

# GrafGuard® 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 materials contain no halogenated fire-retardant additives and are manufactured without the lead or chromium that can be found in some other expandable graphite flakes. With the addition of synergistic chemicals, customers are able to meet a variety of fire ratings and accelerate their new product development.

### 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. The char layer can also be designed for increased stability to prevent drips during a flame test.

### Grade Designation

Every GrafGuard product is identified by a specific grade. For example, GG220-50N represents a flake with an onset temperature of 220°C, manufactured from 50 mesh natural graphite, with neutral surface chemistry.

GG220	—	50	—	N
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 polyurethane foams
200 to 220°C	Mixing, extruding or processing at elevated temperatures	Fire-retardant additive in plastics and coatings, such as polyethylene, polypropylene, polystyrene, etc.
250 to 280°C	Processing temperatures are higher than ~210°C.	Fire-retardant additive in high melt temperature plastics, such as plasticized PVC, PA6, ABS, etc.

## Surface Chemistry

The surface chemistry of GrafGuard expandable graphite can be modified to meet specific processing or formulation requirements. Grades are typically offered as “N” neutral (pH 5 to 8.5).

## Expansion Performance

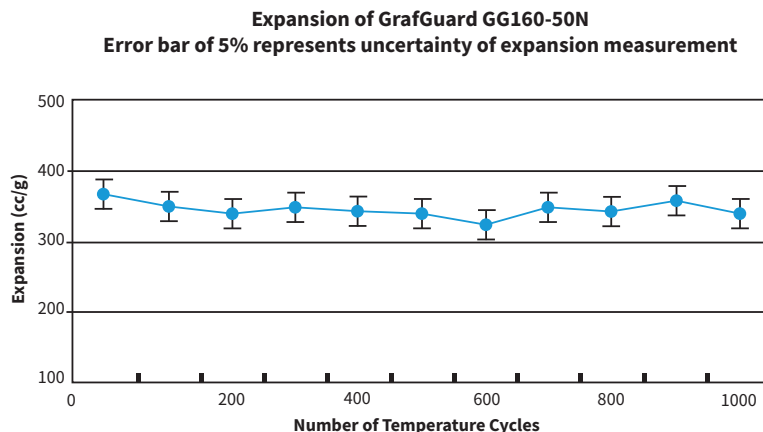
GrafGuard flake has been shown to expand up to eight times more than other intumescent systems, exhibiting superior performance even at low temperatures. This high expansion makes it possible to reduce overall loading levels of the non-halogenated fire-retardant system. As the amount of additive is reduced, 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> with a physical density of 1.8 to 2.2 g/cm<sup>3</sup>.

GRAFGUARD GRADE	TYPICAL EXPANSION (CC/G)			TYPICAL SIZING US MESH
	400°C	600°C	800°C	
GG160-50N	130	290	655	65% on 50 mesh
GG160-80N	120	200	390	65% on 80 mesh
GG180-60N	80	240	645	65% on 50 mesh
GG200-100N	90	160	350	65% on 100 mesh
GG210-200N	50	120	230	65% on 200 mesh, <1% on 50 mesh
GG220-50N	70	170	660	65% on 50 mesh
GG220-80B	90	165	390	65% on 80 mesh
GG225-270N	30	50	100	60% on 200 mesh, <5% on 80 mesh
GG250-50N	15	30	175	65% on 50 mesh
GG280-50N	-	50	250	65% on 50 mesh

**Note:** Typical expansion values should not be construed as a specification.

## 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 recycled 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 1,000 cycles.



## Environmental Benefits

NeoGraf Solutions' GrafGuard expandable graphite materials are REACH and RoHS compliant and ISO 14001:2015 certified. Our GrafGuard materials, GG220-80B, GG160-50N, GG160-80N, GG180-60N, GG210-200N, GG220-50N, GG220-80N, GG200-100N, GG250-50N, and GG280-50N are listed on the OEKO-TEX<sup>1</sup> list of accepted active chemical products. 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.

NeoGraf's highly automated intercalation provides the highest level of consistency in product performance. 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 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.

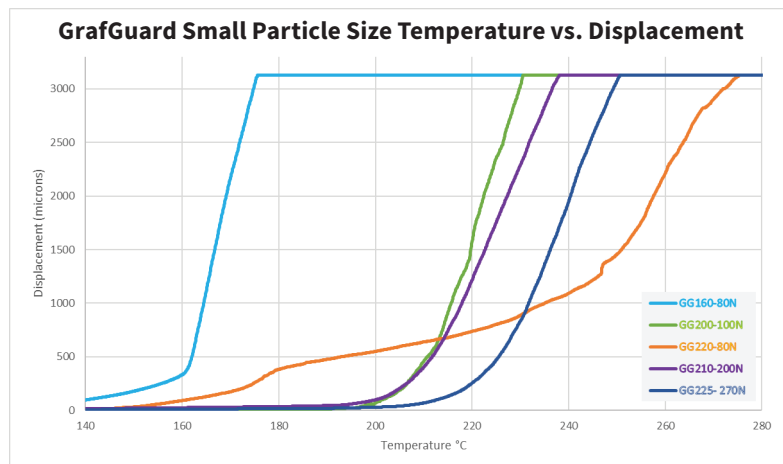
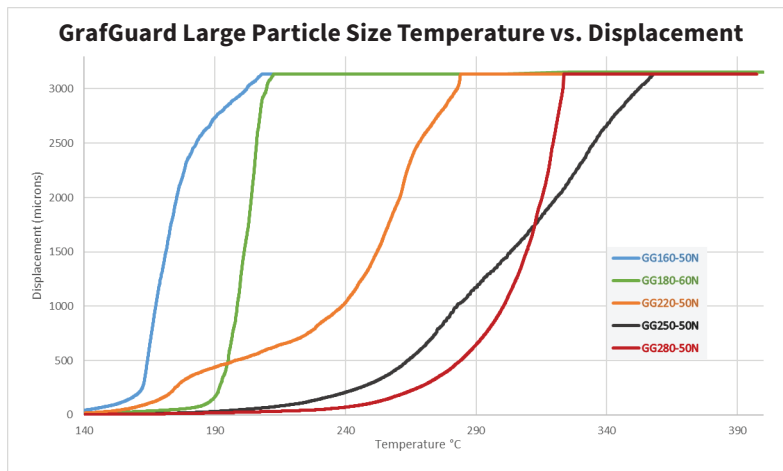
NeoGraf Solutions has a long history, over 140 years, in the graphite business from the first arc carbons lighting up the streets of Cleveland, Ohio to the most complex electronics cooling applications for today's smart phones to the GrafGuard expandable graphite protecting our structures and homes from fire and smoke. Our processes and products are ISO 9001 certified and we strive for continuous improvement.

<sup>1</sup> OEKO-TEX® [https://www.oeko-tex.com/en/apply-here/active-chemical-products/accepted-acps?tx\\_solr%5Bfilter%5D%5B0%5D=type%3Aflame\\_retardant&tx\\_solr%5Bpage%5D=7](https://www.oeko-tex.com/en/apply-here/active-chemical-products/accepted-acps?tx_solr%5Bfilter%5D%5B0%5D=type%3Aflame_retardant&tx_solr%5Bpage%5D=7)

## Optimizing Product Selection to Enhance System Performance

The 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 materials can be observed by analyzing the Thermomechanical Analysis (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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