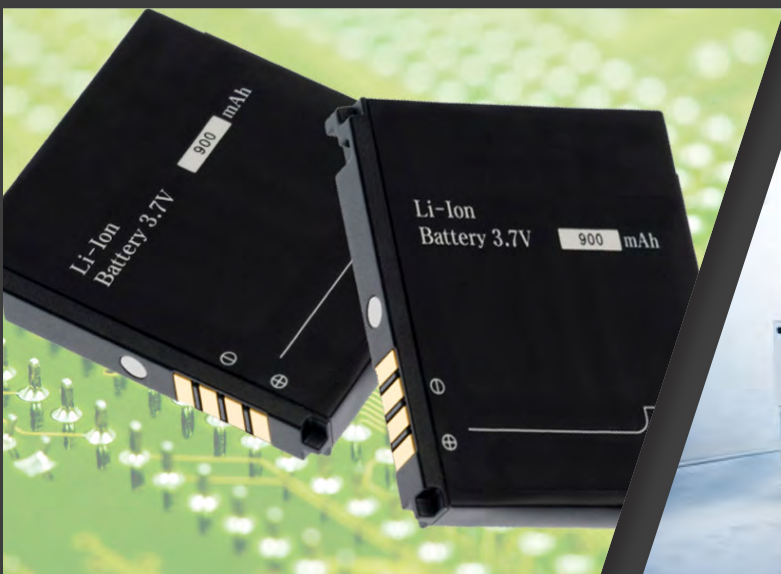


**GRAFTech**  
*International*

**GRAF+**<sup>TM</sup>

## Advanced Graphite Powders

*Redefining Limits in Powder Technology*





## GRAPHITE POWDER AS A SOLUTION FOR YOU

GRAF+™ graphite powders contain many unique physical properties including:

- Superior electrical and thermal conductivity
- Highly crystalline structure and high purity
- Temperature stability
- Lubricity and inertness



Such diverse characteristics make graphite an ideal choice for a wide variety of applications.

## DELIVERING GRAPHITE POWDERS AND EXPERTISE

GrafTech leads the world in carbon science and is a partner of choice for your application.

- Global Supply**  
*As one of the largest graphite producers in the world, GrafTech relies on a global supply chain that can meet your needs on any continent.*
- Product Quality**  
*Our purity is among the highest in the world.*
- Processing Capability**  
*GrafTech has the ability to meet your specification in terms of custom processing and packaging to fit your operation.*
- Research and Development**  
*Our in-house R&D separates us in the carbon world as the clear leader.*



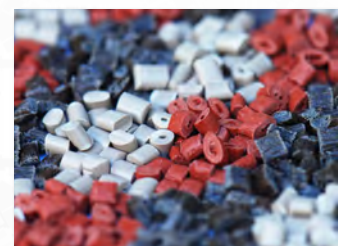
## TYPICAL APPLICATIONS OF CARBON AND GRAPHITE POWDERS



Powder Metallurgy



Friction Modifiers



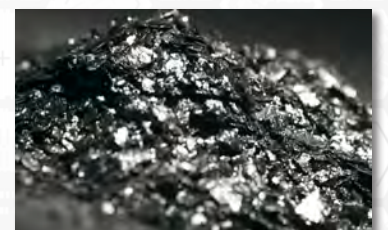
Polymer Additives



Powder Coatings

Typical Application	Synthetic Graphite Powders	Expanded Natural Graphite Powders	GRAFGUARD® Flame Retardant Additive*
Batteries	✓	✓	
Carbon Brush	✓		
Polymer Additives	✓	✓	
Flame Retardants			✓
Conductive Coatings		✓	
Friction Modifiers	✓		
Lubricants	✓	✓	
High Temperature Additives	✓	✓	
Carbon Raisers	✓	✓	
Powder Metallurgy	✓		
Gaskets and Seals		✓	

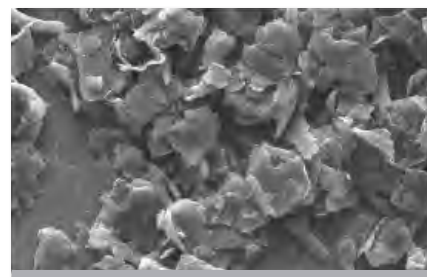
\***GRAFGUARD®** Expandable Graphite Flake is a flame retardant additive for materials that require improved fire protection characteristics, including wood, foam, plastics, and other construction and building materials. This product can also be used to improve the performance of fire retardant additives such as phosphates, halogens, and nitrogen compounds. The treated graphite flakes are designed to expand up to 100 times its original thickness, resulting in a non-burnable, insulating layer.





