12	6.0	12	23	0.50	1.8	99.3	0.02	0.7
SP16	7.4	16	29	0.50	1.6	99.4	0.02	0.6
SP30	14	30	50	0.55	1.1	99.7	0.02	0.3

Modified Platelets

MP50	0.6	3.3	20	0.60	40	95.0	0.90	4.8
MP20	1.0	5.4	20	0.55	40	98.0	0.40	1.7
MP05	4.4	10	20	0.65	15	99.2	0.30	0.7

Flowable Platelets

FP12	100.0	400	800	0.75	14	99.3	0.07	0.6
FP30	100.0	400	800	1.00	1.2	95.5	0.09	2.7

Spherical Agglomerates

SA35	20	35	55	0.50	4.2	99.5	0.03	0.3
SA75	55	75	105	0.50	4.0	99.5	0.03	0.3
SA125	95	130	185	0.45	3.9	99.5	0.03	0.3
SA300	200	315	500	0.40	2.8	99.5	0.02	0.3

High Density Agglomerates

HD75	40	80	110	0.75	2.6	99.7	0.02	0.3
HD125	60	120	200	0.80	2.4	99.8	0.02	0.2
HD200	110	180	250	0.75	2.7	99.8	0.02	0.2

Typical properties, not to be used as product specification

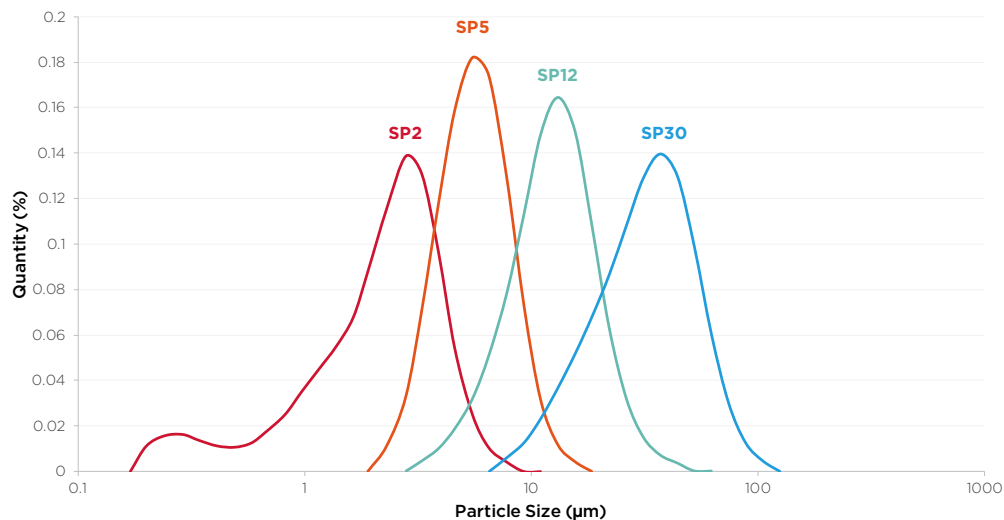


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Typical Powder Properties - Particle Size Distributions

