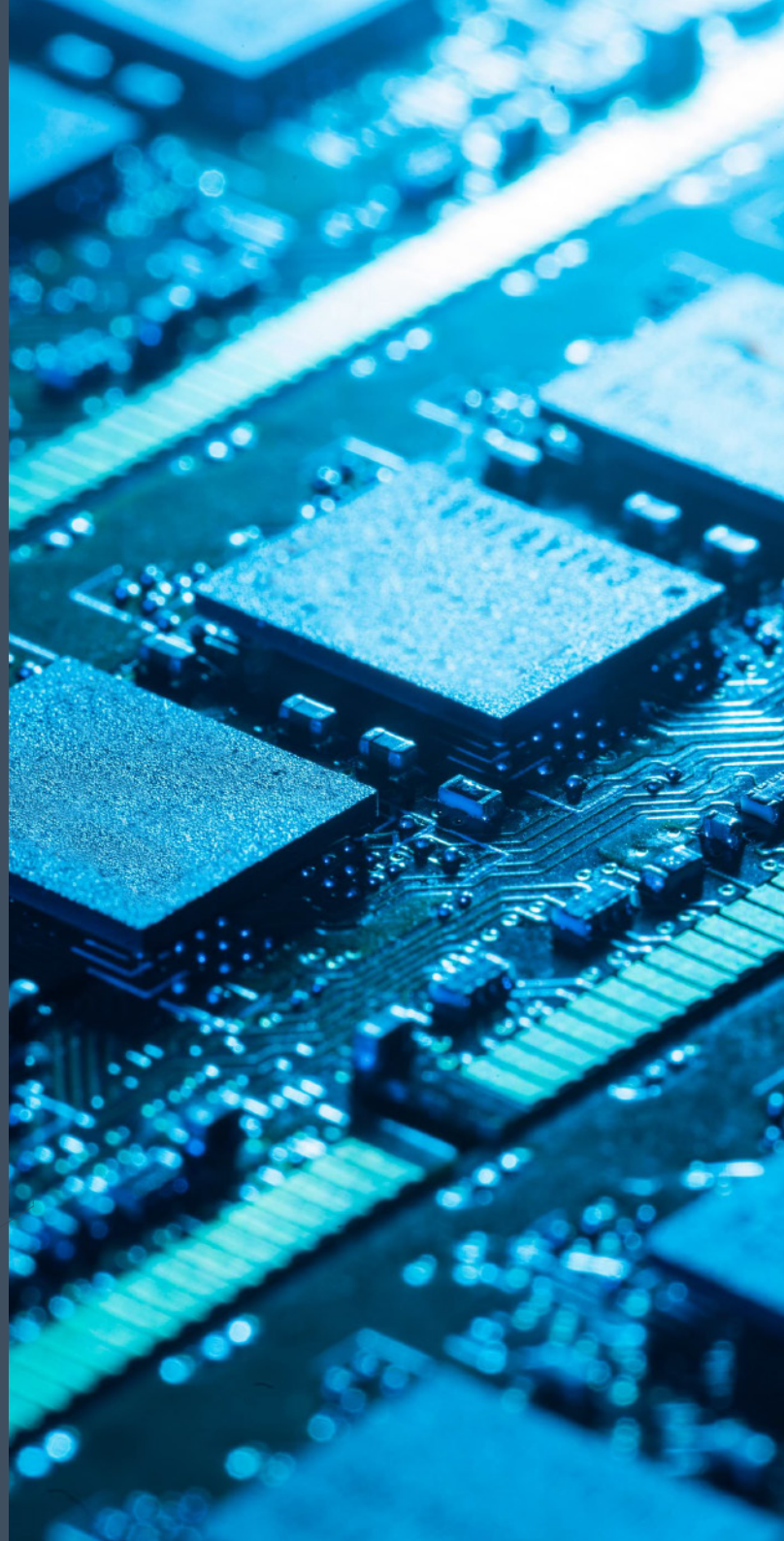
Morgan
Advanced Materials

Performance Solutions for Semiconductors

Innovative, Stable, Reliable, Consistent



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Morgan boasts over 100 years of expertise and application experience in providing specialty graphite and insulation products.

With the help of rich experience in material research and application, we provide customers with comprehensive solutions to meet a variety of challenges in semiconductor applications.

