



## INDUSTRIAL MATERIAL SOLUTIONS

*Premium graphite and silicon carbide*



**Aerospace**

**Air Bearings**

**Bearing Sleeves**

**Biomedical**

**Crucibles**

**Fuel Cell &  
Energy Storage**

**Heaters**

**Hot Press Die**

**Ink Jet**

**Oil & Gas**

**Optics**

**Photovoltaic**

**Thermal  
Management**

**Ultrasound**



## Overview

POCO manufactures a variety of specialty graphite and silicon carbide materials that are routinely used in a wide range of highly technical industrial applications. POCO is well known for its production of uniform materials that range from 1 micron to 10 microns in particle size, with many post-processes, infiltrations, and coating options. Each grade has characteristics and properties that allow the user to match the ideal material to each application.

## Materials

### Graphite

POCO's graphite grades exhibit unique properties that make them the only choice for many Industrial applications. The proprietary manufacturing process yields synthetic graphite with a higher thermal expansion coefficient than competitive materials. Fine particle size and homogenous microstructure of the graphite yield materials of higher strength and isotropy when compared to competitive synthetic grades. POCO has the capability to perform several post-processes on our materials to enhance specific properties as needed for particular applications.

### Silicon Carbide

Based on a proprietary grade of graphite, the SUPERSiC® family of silicon carbide represents an ideal combination of the superior mechanical and thermal properties of SiC with the low cost manufacturing capability of graphite. The SUPERSiC technology allows the machining of complex components into near net shape in graphite using low cost machining processes. These net shaped articles are then converted directly, through high-temperature processing, into 100% beta-phase silicon carbide. This unique process allows for the manufacture of components that previously couldn't be considered for SiC, opening a trade space for mechanical engineers to use a high-strength, high-stiffness, high thermal conductivity material where no solution may have existed in the past.

The properties of SUPERSiC materials can be further enhanced through impregnations, coatings, and advanced cleaning methods to meet the requirements of specific industries, customers, or projects.

## Applications

### Aerospace

POCO's a leading manufacturer of graphite and silicon carbide materials and products for use in Aerospace applications. These materials find use in extreme environments, in systems that require both unparalleled precision and high performance.

Advanced aircraft engines rely on advanced materials to enable increased performance. Improvements in thermodynamic efficiency that lower specific fuel consumption require higher temperatures, and drive the need for materials that are able to withstand those temperatures. POCO's JET family of graphite is being used in tribological and structural applications in the core of these next-generation engines. JET replaces polymers, whose properties are less stable over large temperature ranges and whose capabilities are below the standards required in these new systems. Typical applications are stator vane bushings, vane tip bushing, thrust washers, bumpers, and seals operating up to 1200°F.

### Air Bearings

POCO graphite materials have high uniform porosity in a wide range of densities. As a result, POCO is able to produce material with airflow in very narrow bands. Customers use this feature to manufacture air bearings with very tight airflow specifications. POCO has the capability to test it's graphite products for permeability prior to shipment, ensuring that customers receive bearings or bulk material that will provide high yield in their assemblies.

Using POCO graphite, OEMs have been able to greatly reduce the cost of their bearings by eliminating machined metal components. As an added benefit, POCO bearings offer protection to high-precision spindles and housings if airflow is unexpectedly interrupted. Improved reliability, increased performance, and lower cost than traditional metal bearings.

### Bearing Sleeves

Graphite has long been applied as a bearing component in mechanical systems due to its inherent self-lubricating properties, high wear resistance and high temperature capability. POCO's family of bearing materials offers the highest performance in industry. The uniform microstructure of the graphite results in high flex strength, high crack resistance, and uniform, predictable wear over the lifetime of the bushing. For applications exceeding 900°F, POCO offers a range of antioxidant impregnations that extend the life of the product and further enhance lubrication. Other impregnations may be added to further increase toughness and reduce friction.

### Biomedical

The biocompatibility, safety and efficacy of carbon and graphite within the human body allows POCO materials to be used in a variety of medical applications. Select graphite grades have FDA approval, via the medical device, for use in medical implants. Applications include mechanical heart valves, cancer treatment therapies, and joint replacements.

### Crucibles

The POCO graphite electron beam evaporation crucibles are designed to offer E-Beam users improved evaporation performance over that obtainable in bare hearth mode. The graphite crucible acts as an “energy efficient” thermal barrier between the molten evaporant and the water cooled copper hearth.

POCO manufactures and stocks a wide range of standard sized crucibles. The crucibles typically utilize POCO AXF-5QPYC, a pyrolytically coated graphite, to seal surfaces and enhance the performance and lifetime of the product.

