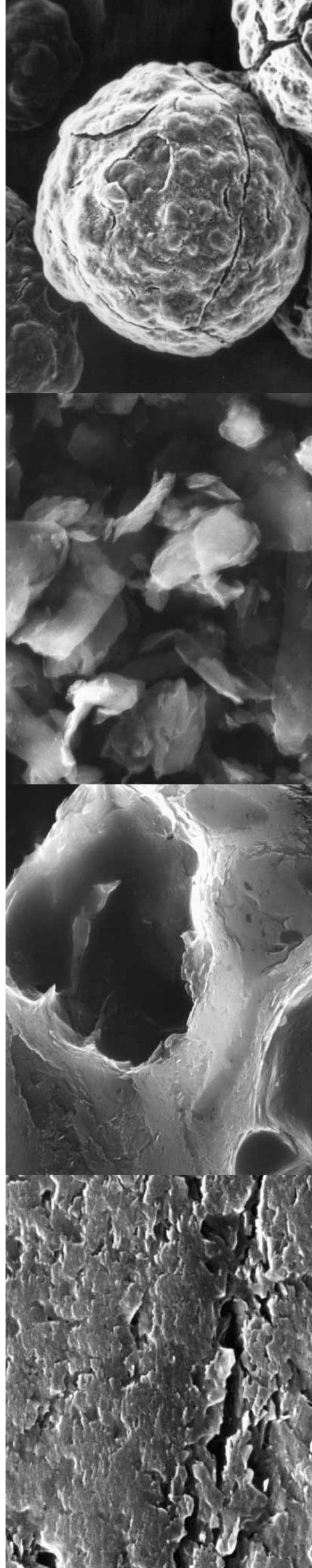


Resilient Graphitic Carbons

Providing unique properties
to promote unique materials



What are RGC Materials?

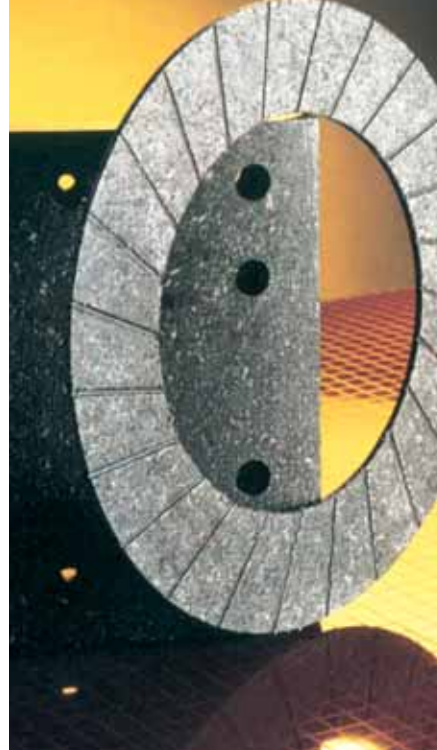
RGC materials are one of the **most unique graphitic carbons** available today. Produced using patented **high temperature thermal purification technology**, and coupled with our many years of graphite/carbon expertise, these products offer superior performance.

Utilizing a variety of **custom raw materials**, RGC materials are developed with the end user in mind. These raw material sources are selected for quality, consistency, and both unique chemical composition and morphology. Once exposed to the thermal purification process, these materials are transformed into graphitic materials with **high purity** and the **added feature of resiliency**.

Resilient Graphitic Carbons are used for highly innovative products in different applications:

- **Friction materials**
- **Polymer composites**
- **Carbon brushes and parts**
- **Coatings & lubrication**
- **Loss circulation materials (LCM) for oil fields**

Our innovative, highly educated and skilled development team, continually strives to engineer new RGC materials with **revolutionary properties**. This team is dedicated to investigate the performance of our products in the field and evaluates new raw material sources and advanced technologies to develop advanced knowledge of the carbon matrix. The development team supports our field sales engineering teams worldwide by providing technical information, expert product analysis, and specific recommendations or alternative solutions for customers.



Superior Graphite

Throughout its long history, Superior Graphite has remained committed to three core principles: ingenuity, versatility, integrity. This has enabled us to adapt to ever-changing business and economic conditions, and led to a process of continuous growth and evolution with our customers.

Since its foundation in 1917, our company has explored the physical and geographic frontiers of its markets. In the late 1970's, this pioneering approach led to the invention of a new, patented furnace technology that revolutionized our product range and transformed the company. Until then, graphite was mainly processed from natural mineral resources or the re-crushing of used electrodes. We were the first to **manufacture graphitic** powders on a continuous basis using proprietary technology. We subsequently expanded the boundaries of natural and synthetic graphite purification, as well as the process of synthesizing graphite or other carbon-based materials. We have also explored new avenues in continuous purification technology, and developed a number of innovative processes.