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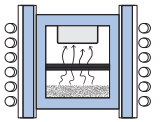
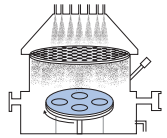
- G Graphite Solutions
- C CVD-SiC
- A Alumina
- B Brazed Metal Alloys
- P Purified Source Powders
- CG Coated Graphite

Materials

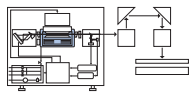
Device Fabrication



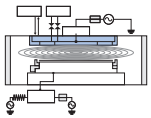
G P Crystal Growth



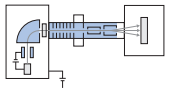
G C A Deposition



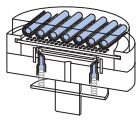
C A Lithography



C A Dry Plasma & Wet Chemical Etch



G CG C A Ion Implantation



B Rapid Thermal Processing

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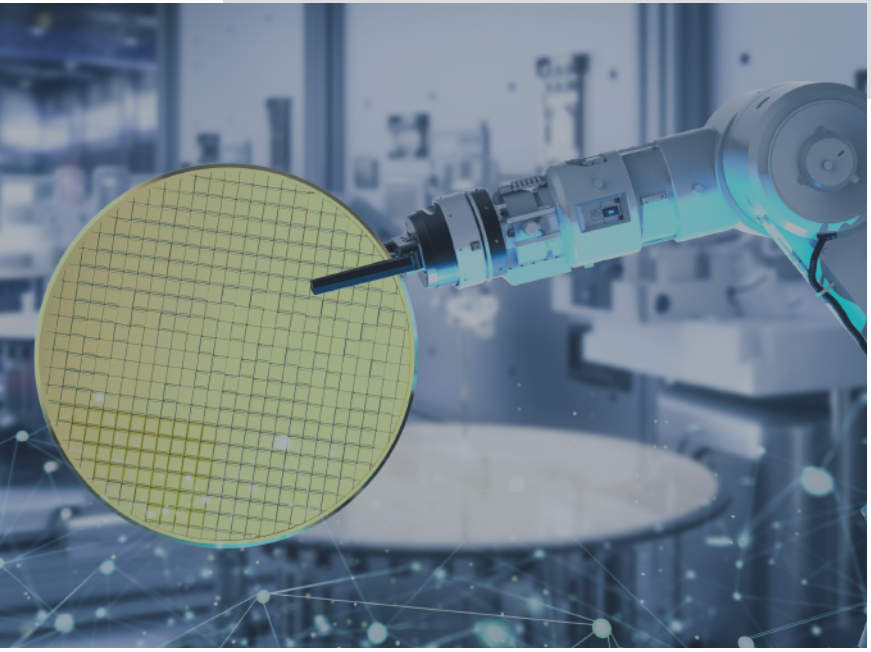
Performance Carbon Product Portfolio

- Insulation Solutions
- Porous Graphite
- Isostatic Graphite
- Natural Graphite Powder



Value-Added Services

· Tailor-Made Material Production

· Advanced Purification

· Ultrasonic Cleaning

· Glassy Carbon Impregnation

· Glassy Carbon Coating

· Precise Clean Machining

· Collaborative Innovation Process

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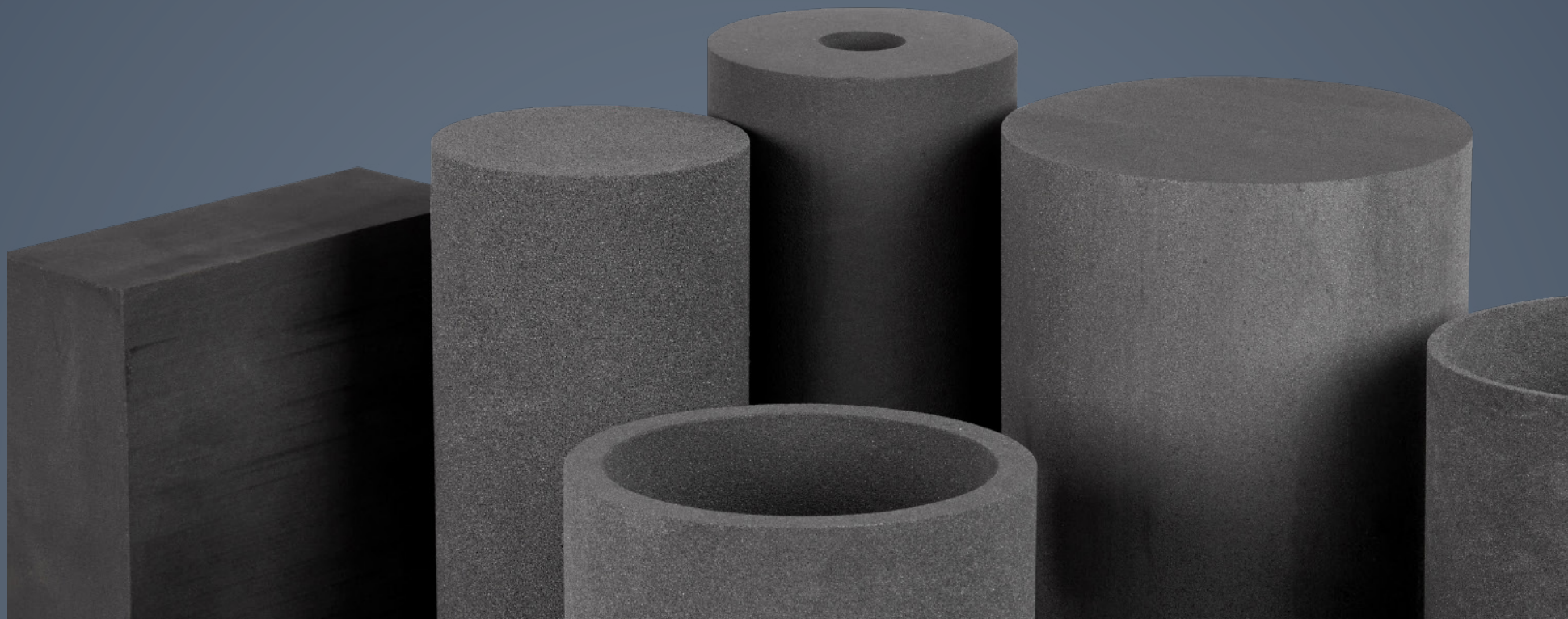
Porous Graphite Materials

