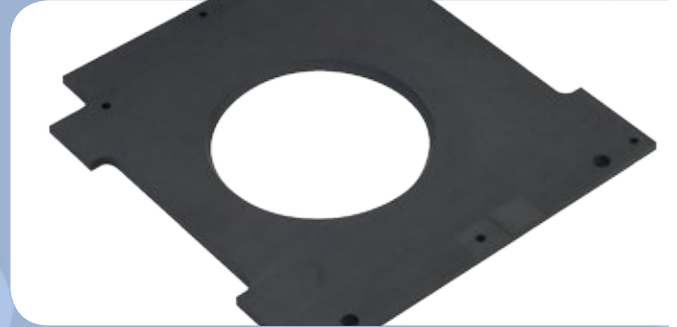


Specialty Graphite for Semiconductor Applications



Morgan Advanced Materials

Morgan Advanced Materials is a global materials engineering company which designs and manufactures a wide range of high specification products with extraordinary properties, across multiple sectors and geographies.

From an extensive range of advanced materials we produce components, assemblies and systems that deliver significantly enhanced performance for our customers' products and processes. Our engineered solutions are produced to very high tolerances and many are designed for use in extreme environments.

The Company thrives on breakthrough innovation. Our materials scientists and applications engineers work in close collaboration with customers to create outstanding, highly differentiated products that perform more efficiently, more reliably and for longer.

Morgan Advanced Materials has a global presence with more than 9,000 employees across 50 countries serving specialist markets in the energy, transport, healthcare, electronics, security and defence, petrochemical and industrial sectors. It is listed on the London Stock Exchange in the engineering sector (ticker MGAM).

The Technical Ceramics business of Morgan Advanced Materials designs and manufactures advanced ceramic components from a portfolio of cutting edge materials. We routinely engineer complex parts that enhance the reliability or the performance of our customer's products in technically challenging applications.

Our Graphite Machining and Downstream Processing Capabilities

We specialize in machining all grades of premium graphite utilizing manual, 3,4 and 7-axis mills. We are best in class in ultrasonically cleaning, purifying, impregnating and glassy carbon coating. In addition, we specialize in other value-added processing such as heli-coil installation and polishing.

Did You Know?...

Our purification process can reduce total metallics down to the 2 ppm range.



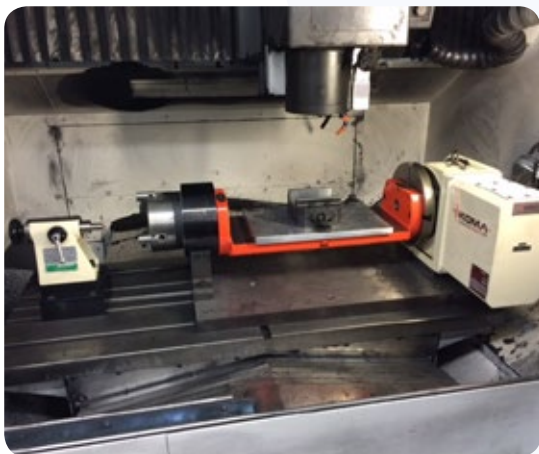
Machining

Morgan Advanced Materials continues to invest in State of the Art equipment and tools to remain at the forefront of machining capability. This allows for the machining of larger and more complex parts being required by the industries that we serve.



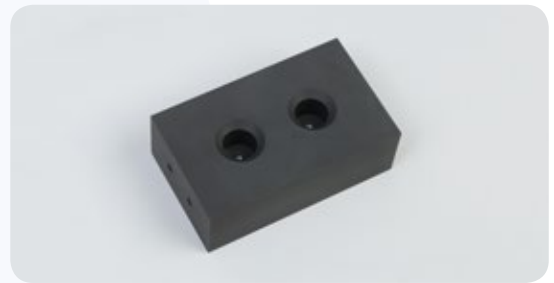
FEATURES

- Manual machining center
- 3, 4 and 7-axis mills, lathes
- Centerless grinder
- Tight tolerances +/- .0005"
- MasterCam programs
- Custom tooling and fixturing
- ISO9000/2000 certified



Purification

The purification process at Morgan Advanced Materials has been customized to achieve the lowest possible limits for metallic and other impurities.



FEATURES

- Purification before or after machining
- Graphite and/or other materials
- Less than 2ppm total metallics
- State of the Art process control technology
- Maintains integrity of graphite
- Customizable for any application

Effects on Substrate Permeability

Process Permeability	Darcy (10^{-4})
Purified	26.15
Impregnated	13.71
Coated	0.038

Glassy Carbon Impregnation

Morgan's Glassy Carbon Impregnation penetrates and seals the graphite substrate to approximately 0.25-inch (6.35mm).

