

# Flame Retardant Additive

## TECHNICAL DATA SHEET 226

### Product Overview

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

### 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 Neutral surface chemistry.

<b>220-</b>	—	<b>50</b>	—	<b>N</b>
Onset Temperature (°C)		Particle Sizing (Mesh)		Surface Chemistry (Neutral or Basic)

### 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 TEMPERATURE	USE WHEN	APPLICATIONS
160 to 180°C	High expansion is required at low on-set temperatures	Intumescent putties, sealants and mats Fire-retardant foams for building insulation, transportation seating
200 to 220°C	Mixing, extruding or processing at higher on-set temperatures	Fire-retardant additive in plastics: Polyethylene Polypropylene High-impact polystyrene
250°C	Processing temperatures are high	Fire-retardant additive in plastics Polyethylene Polypropylene High-impact polystyrene Plasticized PVC

### 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).

### 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 negatively affected is also reduced. Before expansion, GRAFGUARD® expandable graphite flakes have a typical tap density between 0.69 to 0.85 g/cm<sup>3</sup>.

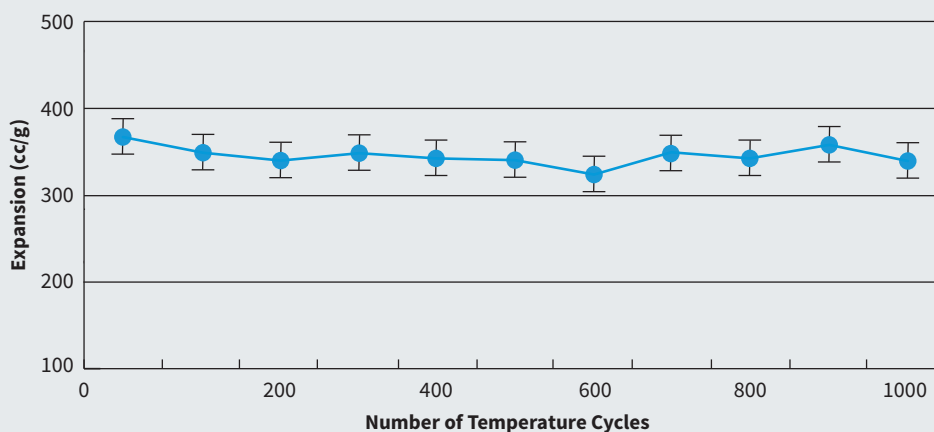
GRAFGUARD GRADE	TYPICAL EXPANSION VOLUME AT 600°C (CM <sup>3</sup> /G)	MESH	USE WHEN	TYPICAL AVERAGE PARTICLE SIZE
160-50N	250	65% on 50 mesh nominal	Maximum expansion is desired	350 microns
160-80N	200	65% on 80 mesh nominal	Particles must be widely distributed, Particles must pass through a small orifice	250 microns
180-60N	260	65% on 50 mesh nominal	Fast, high expansion is desired	320 microns
200-100N	175	65% on 100 mesh nominal	Fine particle size is required	150 microns
210-140N	80	65% on 140 mesh nominal	Very fine particle size is required	105 microns
220-50N	200	65% on 50 mesh nominal	Maximum expansion is desired	350 microns
220-80N and B	100	65% on 80 mesh nominal	Particles must be widely distributed, Particles must pass through a small orifice	250 microns
250-50N	200**	65% on 50 mesh nominal	Processing temperatures are too high to use other grades	350 microns

Notes: \*\*Expansion conducted at 800°C using the hot crucible method

### Performance Stability

Where conventional flame retardants can lose effectiveness when subjected to heat, humidity or UV radiation, GRAFGUARD® products remain stable indefinitely and provide reliable, consistent, dependable expansion. The materials tested were cycled from temperatures below freezing to above boiling (-40°C to +110°C) every four hours. The expansion measurements show that GRAFGUARD® products exhibit no degradation in expansion volume, even after 1000 cycles.

**EXPANSION OF GRAFGUARD® 160-50**  
 Error bar of 5% represents uncertainty of expansion measurement



### Environmental Benefits

NeoGraf Solutions is ISO 14001 certified and our GRAFGUARD® expandable graphite materials are REACH and RoHS compliant. Emphasis on environmental protection is at an all-time high and continues to increase. Consumer awareness combined with worldwide regulations that 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 a consistent, high performing, environmentally friendly, and cost-effective 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, mastics, adhesives, paints, paper products, and building and construction materials. The material presents no explosion hazard and can be handled safely without special precautions.