Porous graphite materials are used to **shield against contaminants, enrich carbon content, and optimise vapour flow & temperature distribution** in semiconductor material growth applications, particularly in single-crystal SiC growth. Our porous graphite materials are characterized by high porosity and highly uniform interconnected pore distribution.



Experience Our Excellence

Grades Available

PG 25

PG 45

PG 60

PG 70

YOU DESIGN,

WE IMPLEMENT——

Tailored grades are available upon request.

Morgan PG Key Features:

Pore Size Distribution: Uniform pore sizes controlled during manufacturing, essential for consistent fluid flow and gas adsorption.

High Surface Area: Large surface area per unit volume, ideal for adsorption and catalytic applications.

Mechanical Strength: Maintains good strength and durability despite porosity.

Consistency: Consistent properties intra-part and inter-part enables reproducible processes and crystal quality.

Value-Added Services:

Clean Machining: Precision-machined, contamination-free parts tailored to specifications.

Advanced Purification Process (MAP): Reduces metallic impurities to below GDMS detection limits and achieves metallic purity levels of < 1 ppm, meeting semiconductor industry standards.

For more technical information,
please contact semiconductor@morganplc.com

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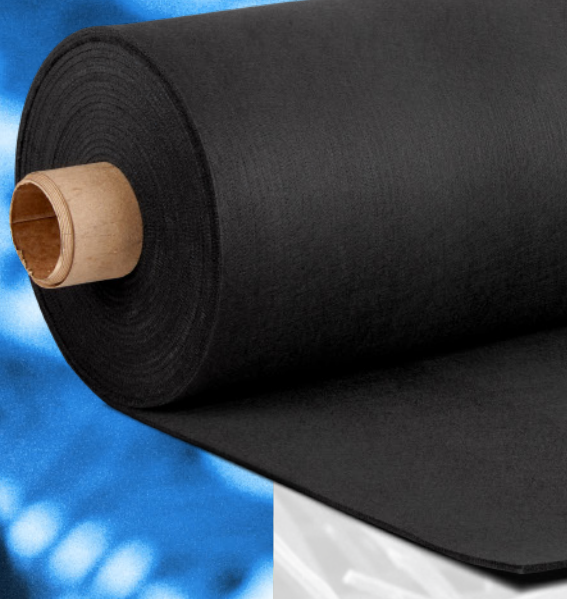
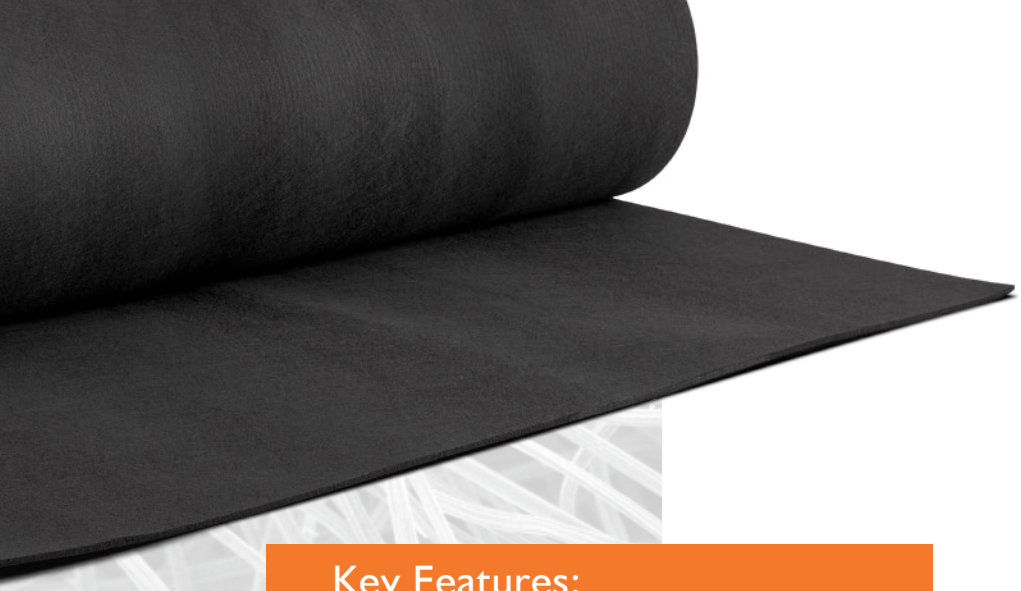
Morgan Engineered Insulation Solutions

