SIO-9915 Polyborosilazane Resin

Product Description

SIO-9915 is a high-performance polyborosilazane (PBSZ) ceramic precursor resin. Through pyrolysis conversion, this material can be transformed into silicon boron carbon nitride (SiBCN) composite ceramics, serving as an important precursor for advanced inorganic ceramic materials.

With the introduction of boron (B), PBSZ can generate stable B–N and B–C–N structures during the ceramic conversion process. Together with the Si–N network, these structures form a highly stable inorganic ceramic framework. The resulting SiBCN ceramics exhibit excellent high-temperature thermal stability, oxidation resistance, creep resistance, and thermal shock resistance, maintaining structural integrity even under extreme temperature conditions. Therefore, SiBCN ceramics are considered one of the promising next-generation ultra-high-temperature ceramic materials.

SIO-9915 exhibits excellent electrical insulation properties, oxidation resistance, gas barrier performance, and radiation resistance, making it suitable for advanced ceramic coatings, electronic component protection, sealing and protective materials, gas barrier films, and aerospace high-temperature protection applications.

Product Features and Applications

SIO-9915 can be used as a ceramic precursor coating material, organic-inorganic hybrid coating resin, and high-temperature protective coating binder.

After curing and high-temperature ceramic conversion, SIO-9915 forms a dense SiBCN ceramic protective layer with the following properties:

- Excellent high-temperature resistance
- Good oxidation resistance
- Excellent corrosion resistance
- Good hydrophobic properties
- Good chemical resistance
- Excellent electrical insulation performance
- Excellent gas barrier properties

The cured coating demonstrates excellent resistance to alcohols, ketones, and various organic solvents.

Typical Applications:

- High-temperature protective coatings
- Ceramic coatings
- Inorganic heat-resistant coatings

- Metal corrosion protection coatings
- Electrical insulation protection for electronic components
- Aerospace composite material protection
- High-temperature sealing and barrier materials
- Ceramic matrix composites (CMC)

Main Performance Characteristics

Test Item	Performance
Appearance	Light yellow to colorless transparent liquid
Solid Content	＞75%
Viscosity (Ford Cup No.4)	11–20 s
Density	0.95–1.05 g/cm³
Pencil Hardness	6–9H
Adhesion	Grade 0
Dielectric Strength	≥105 V/mm
Volume Resistivity	≥10^{13} Ω·m
Salt Spray Resistance	＞3000 h
Artificial Weathering	No rusting, chalking, cracking, or discoloration after 30 days
Wear Resistance after Nitrogen Ceramic Conversion	5000 cycles without substrate exposure

Applicable Substrates

SIO-9915 is suitable for various inorganic and metal substrates, including:

- Carbon steel
- Stainless steel
- Cast iron
- Aluminum alloys
- Titanium alloys
- High-temperature alloys
- Glass ceramics
- Ceramic materials
- Cement-based materials

Different substrates and service conditions require optimized formulations and curing processes. The coating system can be adjusted according to specific application requirements.

Temperature Performance

Air-Cured Conditions

Suitable for:

- Outdoor protective applications
- Long-term service temperatures ≤350℃
- Short-term exposure to temperatures up to 500℃

Ceramic Conversion Under Inert Atmosphere

After high-temperature ceramic conversion under inert atmospheres such as nitrogen, SIO-9915 forms a SiBCN ceramic structure suitable for:

- High-temperature environments ≥550℃
- Short-term operation at 700℃

The final temperature resistance depends on substrate type, coating thickness, ceramic conversion process, and actual service conditions.

Basic Application Parameters

Item	Parameter	Item	Parameter
Coating Solid Content (%)	＞75	Volatility	Solvent evaporation
Theoretical Coverage (m^2/kg)	8–15	Air Curing Temperature (℃)	Room temperature–220
Dry Film Thickness (μm)	15–30	Air Curing Time (h)	＞24 / ＜1
Pot Life (h)	4	Nitrogen Ceramic Conversion Temperature (℃)	＞600
Diluent	Alkanes, esters, ethers, etc.	Nitrogen Curing Time	Controlled heating profile
Flash Point (℃)	＜22 (solvent flash point)	Storage Temperature (℃)	0–25

Special Notes:
This product is a single-component self-curing material. Once taken out of the container, the coating should be used within 4 hours. For extended application intervals, all tools should be cleaned properly to prevent cured material buildup.

It is recommended to complete the coating application in one pass. The dry film thickness should not exceed **30 μm**, otherwise coating performance may be reduced.

Standard Surface Preparation and Application Process

Surface Cleaning → Surface Roughening → Cleaning and Drying → Coating Application → Curing

Process Details

1. Surface Roughening Treatment

Before coating, the substrate surface should be sanded or grit blasted to remove rust, dust, contaminants, and loose materials.

Surface preparation has a significant impact on coating performance:

- Recommended: **Sa2.5**
- Minimum requirement: **St3 without oxide scale**
  (GB/T 30790.4-2014)

2. Cleaning

Use suitable cleaning agents or degreasers to remove oil, dust, and other contaminants remaining after surface treatment.

3. Substrate Drying

Ensure the substrate surface is completely clean and dry before application.

4. Coating Preparation

This product is a single-component system. Filter the required amount through a **120-mesh filter** before use.

5. Coating Application

For laboratory spraying, a **1.0 mm spray nozzle** provides better coating appearance and uniformity.

After curing, the coating exhibits certain hydrophobic and oleophobic properties; therefore, repeated recoating is not recommended.

6. Curing

- Room-temperature curing: complete curing time >24 hours
- Accelerated curing: 85–180℃ heating can shorten curing time

- Nitrogen atmosphere ceramic conversion: requires controlled temperature ramping according to the curing profile

Storage Conditions

1. Store according to applicable regulations. Keep in a dry, cool, and well-ventilated area away from heat sources and ignition sources. Containers must remain tightly sealed and handled carefully.
2. Recommended storage temperature: **5–25**℃. Shelf life: **12 months**.
3. After opening, unused product must be resealed tightly.
4. Mixed or prepared unused coating should not be returned to the original container and must be disposed of according to local regulations.
5. Products beyond the shelf life should only be used after passing performance evaluation.

Disclaimer

The information provided above is based on our current knowledge obtained from laboratory testing and practical experience. Since product application conditions are beyond our control, we only guarantee the consistency of product quality.

To comply with local regulations and application requirements, product specifications may be adjusted accordingly. We reserve the right to modify this technical data sheet without prior notice.

Users should consult with our technical team regarding product suitability for their specific requirements and applications.