## TESTING CAPABILITIES

- Carbon Content
- Moisture
- Trace Element Analysis
- Electrical and Thermal Conductivity
- Bulk and Tapped Density
- Particle Size Analysis
- Screen Analysis
- Surface Area
- Aspect Ratio
- Oxidation Onset Temperature
- X-Ray Lattice
- SEM Scanning Electron Microscope



Milled Synthetic Graphite Powder



Exfoliated Natural Graphite

## TYPICAL PROPERTY RANGES FOR CONVENTIONAL SYNTHETIC GRAPHITE POWDERS

Characteristic	Unit	Typical Property Range
Average Particle Size	µm	2 - 20,000
Ash	%	0.01 - 0.1
XRD Lattice Parameters	$C_c/2$ (nm) $L_c$ (nm)W	0.3354 - 0.380 20 - 100
BET Surface Area	m <sup>2</sup> /g	5 - 25
Helium Density	g/cm <sup>3</sup>	2.20 - 2.26
Electrical Resistance	µΩm	2 - 50
Thermal Conductivity	W/mK	10 - 50
Sulfur Content	%	<0.1 - 0.5
Morphology	-	Spherical, Platelet, Needle
Aspect Ratio	-	1 - 10
Oxidation Onset Temperature (Determined by TGA)	°C	600 - 750

## PRIMARY SYNTHETIC POWDER

Characteristic	Unit	GP44-B Typical Property	GP55-B Typical Property
Ash	%	0.08	0.06
Moisture	%	0.02	0.02
A.D.	Scott	0.23	0.222
Real	Helium	2.25	2.24
BET Surface Area	m <sup>2</sup> /g	8.9	8.0

## SECONDARY SYNTHETIC POWDER

Characteristic	Unit	GS75 Typical Property
Ash	%	0.01
Moisture	%	0.02
A.D.	Scott	0.28
Real	Helium	0.28

## EXPANDED NATURAL GRAPHITE

Characteristic	Unit	Typical Property
Ash	%	2.25
Moisture	%	0.2
A.D.	Scott	0.05
BET Surface Area	m <sup>2</sup> /g	20

## GLOBAL PARTNER OF CHOICE

GrafTech International is a global company that has been redefining limits for more than 125 years. We offer innovative graphite material solutions for our customers in a wide range of industries and end markets, including steel manufacturing, advanced energy, industrial heat management and latest generation electronics.



- 730+ issued and pending patent applications
- 16 R&D 100 Awards recognizing groundbreaking technology
- 125+ scientists, engineers and R&D professionals
- Extensive testing facilities and capabilities
- Equipment to duplicate or simulate process technology
- Lean manufacturing expertise
- Sales in 80+ countries

## GRAFTECH LOCATIONS

### North America

Biddeford, Maine (Fiber Materials Inc)  
 Clarksburg, West Virginia  
 Columbia, Tennessee  
 Emporium, Pennsylvania  
 Lakewood, Ohio  
 Lawrenceburg, Tennessee  
 Monterrey, Mexico  
 Parma, Ohio  
 Port Lavaca, Texas (Seadrift Coke LLC)  
 Presque Isle, Maine (Fiber Materials Inc)  
 Sharon Center, Ohio  
 St. Marys, Pennsylvania

### South America

Salvador, Brazil  
 São Paulo, Brazil

### Europe, Middle East & Africa

Bussigny, Switzerland  
 Calais, France  
 Malonno, Italy  
 Meyerton, South Africa  
 Notre Dame, France  
 Pamplona, Spain  
 Vyazma, Russia

### Asia

Beijing, China  
 Hong Kong, China  
 Shanghai, China



For additional information, visit [www.graftech.com](http://www.graftech.com).

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