We are committed to continuously collaborate with our business partners, harnessing the challenges of today, and turning them into the opportunities of tomorrow. Solutions from Superior Graphite are tools that will positively impact your success.

***We create value for our customers by providing Superior Solutions
- utilizing our unique technologies, processes and talents -
while contributing to the company's long-term success.***



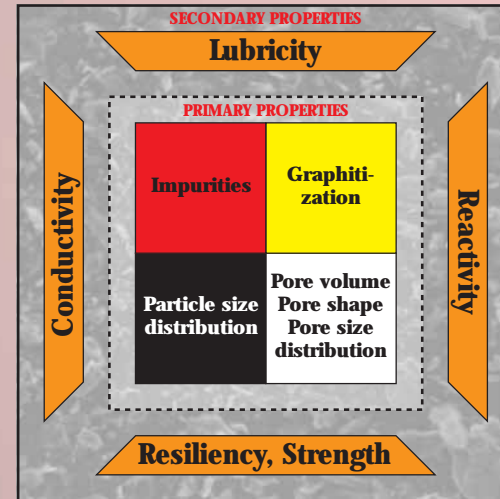
Primary and Secondary Properties

Graphite and coke as well as RGC's are controlled in their properties by key characteristics such as:

- Degree of Graphitization
- Level of Impurities
- Pore Size and Morphology
- Particle Surface Morphology

RGC's have proven to be an innovative raw material for numerous applications, such as friction and polymer.

The unique combination of strength, lubricity and resiliency is based on the accurate control of these primary properties.

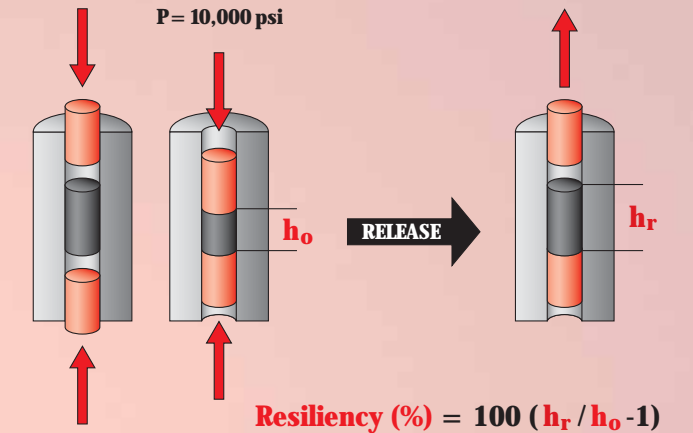


Resiliency Test Method

In order to quantify resiliency, a mechanical test method is applied.

Samples are placed in a metallic mold and exposed to various pressures ranging from 5 - 70 MPa (700 - 10,000 psi).

Particles are compressed and are able to recover their shape after pressure is released without damage.



RGC's show a unique spring back effect, higher than all other known carbonaceous materials.

Properties of RGC Materials

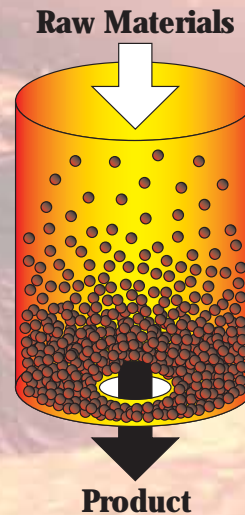
High Temperature Manufacturing Process

Based on a proprietary high temperature process, Superior Graphite has developed the concept of producing RGC's

Controlled carbonaceous raw materials are specifically chosen and are subjected to temperatures of 1900°C - 2700°C.

In this high temperature technology, impurities are removed thus leaving a very unique and controlled microstructure. The degree of graphitization is depending on furnace conditions and feed stock.

Composites can be synthesized by introducing additional raw materials, leading to highly innovative components such as RGC coated with SiC or metallic elements.



Application oriented testing

Numerous applications require resiliency under different conditions.

In order to analyze the compaction behavior under different pressure levels and to allow predictions about the stability of the resiliency over time, Superior Graphite has developed a resiliency tester which allows static and dynamic tests.

Supplemental grain size analysis prove that even under high pressure RGC's resist cracking.

