



MOMENTIVE
performance materials

Quartz
Chemical vapor deposited solutions
for your specific applications



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Momentive Performance Materials, Quartz provides products to deliver the most advanced materials and engineered solutions for your applications. With a global reach and unparalleled resources, Momentive Performance Materials, Quartz supports your product and process development efforts every step of the way, in a wide range of advanced technology fields such as crystal growth and semi-conductor processing.

Momentive offers a full range of chemical vapor deposited (CVD) products:

- Pyrolytic Boron Nitride (PBN) shapes
- Pyrolytic Graphite (PG) shapes and derivatives (HOPG, TPG)
- Crucibles, boats, tubes, and plates for molecular beam epitaxy (MBE) and compound semiconductor crystal growth
- Metal carbide coatings for graphite
- Heaters and electrostatic chucks
- PBN coatings for graphite susceptors, heat shields, nozzles, flash evaporation boats, and other applications

The solution you need

At Momentive Performance Materials, Quartz, our engineers are eager to work with you to solve your problems. If a standard solution isn't exactly what you need, we'll engineer a solution specifically for your requirements – confidentially and completely

We take the time to understand your problems and processes. It's the Momentive way ... it's imagination at work. For advanced material solutions for your specific application, call a Momentive sales representative (back cover).

Pyrolytic Boron Nitride

PBN is an anisotropic, high temperature ceramic which exhibits a unique combination of high electrical resistance and good thermal conductivity. This inert, non-porous compound is exceptionally pure by virtue of its synthesis process (high temperature/low pressure chemical vapor deposition). PBN can be deposited to or easily machined into a limitless number of shapes:

- Crucibles
- Boats
- Tubes
- Bottles
- Machined plate products

Pyrolytic Boron Nitride

PBN: Benefits by the Dozen

1. Non-toxic
2. High purity
3. Low density
4. Chemically inert
5. Non-porous
7. Good thermal conductivity
8. Tensile strength increases with temperature
9. Excellent thermal shock resistance
10. High oxidation resistance
11. No auto-doping
12. Excellent anisotropy (electrical, mechanical and thermal)

CVD products and applications

PBN Crucibles

For crystal growth applications, PBN crucibles and boats are used to contain the melt as it is transformed from a polycrystalline state to a single crystal. Its ultra-high purity and unique thermal properties make PBN the ideal crystal growth vessel.

High Temperature PG Components

Pyrolytic Graphite (PG) is manufactured by decomposition of a hydrocarbon gas at very high temperature in a vacuum furnace. The result is an ultra-pure product which is near theoretical density and extremely anisotropic. PG is available as plate, free standing shapes and as an impenetrable coating on graphite and other surfaces. Momentive Performance Materials, Quartz also produces thermal PG (TPG) for heat sink applications and highly oriented PG (HOPG) for use as monochromators.

MBE Crucibles

Momentive manufactures high purity PBN crucibles to fit MBE tools from all major OEMs. Additionally, Momentive's hot-lip MBE crucibles combine the infrared (IR) absorption and anisotropic thermal conduction characteristics of PG with the chemical inertness and high temperature stability of PBN to optimize axial thermal profiles for enhanced control over source molecular flux.

Metal Carbide Coatings

Tantalum carbide (TaC) and niobium carbide (NbC) coatings can be applied to a range of graphite grades for use as wafer carriers, susceptors, etc. TaC and NbC coatings seal the graphite surface to protect it from attack by reactants, such as hot ammonia or hydrogen, and minimize auto-doping from graphite in metal-organic chemical vapor deposition (MOCVD) applications.

Heaters and Electrostatic Chucks for Wafer Processing

PBN/PG resistance heating elements combine the unique electrical, chemical, and thermal properties of PBN, a dielectric material, and PG, an electrical conductor, to produce a truly advanced heating system. These heaters are chemically inert to most gases and liquids, mechanically and thermally uniform, shock resistant, fully dense to eliminate outgassing, and provide ultra-fast response.

Typical Properties of Pyrolytic Boron Nitride

Apparent Density, gm/cc	1.95 - 2.22
Tensile Strength, MPa (psi)	40 (6000)
Flexural Strength, MPa (psi)	80 (12,000)
Thermal Conductivity, W/m°C	"ab" 60, "c" 2
CTE, mm/mm/°C (1000°C) "ab"	2X10 ⁻⁶
Resistivity, ohm-cm	10 ¹⁵
Dielectric Strength, D.C. volts/mm	2X10 ⁵
Dielectric Constant	"ab" 5.2, "c" 3.4
Total Metallic Impurities, ppm	<10
Outgassing	Negligible
Max. suggested use (°C)	2500

Principal Bulk Impurities in PPN

Impurity	ppm
Na	<2
Al	0.4
Si	3
Ca	3
Fe	0.2
Measurement Method SSMS (Spark Source Mass Spec.)	