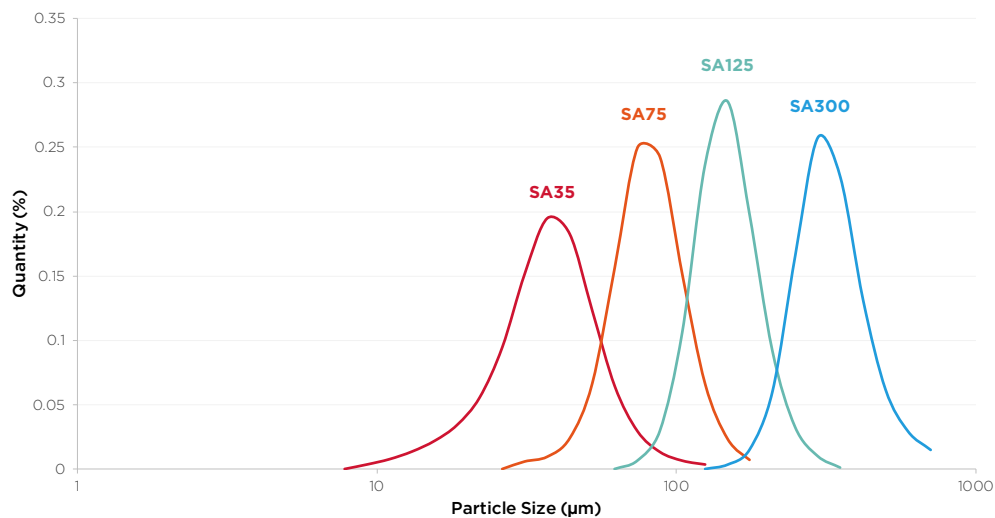
Standard Platelets

Particle Size Distributions



Spherical Agglomerates

Particle Size Distributions



Saint-Gobain Boron Nitride

168 Creekside Dr.
Amherst NY 14228

T: 1 877 691 2001 (Toll free)

T: 1 716 691 2000

F: 1 716 691 2090

email: BNSales@saint-gobain.com
bn.saint-gobain.com

bn.saint-gobain.com

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Boron Nitride Coatings

Aqueous Coatings for High Temperature Protection, Lubrication and Release

CeraGlide™ Boron Nitride (BN) coatings are composed of a high purity BN powder base paired with a high-temperature bond phase. Supplied in a liquid form suitable for brushing, they can be diluted with water to spraying and dipping consistencies and applied to a variety of porous and non-porous materials including ceramics, metals, graphite and glass.

Resistant to and non-wet by most molten metals, slags and drosses, CeraGlide BN coatings can be used up to 1372°C (2500°F) in a reducing atmosphere and up to 850°C (1562°F) in an oxidizing atmosphere, and retain many of its properties such as high temperature lubricity and corrosion resistance.

New and Improved Grades

Suspension stability and effective solids dispersion are important for coating consistency and performance. A precisely engineered and high purity BN powder, a nearly neutral pH and a premium alumina binder makes for a new and robust base for CeraGlide boron nitride coating grades SF+ and 10SF+. The improved binder dispersion offers more consistent and even coating layers for better adhesion and performance. The resulting solids stability reduces settling and allows for easy mixing and tighter viscosity ranges of the coating.

With these improvements, CeraGlide BN coatings not only offer excellent performance in a broad range of demanding applications on ceramic and metal substrates, but also a better fit for automated and robotic applications or when there is extended time between uses.

CERAGLIDE SF+ A general-purpose thick coating offers premium value and flexibility of concentrated BN in aqueous phase that can be used as is, or diluted with water to desired thickness and viscosity.

CERAGLIDE 10SF+ A ready-to-use formulation for spraying, brushing or dipping, 10SF+ combines simplified set-up, efficiency and performance in automated and robotic applications, eliminating possible variation caused by dilution on site.

Specialized Grades

CeraGlide Specialized BN grades are differentiated by the type of inorganic binder used. These grades offer a range of physical properties such as hardness and adherence in more specialized applications with specific substrates.

CERAGLIDE A A high-viscosity paste with a unique aluminum phosphate binder and higher solids content for custom dilution. Offers a very strong bond with many different refractories and glass substrates.

CERAGLIDE V A thick composition with a magnesium silicate binder that dries to a harder coating, particularly useful in applications requiring additional durability such as moving parts in molten metal. Excellent for coating graphite.

PRODUCT DATA SHEET



Features/Benefits

- Ready to use, water based coatings for easy application
- Excellent parting plane and lubricity provide outstanding release properties even at high temperatures
- Non-wet by most molten metals, salts, fluxes - enables extreme resistance to molten metal corrosion and light metal drosses
- Increases corrosion resistance and lifetime of refractory, metal and graphite components and tools

Key Applications

- Hot pressing, forging, extrusion
- Coating of launders, troughs, spoons, sieves, cups
- Super-plastic and quick-plastic forging

Target Markets

- Light metal processing
- Secondary aluminum manufacturing
- Glass manufacturing

