

3M Advanced Materials Division

# 3M™ Boron Nitride Cooling Fillers

**Important Notice and Disclaimer:** 3M Boron Nitride Cooling Filler Flakes and Agglomerates are experimental or developmental products that have not been introduced or commercialized for general sale, and their formulation, performance characteristics and other properties, specifications (if any), availability, and pricing are not guaranteed and are subject to change or withdrawal without notice.

## Introduction

3M™ Boron Nitride Cooling Fillers are engineered to improve thermal conductivity in polymers while maintaining or improving electrical insulation. Their unique properties make these additives suitable for many thermoplastic, elastomer and thermoset resins used in a wide variety of electrical and electronic applications – including thermal interface materials (TIM), consumer electronics and automotive applications.

3M Technical Ceramics offers a family of boron nitride cooling filler materials:

- 3M™ Boron Nitride Cooling Filler Platelets: powders of highly crystalline single platelets
- 3M™ Boron Nitride Cooling Filler Agglomerates\* (experimental product): soft, randomly oriented aggregated platelets
- 3M™ Boron Nitride Cooling Filler Flakes\* (experimental product): hard, oriented aggregated platelets

## 3M™ Boron Nitride

3M™ Boron Nitride is a versatile ceramic material offering thermal conductivity, temperature stability, chemical resistance, high reflectivity, lightweighting and electrical insulation. The structure of layered hexagonal plates provides outstanding lubricating properties and is non-abrasive to tooling.

3M boron nitride products are manufactured at fully dedicated, ISO 9001 and 14001 certified facilities. Our manufacturing processes are optimized for quality, efficiency and consistency – helping ensure reliable and repeatable product performance.

## Expertise in Production - and Customer Service

Our experienced specialists will work with you to develop and optimize custom boron nitride products for your application. The particle size, powder morphology and chemical composition of 3M boron nitride can be tailored to your specific requirements. We are ready to assist you with initial design and development, and our extensive and well-equipped manufacturing facilities allow us to quickly scale-up to full production.

For more information, contact us at 1-800-367-8905.

## Typical Physical Properties

(Not for specification purposes)

O	<0.7%*
C	<0.2%**
B <sub>2</sub> O <sub>3</sub>	<0.1%***
BN	>98.5%****

\* Platelets CFP 003, 003E and 003SF: O ≤1.1%  
Platelets CFP 001: O ≤1.2%  
Agglomerates CFA 250S: O ≤10.0%

\*\* Platelets CFP 012P: C ≤2.0 %

\*\*\* Platelets CFP 001 and 003SF: B<sub>2</sub>O<sub>3</sub> ≤0.2%

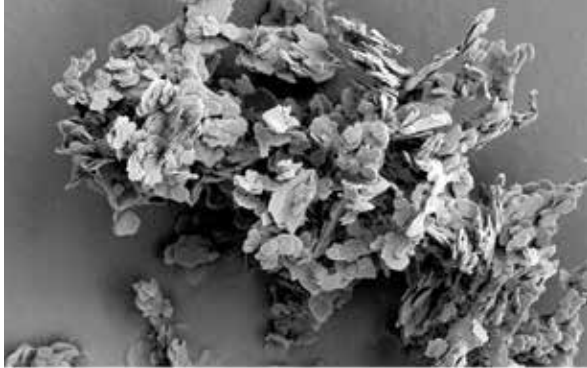
\*\*\*\* BN content is calculated as (100% minus B<sub>2</sub>O<sub>3</sub>, O, C, Si, Al, Fe, Ca, without loss on drying)  
Platelets CFP 001, 003, 003E and 003SF: BN ≥98.0%  
Platelets CFP 012P: BN ≥97.0%  
Agglomerates CFA 250S: BN ≥80.0%, contains an inorganic binder

\* This product is experimental. Contact your 3M representative for more information.

