

GRAFGUARD® expandable graphite flake is an intumescent material used as a fire retardant additive in plastics, foams, putties and coatings. Upon exposure to high temperatures, the material forms a graphite char that is more resistant to degradation than the carbon chars formed from typical chemical intumescent. GRAFGUARD® material contains no halogenated fire retardant additives, and is manufactured without the lead or chromium that can be found in other expanding graphite flakes.

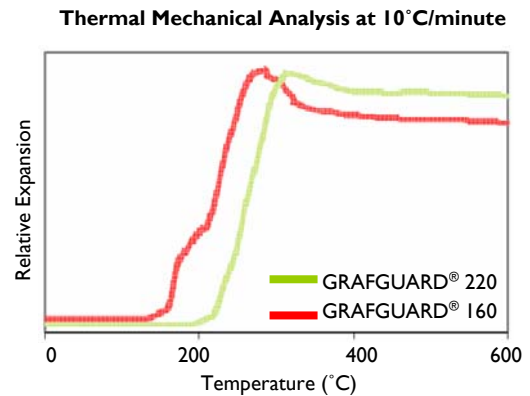
Technical Profile

Manufactured from natural graphite flake, the proprietary processing for GRAFGUARD® expandable graphite inserts an expansion agent (or intercalant) between the parallel layer planes in the graphite. Beginning at temperatures as low as 160°C, the intercalant degrades to produce gases that force the layer planes apart. The force of this expansion enables ideal application as an intumescent additive for putties, pipe collars and other firestop products. In plastics, foams and coatings, the layer of expanded graphite forms an effective insulating “char” layer that protects the substrate from heat and air and interferes with the migration of decomposition products to the combustion zone.

Onset Temperature

The onset temperature defines the temperature at which a material begins to expand. This expansion is important whether the material is being used as an intumescent agent, or to form a protective heat insulating char layer.

Onset of Expansion Temperature	Recommended Applications	Typical Usage
160°C	<ul style="list-style-type: none"> Highest expansion required at the lowest temperature The lowest onset temperature of any expandable graphite flake available 	<ul style="list-style-type: none"> Intumescent putties, sealants and mats Fire-retardant foams for building insulation, transportation seating
220°C	<ul style="list-style-type: none"> Mixing, extrusion or processing at higher temperatures is required 	Fire-retardant additive in plastics: <ul style="list-style-type: none"> Polyethylene Polypropylene High-impact polystyrene



Expansion Performance

GRAFGUARD® flake has been shown to expand up to eight times more than competitive products, exhibiting superior performance even at low temperatures. This high expansion makes it possible to reduce loading levels and improve performance. As the amount of additive is reduced, the probability that the physical properties of the final product will be affected is also reduced. Before expansion, GRAFGUARD® particles have a specific volume of about 1.25 cm³/g. After expansion at 600°C, the expanded volume is dependent on the onset temperature and particle size.

GRAFGUARD® Grade	Expansion Volume at 600°C (cm ³ /g)	Mesh	Recommended Applications	Mean Particle Size
160-50	250	65% on 50 mesh nominal	<ul style="list-style-type: none"> Maximum expansion is desired 	350 micron typical
220-50	200			
160-80	200	65% on 80 mesh nominal	<ul style="list-style-type: none"> Particles must be widely distributed Particles must pass through a small orifice 	250 micron typical
220-80	100			

For additional information, contact the GrafTech Sales Office: +1 (800) 253-8003 (Toll-Free in USA), +1 (216) 529-3777 (International), +1 (216) 529-3922 (Fax)

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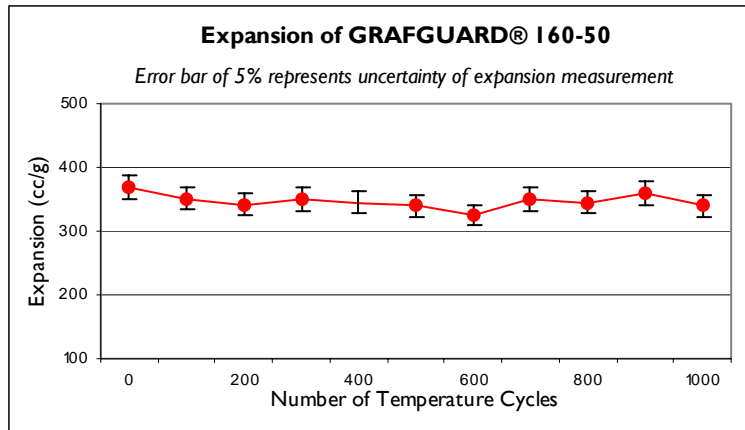
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For patent information visit www.grafguard.com/patents

Performance Stability

Where conventional flame retardants can lose effectiveness when subjected to heat, humidity or UV radiation, GRAFGUARD® products remain stable indefinitely and provide dependable expansion.

Cycled from temperatures below freezing to above boiling (-10°C to +110°C) six times each day, expansion measurements show that GRAFGUARD® products exhibit no degradation in expansion volume, even after hundreds of cycles.



Surface Chemistry

The surface chemistry of GRAFGUARD® expandable graphite can be modified to meet specific processing or formulation requirements. Grades are offered as “N” neutral (pH 5-8.5) or “B” basic (pH 7.5-11).

Grade Designation

Every GRAFGUARD® product is identified by a specific grade. For example, **220-50N** represents a flake with an onset temperature of 220°C, manufactured from 50 mesh natural graphite, with N neutral surface chemistry.

220-	50	N
Onset Temperature (°C)	Particle Sizing (Mesh)	Surface Chemistry (Neutral or Basic)

Environmental Benefits

Emphasis on environmental protection is at an all-time high, and continues to increase. Regulations worldwide are becoming more stringent as legislators seek new ways to prevent greenhouse gases, heavy metals and other toxic substances from entering the environment. This trend is reducing the number of acceptable fire retardant additives that meet new and anticipated environmental requirements.

GRAFGUARD® expandable graphite provides an alternative to halogenated fire retardant additives. It contains no chlorine or bromine compounds, and has been proven to be compatible and synergistic with many other conventional fire retardant additives in a wide variety of plastics, foams, coatings, composites and paper products. The material presents no explosion hazard, and can be handled safely without special precautions.

In addition, GRAFGUARD® expandable graphite is manufactured without the lead and chromium that can cause certain graphite flakes, as well as the products containing them, to be treated as hazardous waste—eliminating the need, expense and potential liability of hazardous waste disposal.

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