BORON NITRIDE





Boron Nitride Coatings

PRODUCT DATA SHEET

CERAGLIDE™ BORON NITRIDE COATINGS

General Properties	SF+	10SF+	A	V
Carrier Liquid	Water	Water	Water	Water
Binder Phase	Alumina	Alumina	Aluminum Phosphate	Magnesium Silicate
pH	5.5 - 7.5	5.5 - 7.5	1.0 - 3.0	> 7.5
Viscosity (cps)	6,000 - 15,000	300 - 2,000	50,000-200,000	3,000-12,000
Specific Gravity (g/cc)	1.2	1	1	1
Color	White	White	White	White
Coverage, Ft ² /gallon	100 - 400	100 - 400	100 - 400	100 - 400
Shelf Life at RT, Months	12+	12+	12+	12+
Coating Composition				
Total % Solid Phase	31%	16%	55%	33%
--Use Content, BN	>70%	>60%	>70%	>90%
Use-Temperature				
Reducing / Inert	1370°C	1370°C	1370°C	1370°C
Oxidizing	850°C	850°C	850°C	850°C
The properties listed are typical values and should not be treated as product specification. Custom color tinted formulations are available upon request.				

PACKAGING GUIDELINES

For available packaging and related information, please visit our website at --

www.bn.saint-gobain.com/products/coatings

TO ORDER

To find Combat Boron Nitride coatings fit for your specific application, please contact us at BNSales@saint-gobain.com with the following information:

- base material to which the coating will be applied
- operating conditions, i.e. temperature, atmosphere, contact with other materials, etc.



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For more information regarding the unique properties of Saint-Gobain Boron Nitride and our application solutions, please consult our website at

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CeraGlide™ is a pending trademark of Saint-Gobain Ceramic Materials.

CeraGlide BN Coatings-DS 0819



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COMBAT®

Boron Nitride Solids

Unique Properties for High-Performance Industrial Applications

Combat® hot-pressed hexagonal boron nitride (hBN) ceramics exhibit unique combinations of chemical, electrical, mechanical and thermal properties, making it suitable for a wide range of high-performance industrial applications.

Combat® Boron Nitride's characteristics depend on the type and amount of binder, overall composition and the type of bond between layers. Backed with industry leading, international technical support from Saint-Gobain, Combat® provides a full spectrum of solutions in machinable blanks as well as custom finished shapes.

COMBAT® A - Uses boron oxide as a binder to create a hard, dense, yet easily machinable product best used in inert and dry environments. It is ideal for general purpose high-performance applications.

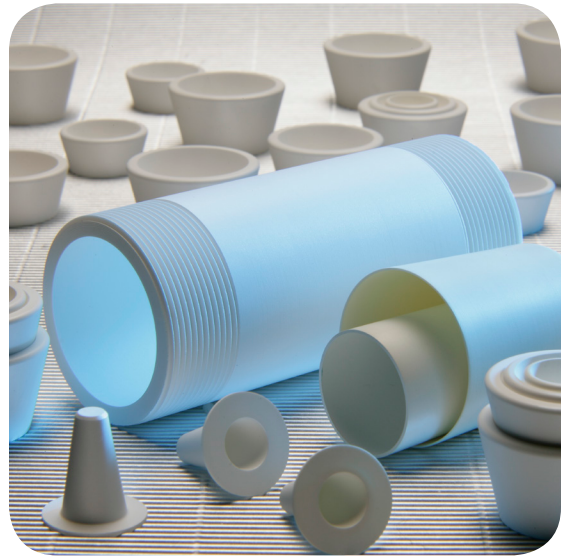
COMBAT® HP - Leverages hBN's outstanding thermal shock resistance with calcium borate glass's moisture resistance. HP is ideal for light metal processing application such as aluminum, magnesium and zinc, and excels in electrical insulation applications up to 1000°C.

COMBAT® AX05 - Does not use any binder and is self bonded, offering the highest purity for high temperature applications. Non-wet by almost all molten metals, AX05 is recommended for applications such as extreme high-temperature insulators and crucibles for high-purity processing.

COMBAT® M AND M26 - Combine the moisture resistance of silica with unique properties of boron nitride. Differentiated by the amount of SiO₂, Combat M offers unparalleled resistance to thermal shock while Combat M26 offers higher thermal conductivity. M and M26 are ideal for applications requiring extreme and exacting dielectric properties.

COMBAT® ZSBN - Combines the non-wetting properties of boron nitride with extreme refractory and wear resistance of zirconia. ZSBN is widely used in a variety of molten metal contact applications.

