

## Advanced Materials: Using Pyroid® Pyrolytic Graphite for Glass/Heating Tooling

Pyroid pyrolytic graphite is a man made specialized graphite manufactured by decomposition of a hydrocarbon gas at temperatures in excess of 2000° C in vacuum furnaces. The resultant material produced is an ultra-pure form of graphene but in a structured material that is near theoretical density of carbon and extremely anisotropic.

In the deposited plane (XY plane - with the layers) it has very high thermal conductivity like copper but only 25% of the weight of copper. In the thickness plane (Z plane - across its layers) it has low thermal conductivity, acting as an insulator.

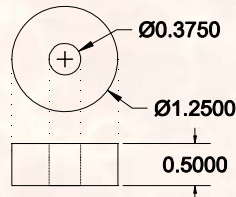
The material traditionally is used in a variety of applications including tooling electronics, semiconductor, aerospace, and industrial production to take advantage of its light weight structure and its ability to provide uniform heating over its surface.

An engineering challenge that designers sometimes face when dealing with pyrolytic graphite applications is what is the best way to attach the material to structures?

To aid designers in the use of this material, this article provides shear test strength data of threaded /tapped sections of two forms of the material, Continuously Nucleated Pyrolytic Graphite (CN-PG) and Sub Nucleated Pyrolytic Graphite (SN-PG) samples

Samples of each graphite type were prepared for shear testing using an Instron Model 5569 Mechanical Tester. All samples had consistent

outside diameters and thicknesses with a center drilled hole. On half of the samples, the center hole was tapped with a 3/8 in X 16 UNC thread. The remaining samples were fitted with 3/8 in X 16 UNC helicoil inserts.



**Figure 1: Sample Part Drawing/Photo of Sample with Helicoil Insert**

The samples were turned onto a threaded rod to a reference torque. The opposite end of the threaded rod was turned into a fixture which was connected to the 10,000 N load cell on the Instron. The sample parts were connected to the bottom deck of the Instron using a "T-channel" mounting fixture. See figure 2 below.



**Figure 2: Set-Up Photos**

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The Instron captured the maximum load (in force-pounds) that the samples supported before shear failure. The data collected from the Instron can be viewed below.

Sample Type	Average Surface Area (mm <sup>2</sup> )	Maximum Load (N)	Pressure (KPa)
Helicoil Inserts (CN-PG)	162.6	3,100	585.8
Threaded (CN-PG)	169.4	8,900	1644.2
Helicoil Inserts (SN-PG)	243.7	5,300	677.7
Threaded (SN-PG)	190.4	4,400	716.9

By using threads and the appropriate fastener, either form of pyrolytic graphite material allows rigid attachment to support the tooling needs of a variety of industries.

**For Details or Samples  
Call, FAX or Email**

Toll Free: 800-962-8586 FAX: 610-250-3325



Pyroid PG SN and CN is ideal material for tools for manufacturing of all mirror surfaces



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