

An example of Air Force supported SBIR/STTR technology that has been transitioned into an Air Force or other DoD system or subsystem or used by Air Force test ranges and facilities or maintenance depots.

**SBIR Topic Number:**  
MDA03-026-AF

**SBIR Title:**  
Ultra-Lightweight Large-Aperture, Silicon Carbide Optical Components

**Contract Number:**  
FA9453-04-C-0323

**SBIR Company Name:**  
Entegris Specialty Materials, Inc.,  
(formerly Poco Graphite, Inc.), Decatur, TX

**Technical Project Office:**  
AFRL Space Vehicles Directorate, Kirtland AFB, NM



## Silicon Carbide Missile Seeker Telescope

- The Missile Defense Agency (MDA) seeks to reduce cost, schedule, and weight for large-aperture optical systems via use of Silicon Carbide (SiC) for opto-mechanical structures and mirror substrates
- In June 2008, an MDA-sponsored payload that included two SiC telescopes was launched on a Black Brant XI sounding rocket from Wallops Island, Virginia
- Entegris Specialty Materials, Inc., (formerly Poco Graphite, Inc.) provided the foundation for the broad development and use of a Chemical Vapor Conversion (CVC) SiC technology for precision optics applications
- This technology insertion is a benchmark for the addition of a SBIR technology into an active military system and highlights the close working relationship between the small business and the prime contractor, Raytheon Missile Systems

Commercialization Pilot  
Program Series

377ABW-2010-1252

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## Air Force Requirement

Numerous government agencies have defined needs for large, lightweight optical systems. The infrared seeker telescopes that guide various missile interceptors are typically made from either aluminum or beryllium. More demanding environmental requirements preclude continued use of aluminum telescopes. Beryllium is also an undesirable material due to its high cost, long lead times and concerns regarding health and safety both during manufacture and after delivery, which require cradle-to-grave tracking on the part of the armed services.

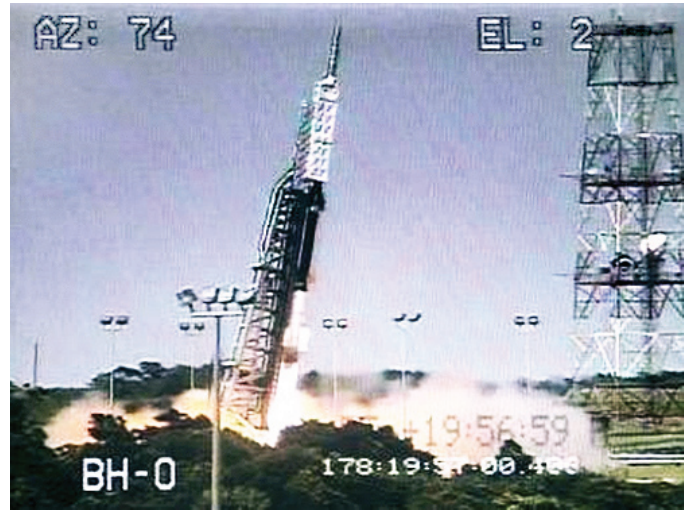
The Missile Defense Agency (MDA) seeks to reduce cost, schedule, and weight for large-aperture optical systems via use of Silicon Carbide (SiC) for opto-mechanical structures and mirror substrates.

## SBIR Technology

During this SBIR project, Entegris Specialty Materials, Inc., (formerly Poco Graphite, Inc.) provided the foundation for the broad development and use of a Chemical Vapor Conversion (CVC) SiC technology for precision optics applications. The goal of the Phase II program was to mature a suitable substitute for beryllium to be used in high performance optics (including mirrors, optical benches, and support structures). In addition, an option for this effort was outlined. This option focused on the development of an improved version of SiC that is denser and stronger than the material tested in Phase I and which offers a substantial advantage for structural components. The SBIR program demonstrated the feasibility of this improved material system, named POCO SuperSiC, as an excellent candidate for optics applications.

## Transition Impact

In June 2008, an MDA-sponsored payload was launched on a Black Brant XI sounding rocket from Wallops Island, Virginia. The payload included two SiC telescopes, each with a 5-inch primary aperture, that have a design consistent with future fill-vehicle sensors.



Launch lift off

The SiC telescopes were manufactured by Entegris (then Poco Graphite) and Axsys Technologies under an MDA-sponsored enhancement to the Phase II project. The objective of the flight experiment was to demonstrate a low-cost alternative to all beryllium telescope designs that may be hampered from supply chain and environmental issues in the future. The all SiC telescopes survived until splashdown as verified by sensors mounted to the telescopes and image data taken just prior to impact.

## Company Impact

"This technology insertion is a benchmark for the addition of a SBIR technology into an active military system and highlights the close working relationship between the small business and the prime contractor," states Christopher Duston at Entegris.

Entegris is a leading provider of premium graphites, carbides and other advanced material solutions to the semiconductor and other high-tech industries. Poco Graphite was acquired by Entegris in 2008.



# SBIR/STTR

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