Insulation is vital for precise thermal management, high-temperature stability, and reliability in semiconductor manufacturing. It enhances reproducibility and purity while reducing the power consumption and total cost of ownership, ensuring efficient and consistent production.

Morgan provides advanced insulation solutions made from 100% rayon-based fiber precursors. These solutions offer exceptional performance and stability in extreme environments with vacuum or inert atmospheres.





Soft Felt Solutions
for Semiconductor Applications:

Morgan carbon and graphite soft felts are processed at temperatures exceeding 1900°C for carbon and 2500°C for graphite. They combine high performance with versatility, providing a reliable solution for critical thermal management and insulation needs.

Key Features:

Thermal Stability: Maintains integrity in aggressive environments with minimal outgassing and shrinkage.

Uniformity: Consistent fibre structure for precise thermal performance and semiconductor production.

Low Thermal Conductivity: Effective thermal insulation and heat management.

Oxidation Resistance: Low oxidation and friability for challenging conditions.

Available Forms:

Stitched Soft Felts: Uniformly wrapped and stitched cylinders for ease of use.

Cut Soft Felts: Ready-to-use forms, reducing preparation and downtime.

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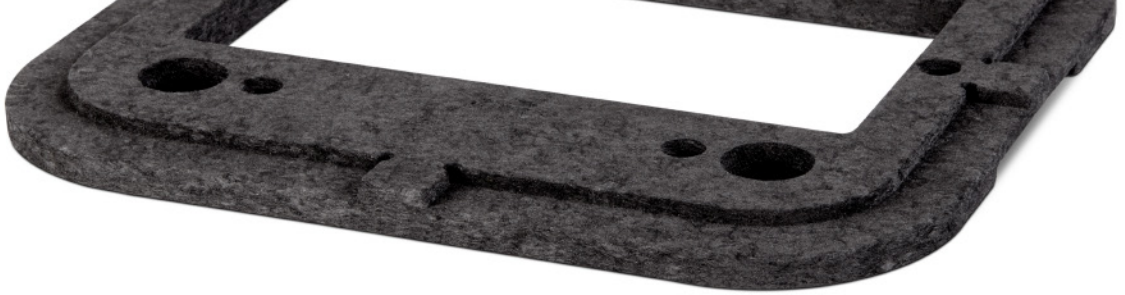
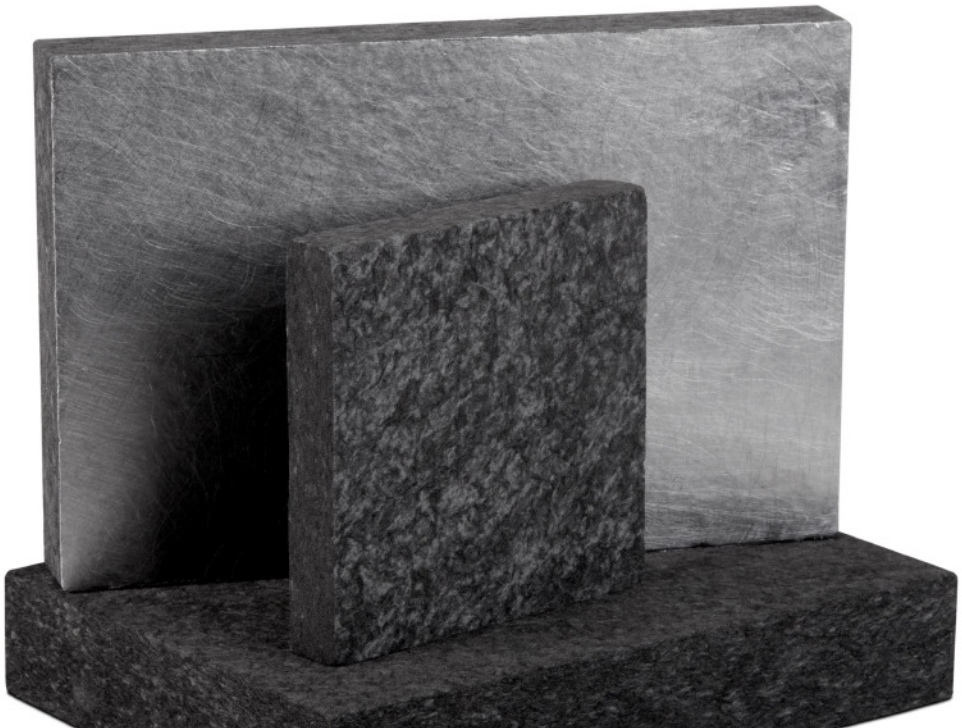