### Fuel Cell & Energy Storage

Participants in the Electrochemical processing industries, including Fuel Cells, Batteries, and Energy Storage systems, agree that POCO’s AXF-5QPYC material represents the benchmark for performance. Electrodes manufactured from our graphite exhibit longer life and higher efficiency than those made with alternative materials as a result of consistent resistivity, minimal permeability, and inherent chemical stability. POCO works with customers to enable the most efficient plate footprint and flow field designs to optimize cost and performance.

### Heaters

POCO grades are used in a wide variety of electrical heating elements. The uniformity of this graphite ensures that no hot spots develop, extending the life of the manufactured heaters and thereby improving the Cost of Ownership. POCO has the ability to make tube heaters, serpentine heaters, coil heaters, bar heaters, or custom configurations.

### Hot Press Die

POCO graphite represents the ideal material for creating powdered metal dies due to its high temperature capability and high compressive strength. The uniform microstructure of POCO materials ensures the smoothest, most consistent finish for final products. Industry-leading high strength ensures that POCO graphite made dies will outlast those made from competitive materials, providing Cost of Ownership benefits to manufacturers.

### Ink Jet

Manufacturers of Ink Jet print heads are constantly pushing for higher throughput, increased precision, and greater flexibility in print media in their equipment. POCO graphite provides the perfect solution to these requirements. This highly uniform material allows manufacturers to maximize control of drop size to allow for very high speed and high precision. The fine grain size and uniform porosity eliminate the potential for cross-talk between channels even at the tightest jet spacing. Inherent chemical stability from heads manufactured with POCO graphite will endure long-term, industrial use with no degradation of jetting performance.

### Oil & Gas

The first Industrial graphite grade POCO introduced to the market was POCO HPD (Hot Press Dies). This grade is specifically designed for the demanding requirements of manufacturers pressing dissimilar materials to enhance the properties of end products. In the Oil & Gas drilling market, POCO’s HPD is used to press hardening materials like diamond or carbides into hardened metal drill bits, allowing for longer lifetime and less replacement of those tools.

POCO also offers materials for use in pumping and compression equipment that is ubiquitous in the industry. The combination of wear-resistant graphite and POCO’s unique SUPERSiC silicon carbide is used in seals and bearings in liquid and gaseous pumping systems to ensure efficient operation over the life of the equipment.

### Optics

Producers of telescopes for applications ranging from Astronomy to optical sensors have long struggled to find a lightweight, stiff material that can be designed and produced in complex shapes. Beryllium is an ideal candidate, but the toxicity of that metal makes it cost-prohibitive both for manufacturing and for managing through a product’s full lifecycle. POCO SUPERSiC silicon carbide materials solve the problems of producible complexity, and enable development of low initial and lifecycle cost optical substrates, structures, and telescopes.

The enhanced thermal properties of SUPERSiC as compared to traditional optics materials enable customers to design systems that are exposed to wide-ranging (cryogenic to laser energy induced) temperatures without succumbing to thermally-induced fail mechanisms.

**Photovoltaic**

As the Photovoltaic industry strives to control the costs of producing solar cells graphite and silicon carbide materials continue to offer cost effective solutions for a variety of applications. Graphite and pyrolytically coated graphite perform well as heat spreaders and custom components in deposition and diffusion processing. Custom graphite heaters can also be designed to meet the unique size and shape requirements of custom designed equipment.

SUPERSiC silicon carbide horizontal wafer carriers and other SiC custom components offer excellent alternatives to quartz, remaining dimensionally stable through years of high temperature deposition, annealing and cleaning cycles.

These inert materials have proven to be excellent choices in Photovoltaic industry applications including CVD, PECVD, Diffusion and other high temperature and/or highly reactive processes.

**Thermal Management**

As electronics and thermodynamic systems continually increase performance, the localized heat generated in those systems grows exponentially. POCO offers a family of Thermal Management materials including POCO HTC (High Thermal Conductivity) and POCOfoam®. These highly engineered materials rapidly channel heat unidirectionally away from sensitive areas, extending the lifetime and enhancing performance of these systems. Heat sinks using both aerodynamic and enthalpic heat transfer are possible, with a range of density potential that allows designers to maximize the trade between speed of heat removal and system capacity.

**Ultrasound**

The fields of Ultrasonic inspection and imaging are growing rapidly due to improved sensitivity, low relative cost, and safety of modern transducers. Through control of material properties, combined with a range of impregnations, POCO produces graphite with matching layers that exhibit a wide range of ultrasonic impedance, allowing designers to tailor the transmission of ultrasonic frequencies to the needs of their applications.

At the same time, these transducers are producing high heat loads. POCO's HTC material is used by manufacturers to rapidly pull this heat from the transducer and away from sensitive materials (tissues). The combination of light weight and high thermal conductivity create the ideal solution for Medical Ultrasound transducers, providing high performance and comfortable use.

## For More Information

Please call your Regional Customer Service Center today to learn what POCO can do for you. Visit [www.poco.com](http://www.poco.com) and select the "Contact Us" link for the center nearest you.

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