FEATURES

- Penetrates and seals pores
- Reduces particulates
- Extends life of part

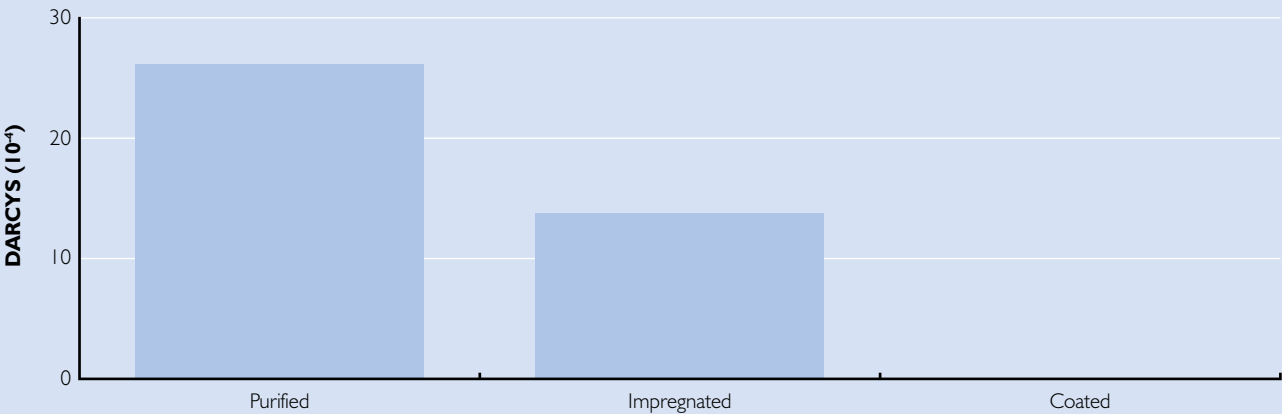
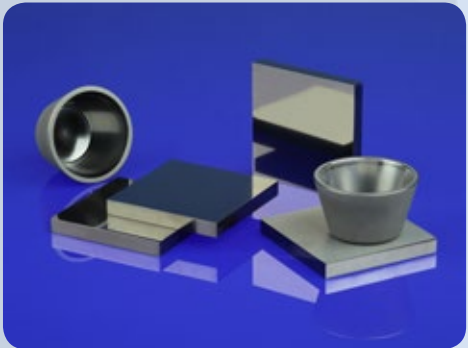


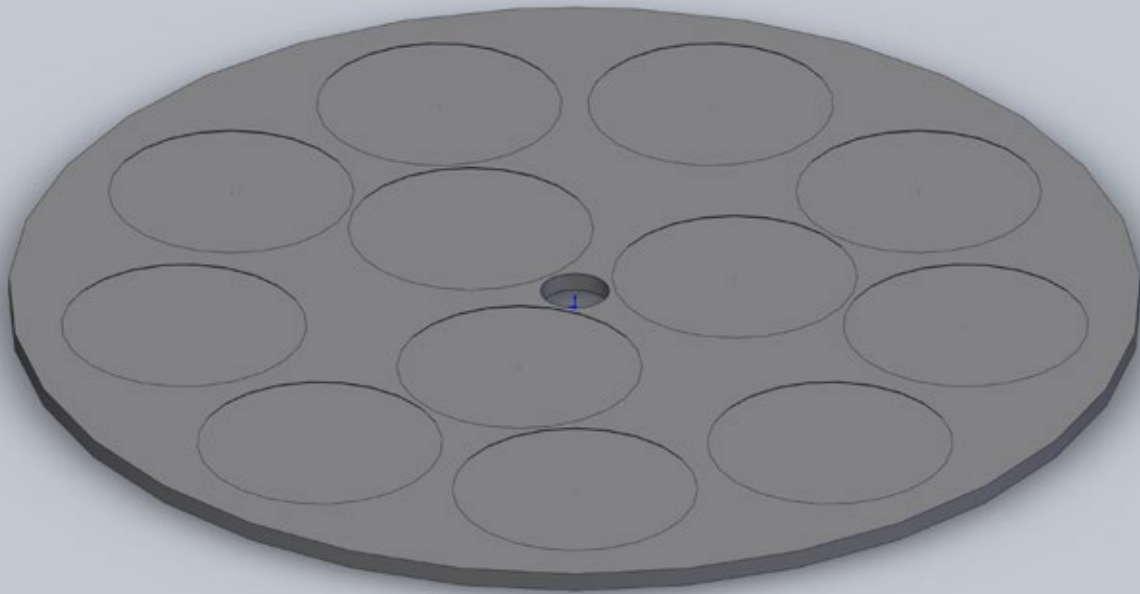
Glassy Carbon Coating

The Glassy Carbon Coating provides an even greater seal, leading to even fewer particulates shed.