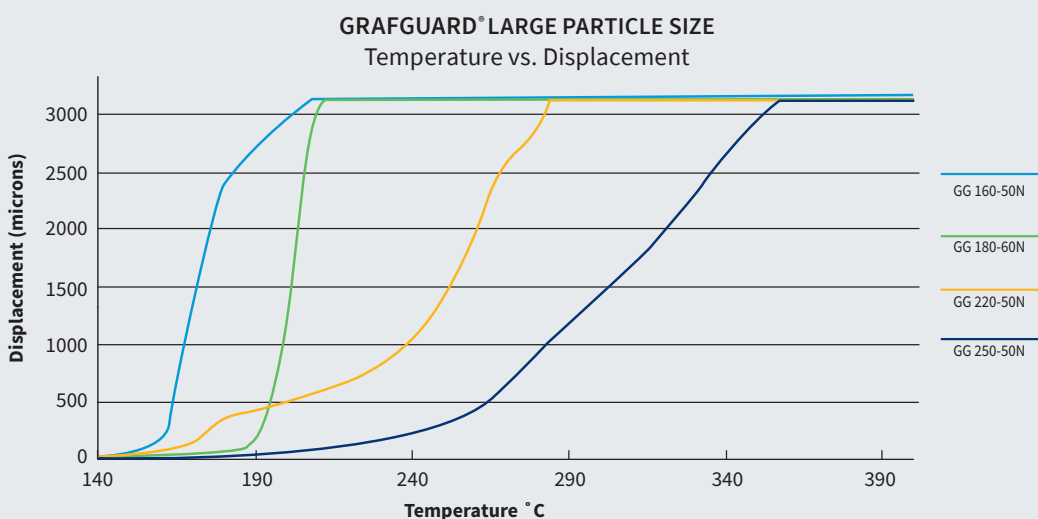
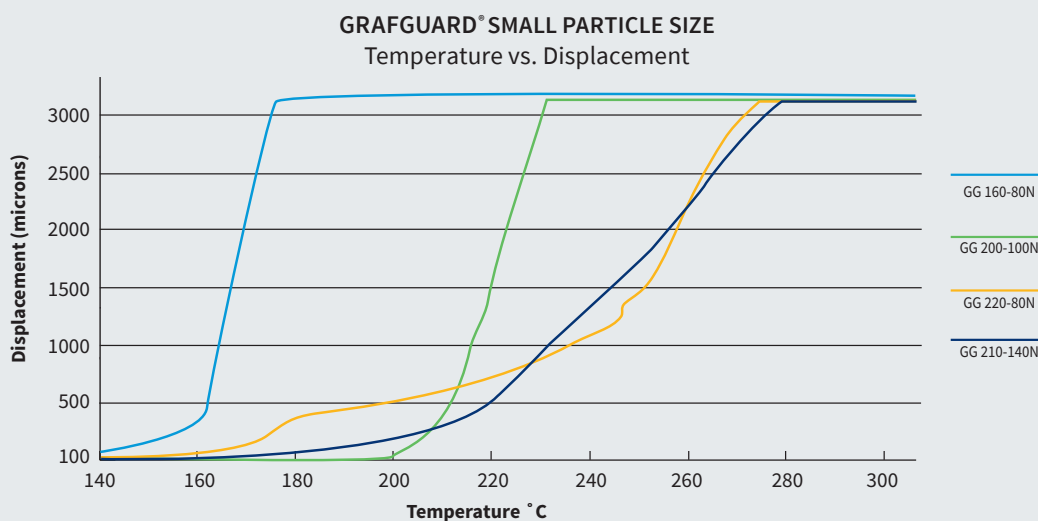
Our highly automated intercalation process produces the most consistent product with the largest treating capacity in the world. Our expertise allows us to use a diverse global graphite supply to ensure consistency and quality to our customers. GRAFGUARD® expandable graphite is manufactured without the 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.

NeoGraf solutions has a long history, over 130 years, in the graphite business from the first arc carbons lighting up the streets of Cleveland to the most complex electronics cooling applications for today’s smart phones to the GRAFGUARD® expandable graphite protecting our structures and homes from fire and smoke. Our processes and products are ISO 9001 certified and we strive for continuous improvement.

## Optimizing Product Selection to Enhance System Performance

NeoGraf Solutions Application Engineering Team will share their expertise in polymers and graphite to work with customers to optimize the system performance required by recommending the best GRAFGUARD® product and synergists, utilizing the widest expandable graphite portfolio in the world.

The performance of the GRAFGUARD® material can be observed by analyzing the TMA curves of the different grades. The TMA curves show the on-set temperature and the slopes of the expansion rates of the different grades. The materials are engineered to allow the specific grade to be matched with the application. The different grades of GRAFGUARD® expandable graphite flakes can be combined with many synergistic fire-retardant additives to allow for the optimal system performance at the lowest total loading levels.



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