Resiliency Test Machine



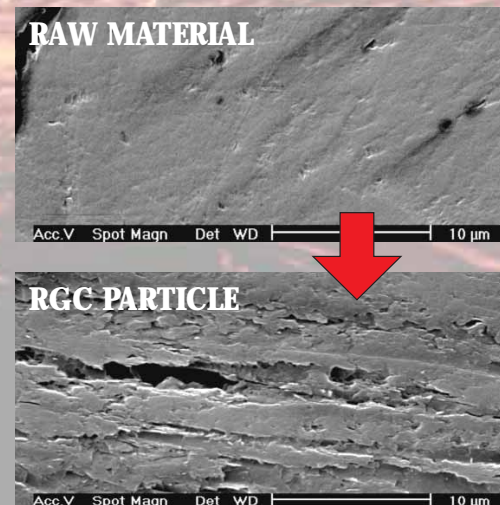
RGC Properties

By utilizing raw materials with different secondary properties and various processing parameters different RGC's can be produced.

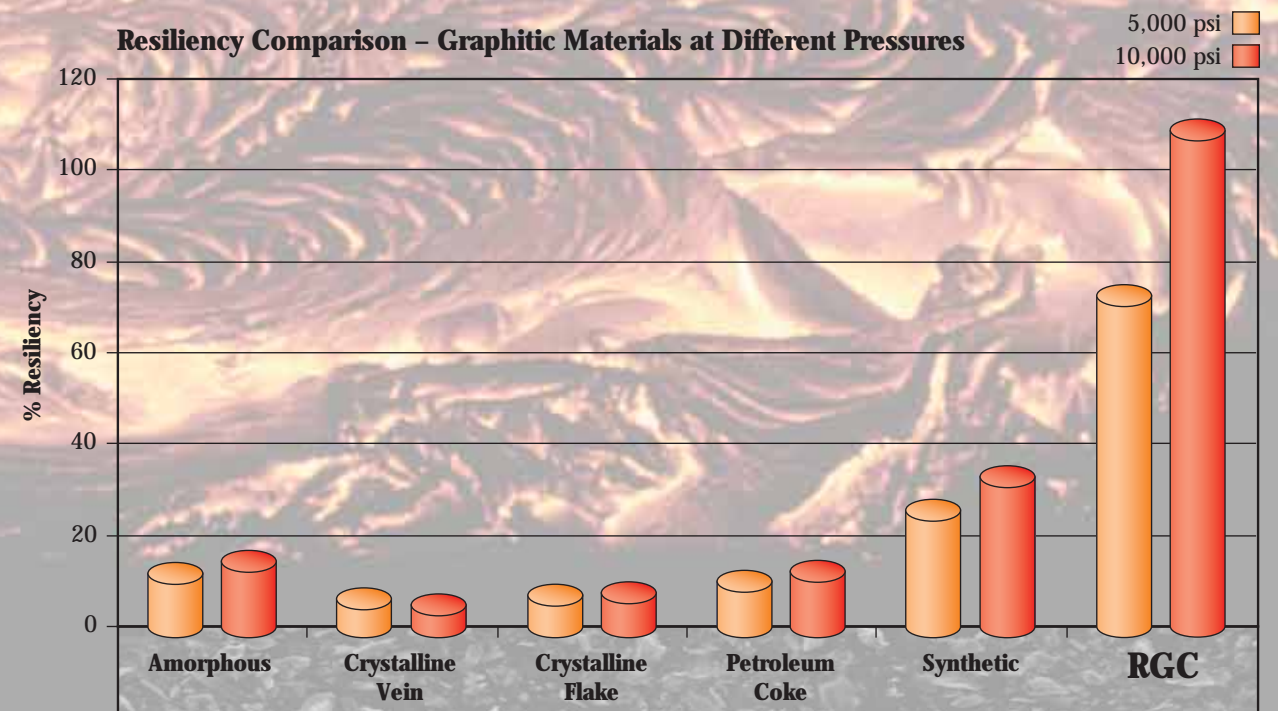
The process is characterized by dramatic changes in primary and secondary properties.

All RGC grades possess high resiliency and high purity.

Carbon **99.9%**
 Degree of Graphitization **80%**
 True density **1.6 g/cc unique pore structure**
 Resiliency **100-150% (specified)**



Resiliency Comparison - Graphitic Materials at Different Pressures



Performance in main applications; Friction and Engineered Polymers

RGC was first successfully used as friction modifiers in brake linings. A moderate addition (1-5%) of relative coarse RGC material into NAO, Semi-Metallic or Low Steel formulations is enough to control and adjust the compressibility of the pads regardless of the working temperature.