FEATURES

- Seals the surface porosity to extremely low levels
- Significantly reduces or eliminates particulates and outgassing
- Reduced surface charging
- Extends graphite life





Engineering

The Specialty Graphite business of Morgan Advanced Materials meets unique customer specifications through its advanced engineering capabilities and expertise in designing products for manufacture. The extensive experience which Morgan's engineers, together with the latest in design software and manufacturing capabilities, ensures that customers' products are designed and manufactured to the highest possible standards. Specialty Graphite parts are suitable for severe service applications including the semiconductor industry, glass and metal production and aerospace.

FEATURES

- Work closely with customers engineers
- Process quotations to customer specifications
- Advise on graphite selection
- Convert CAD designs to MasterCam input

Markets Served

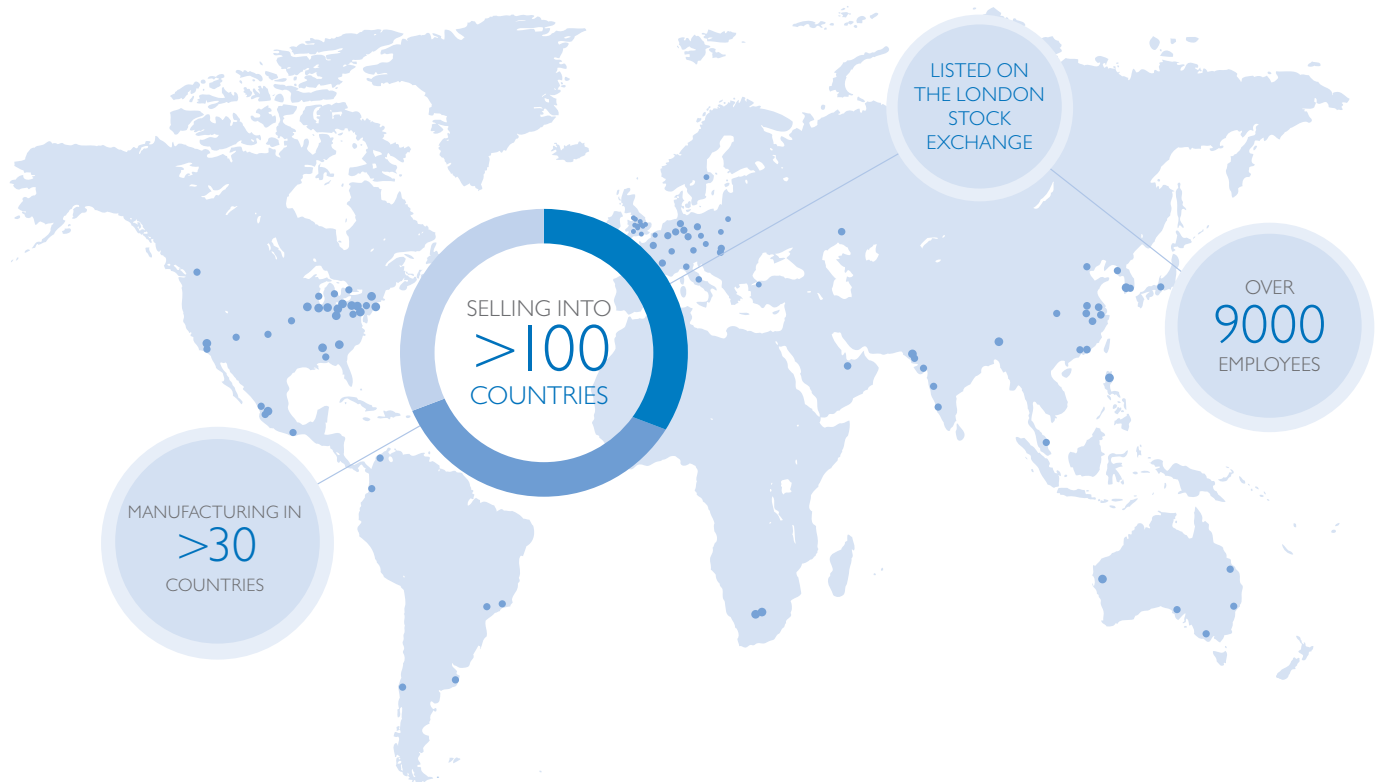
SEMICONDUCTOR APPLICATIONS

- Ion Implanting – Shields, Liners, Apertures, Sweepers, Rods
- Wafer Processing – Susceptors, Rings
- Dry Etching – Electrodes

OTHER MARKET APPLICATIONS

- Aerospace - Heaters
- Industrial - Wire Guides, Rod Dies, Crucibles, Hot Glass Handling, Sweepers
- Instrumentation – Cathodes, Bonding Pads, Bonding Fixtures
- Energy – Storage

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