PRODUCT DATA SHEET



Features/Benefits

- Easily machinable to desired shapes and sizes
- Exceptional heat resistance
- High thermal conductivity
- Low thermal expansion, excellent thermal shock resistance
- Outstanding electrical insulation - even at high temperatures
- High wet resistance to molten metals, slags and glass
- Extreme corrosion and wear resistance

Key Applications

- MOCVD setters and components
- Insulators for high-temperature furnaces
- Muffles and crucibles for Nitride and Sialon firing
- Nozzles for powder metal atomization
- Side dams for twin-roll casting
- Continuous casting break rings
- High temperature mechanical components such as bearings, valves, spacers
- Crucibles and molds for molten metal processing

Target Markets

- High temperature furnace construction
- Ceramic manufacturing
- Semiconductor industry
- PVD coating
- Microwave

BORON NITRIDE



COMBAT® BORON NITRIDE SOLIDS

Typical Properties	Units	A	HP	AX05	M	M26	ZSBN
Crystalline Phase		hBN > 90%	hBN > 90%	hBN > 99.5%	hBN 40% SiO ₂ 60%	hBN 60% SiO ₂ 40%	hBN > 45% ZrO ₂ < 45% Borosilicate < 10%
Binder Phase / Binder Type		Boric Oxide	Calcium Borate	Self Bonded	SiO ₂	SiO ₂	Borosilicate glass
Color		White	White	White	White	White	Grey
Typical Applications		General purpose	Outstanding Moisture Resistance, Refractory, Dielectric Strength	Extreme Corrosion Resistance, Thermal Conductivity, Purity	Extreme Thermal Shock, Moisture Resistance, Dielectric Strength	Extreme Thermal Conductivity, Moisture Resistance, Dielectric Strength	Extreme Wear Resistance & Corrosion Resistance in molten metals applications
Directionality		⊥	⊥	⊥	⊥	⊥	⊥

Mechanical Properties

Flexural Strength (MPa, 25°C)	94	65	59	45	22	21	103	76	62	34	144	107
Youngs Modulus (GPa, 25°C)	47	74	40	60	17	71	94	106			71	71
Compressive Strength (MPa, 25°C)	143	186	96		25		316	289			219	254
Open Porosity (%)	2.8				19.3		6.9		6.7		1.1	
Density (g/cm ³)	2.0		2.0		1.9		2.3		2.1		2.9	
Hardness – Knoop (kg/mm ²)	20		16		4						100	

Thermal Properties

Thermal Conductivity (W/mK, 25°C)	30	34	27	29	78	130	12	14	11	29	24	34
Coeff. of Thermal Expansion (10 ⁻⁶)												
25 - 400° C	3.0	3.0	0.6	0.4	-2.3	-0.7	1.5	0.2	3.0	0.4	4.1	3.4
400 - 800° C	2.0	1.4	1.1	0.8	-2.5	1.1	1.2	0.4	2.5	0.1	5.6	4.3
800 - 1200° C	1.9	1.8	1.5	0.9	1.6	0.4	1.2	0.8	3.0	0.1	7.2	5.2
1200 - 1600° C	5.0	4.8	2.8	2.7	0.9	0.3					4.6	3.4
1600 - 1900° C	7.2	6.1			0.5	0.9						
Specific Heat (J/gK, 25°C)	0.86		0.81		0.81		0.76		0.77		0.64	
Max. Use Temp. – Oxidizing / Inert (°C)	850 / 1,200		850 / 1,150		850 / 2,000		1,000+		1,000+		850 / 1,600	

Electrical Properties

Dielectric Constant at 1MHz	4.6	4.2	4.3	4.0	4.0	4.0	3.4	3.7	4.5	3.8	18	19
Dissipation factor at 1MHz	1.2E-03	3.4E-03	1.5E-03	2.1E-03	1.2E-03	3.0E-04	3.0E-03	3.1E-03	1.7E-03	6.7E-03	4.5E-02	6.7E-02
Dielectric Strength (KV/mm)	88		>10		79		>10		66		3.5	
Resistivity (Ω cm, 25°C)	>10 ¹³	>10 ¹⁴	>10 ¹³	>10 ¹³	>10 ¹³	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹³	>10 ¹⁴	>10 ¹³	>10 ¹²

*Typical properties, not to be used as specification
Blank cells indicate data is not available*



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