In addition, it has been demonstrated that RGC strongly contributes to the noise reduction and reduces vibration development.

Primary advantages are directly related to the extraordinary high resiliency of the RGC product line.

RGC; imparting graphitic performance/properties may also contribute to lubrication and energy dissipation in such applications.

The RGC product line can be developed for critical specifications with respect to particle size distribution (PSD). The resiliency as well as other parameters are strictly controlled; starting from raw material to end products ensuring customer a very reliable consistency over the time.

Finer particle size RGC grades are used as “tribological fillers” in Engineered Polymers. In close collaboration with Universities and end users fine RGC used alone or in conjunction with some other fillers have been demonstrated to be a strong contributor to tribological properties improvement.

A 5% addition of fine RGC improves wear resistance and friction of PEEK, PAI, PA66, PPS or PI polymers.

At same time, the mechanical properties, like Tensile Strength, of the polymers are minimally affected while using RGC; unlike alternative materials such as Synthetic Graphite.

Current industrial applications are:

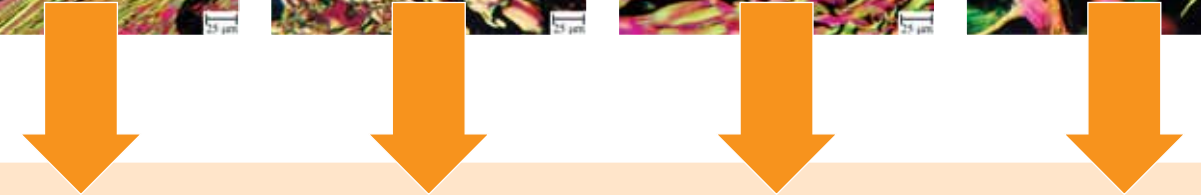
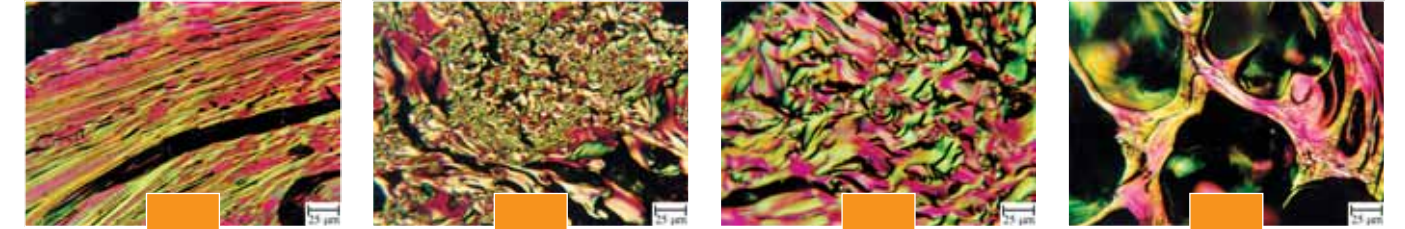
- Plain bearings for Diesel injection pump in PEEK
- Anti Friction coating for engine piston skirt in PAI
- Friction torque limiters in dampened flying wheels PEEK

The unique combination of the choice of raw materials and processing technologies used to make RGCs result in a specific morphology, particle size, and crystalline properties that enhance their performance in polymer applications. For examples due to the combination of these proprieties, high levels of RGCs are easily mixed into the polymer matrix in order to provide the desired results.



Key to Innovation

Images by: Professor John C. Crelling, Southern Illinois University



Controlled, Consistent Raw Materials

RGC Materials are available globally, thanks to Superior Graphite Co.'s extensive worldwide distribution network. Our customer service specialists assure that all shipments conform to consistent standards; which assure the right product, in the desired quantity arrive with the correct documentation, at the right time.

- **Flexible production and services assure that we can provide tailor-made products and product combinations that are consistent and cost efficient. We recognize the customer as an individual partner with unique requirements.**
- **Our ISO 9001: 2008 certified quality management systems assure that the supply of our graphite and carbon materials will meet agreed-upon specifications at all times.**
- **Responsibility to the environment is an important factor in the development, sourcing and production of our products.**

RGC are available in different size. For more detail please refer to RGC Product Line current portfolio which can be requested from our customer service location in Sweden and USA.

Business Centers:

Chicago, IL, USA
Sundsvall, Sweden

Manufacturing Facilities:

Chicago, IL, USA (3)
Hopkinsville, KY, USA (3)
Russellville, AR, USA (1)
Sundsvall, Sweden (1)

**Research and
Development Center:**

Peter R. Carney
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