Rigid Board Insulation
for Semiconductor Applications:

Morgan offers two grades of rigid board insulation designed to meet the demanding requirements of semiconductor applications: RGB and RGB-LTC (Lower Thermal Conductivity).



Key Features:

High-Temperature Performance: Our product is designed to deliver peak performance at extremely high temperatures in vacuum or inert atmospheres. It guarantees reliability under the most extreme conditions, with minimal shrinkage and release of volatile substances.

High resistance: Outstanding oxidation resistance and chemical resistance.

Mechanical performance: Dimensionally stable and lightweight.

Value-Added Services:

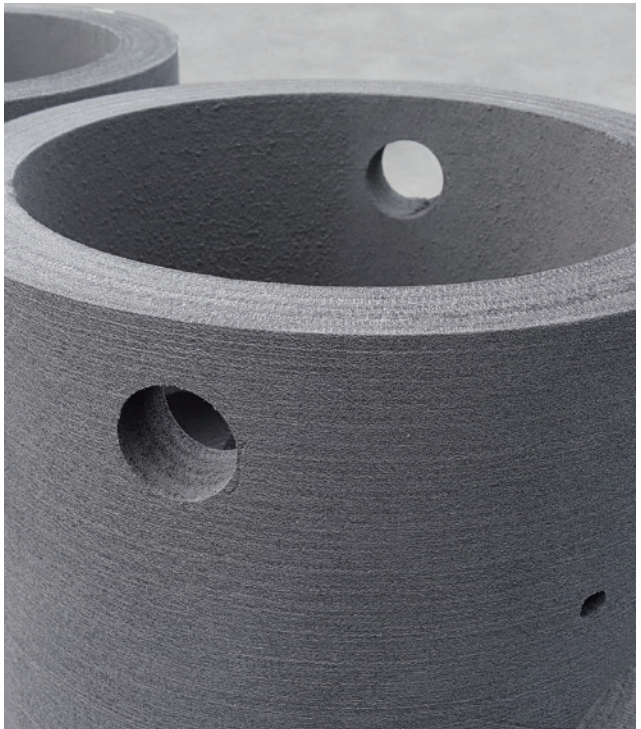
Surface Foiling and Coating: Extends insulation lifespan and prevents particle generation.

Ultra-High Purification: Enhances purity for semiconductor standards.

Engineered Solutions: Customized machining for specific needs.

Rigidized Cylinders
for Semiconductor Applications:

Morgan Rigidized Cylinders® guarantee exceptional insulation properties, unwavering dimensional stability, and high purity levels, crucial for semiconductor processes up to 2500°C.



Key Features:

Superior Insulation: Low thermal conductivity for efficient heat management.

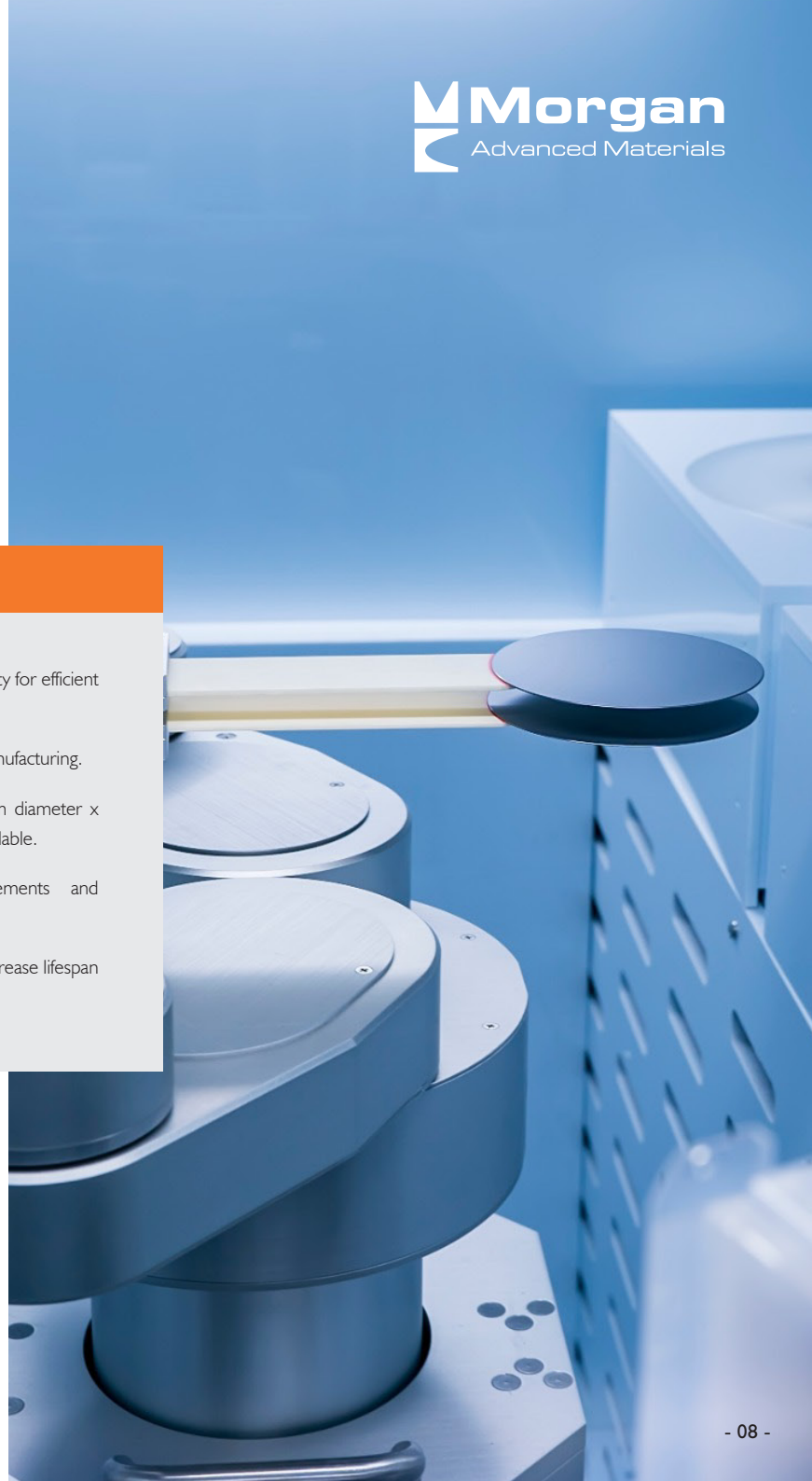
High Purity: Essential for semiconductor manufacturing.

Customization: Various sizes up to 650mm diameter x 800mm height and custom solutions are available.

Ready-to-Use: Facilitates quick replacements and minimizes downtime.

Enhanced Performance: Special coatings increase lifespan and durability.

For more technical information,
please contact semiconductor@morganplc.com



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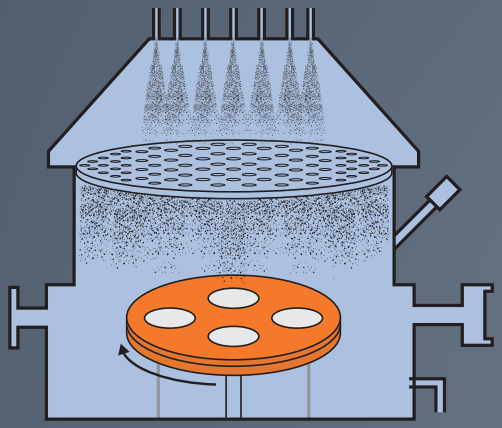
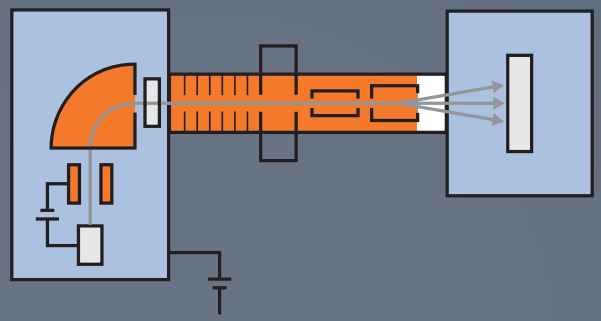
Morgan Machined Iso-Graphite Materials

Morgan provides unmatched flexibility in selecting top-quality materials. This allows us to customize product features to ensure optimal performance and meet a wide range of semiconductor processing requirements. This flexibility empowers us to deliver precision-machined iso-graphite materials with specific properties, such as thermal stability, purity, and durability. Our products effectively address the unique challenges of semiconductor processing, including SiC growth, MOCVD, epitaxy, and ion implantation.





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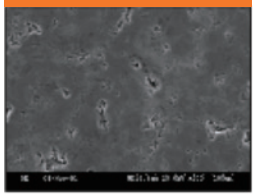
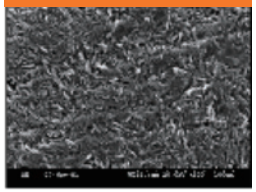
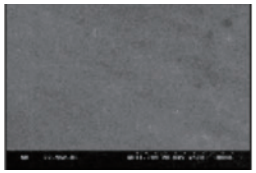
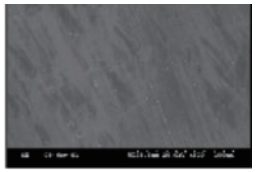
After 2 weeks of acid treatment

	Before	After
Iso-Graphite		
Glassy Carbon		

Value-Added Services:

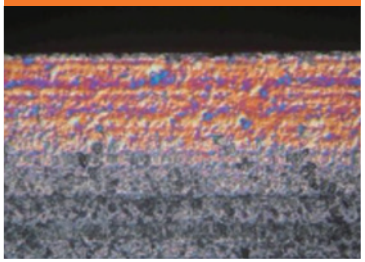
Glassy Carbon Impregnation: Penetrates deeply, reduces porosity and particle generation, extending product life.

GlassyCoat™ Glassy Carbon Coating: Seals surface porosity, reduces particle generation and extends product life.

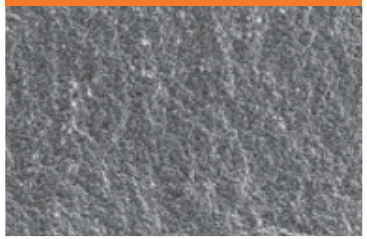
Purification: Achieves ultra-high purity levels of <2 ppm, ensuring clean, reliable performance in semiconductor applications.

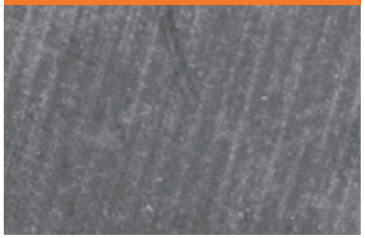
Glassy Coated-SEM

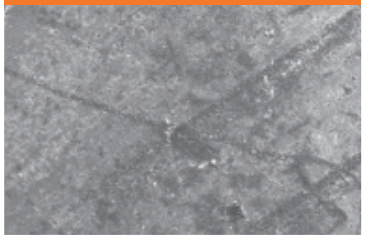
Glassy Coated-Polariscope



Fractured graphite surface → **Grinded graphite surface** → **Impregnated graphite surface** → **Coated graphite surface**







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Role of Glassy Carbon Coating and Impregnation in Wafer Processing

- Contamination Prevention
- Reduced Outgassing
- Improved Thermal Stability
- Enhanced Surface Durability
- Particle Mitigation

For more technical information,
please contact semiconductor@morganplc.com

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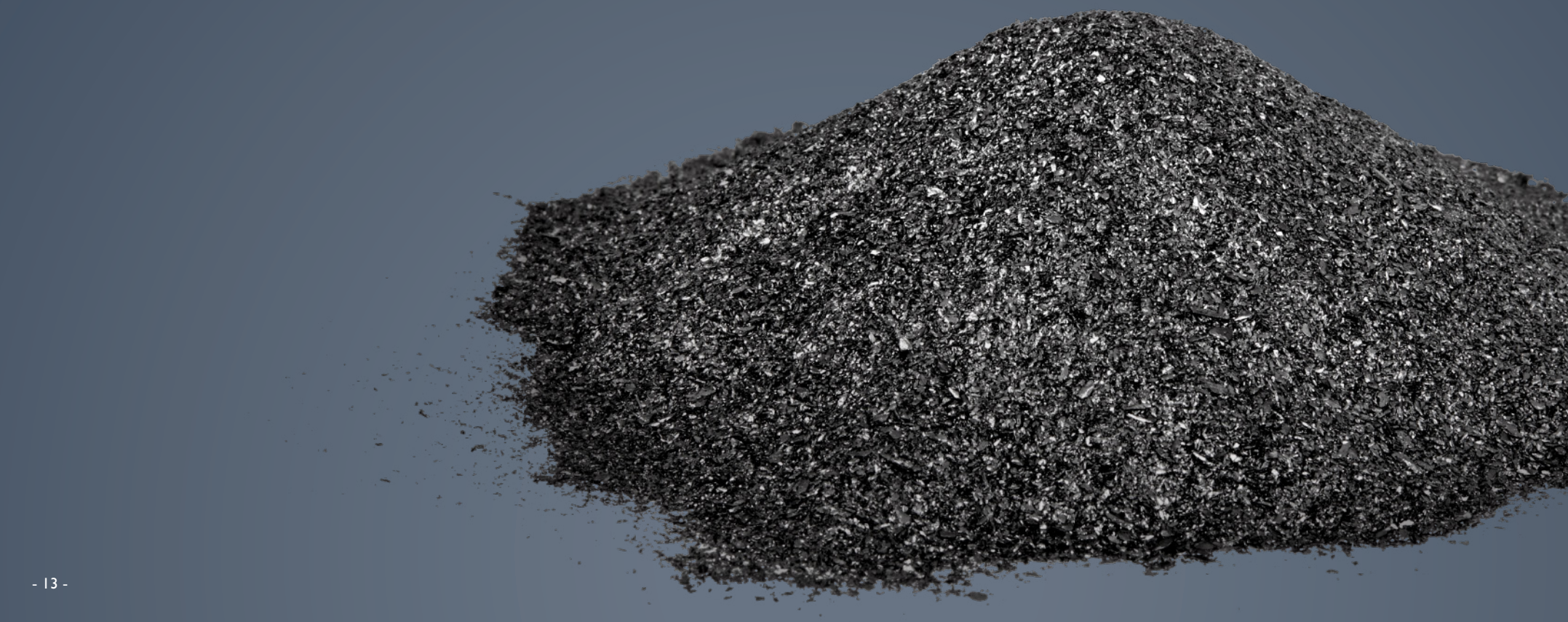
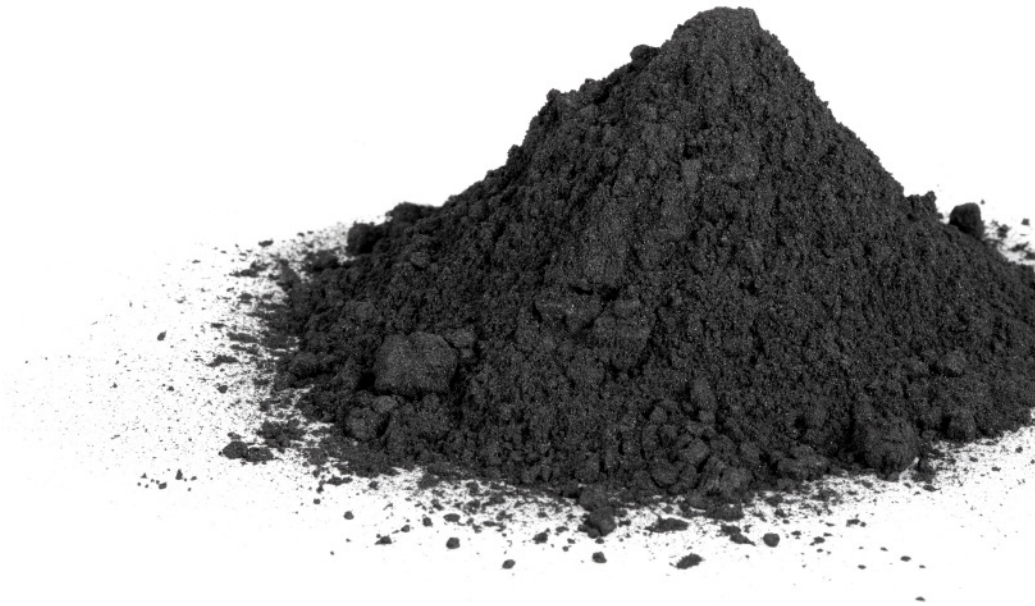
High Purity Graphite Powder for SiC Crystal Growth

High-purity graphite powder is essential for growing silicon carbide (SiC) crystals via physical vapor transport (PVT). It serves as a carbon source, reacting with silicon atoms to form SiC crystals.





Key Features:

Purity: Ensures SiC crystals are free from impurities, maintaining their electrical and mechanical properties.

Uniformity: Consistent particle size and high purity contribute to uniform crystal growth and desirable properties.

Morphology: Quality graphite powder influences the growth kinetics and morphology of SiC crystals.

Advantages of Using High-Purity Graphite Powder:

Consistent SiC crystal deposition.

Enhanced reproducibility and reliability.

Supports large-scale, high-throughput production.

Improved crystal quality and purity.

Minimized contamination and defects.

For more technical information,
please contact semiconductor@morganplc.com

ABOUT MORGAN ADVANCED MATERIALS

Morgan Advanced Materials is a global engineering company offering world-leading competencies in materials science, specialist manufacturing and applications engineering. We focus our resources on the delivery of products that help our customers to solve technically challenging problems, enabling them to address global trends such as energy demand, advances in healthcare and environmental sustainability.

What differentiates us?

Advanced material science and processing capabilities.
Extensive applications engineering experience
A strong history of innovation and reinvention.
Consistent and reliable performance.
A truly global footprint.
We find and invest in the best people.

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