## 3M™ Boron Nitride Cooling Fillers – Grade Profiles

### 3M™ Boron Nitride Cooling Filler Platelets CFP 001 and 003SF

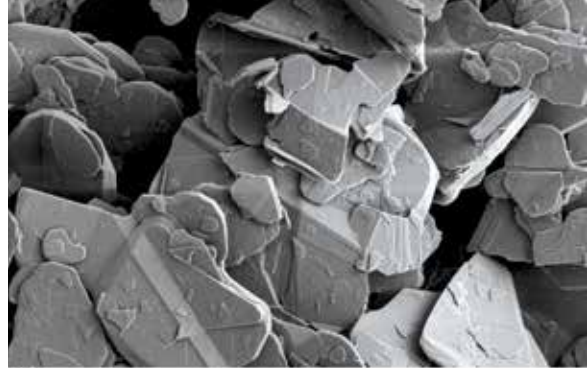
Preferred for thin films <25 µm and fibers, fine channels and windings. CFP 003SF has a controlled top size.



SEM micrograph: Grade CFP 003SF

### 3M™ Boron Nitride Cooling Filler Platelets CFP 003E, 003, 006, 0075, 009 and 012

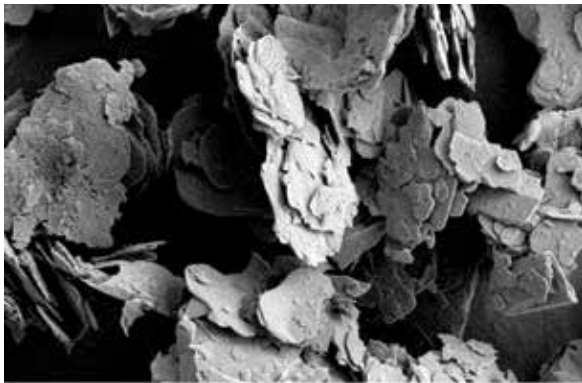
Optimal all-purpose grades for pads and injection molded parts.



SEM micrograph: Grade CFP 0075

### 3M™ Boron Nitride Cooling Filler Platelets CFP 007HS

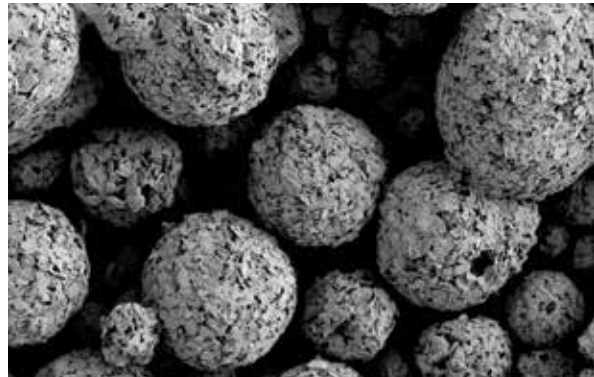
Ideal for thin films <50 µm due to its controlled top size. Highest reflectivity and increased in-plane thermal conductivity in pads.



SEM micrograph: Grade CFP 007HS

### 3M™ Boron Nitride Cooling Filler Granulated Platelets CFP 012P

Spray-dried boron nitride platelets for excellent processability, flowability and high dosing velocities for extruded and injection molded parts.



SEM micrograph: Grade CFP 012P

### 3M™ Boron Nitride Cooling Filler Agglomerates CFA 250S

Soft agglomerates for high filler loadings. Excellent processability, flowability and high dosing velocities. Best fit for silicone TIMs.



SEM micrograph: Grade CFA 250S

### 3M™ Boron Nitride Cooling Filler Agglomerates CFA 50M

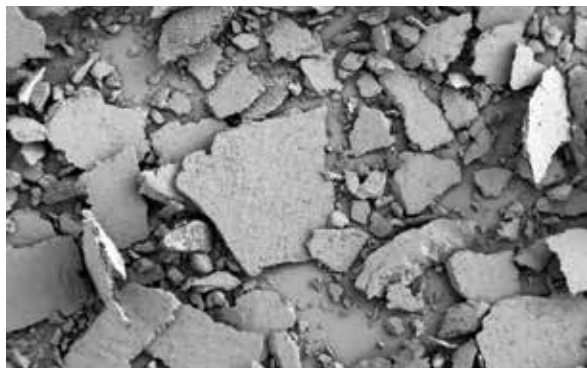
Mix of agglomerates, platelets and boron nitride clusters. Excellent for potting resins.



SEM micrograph: Grade CFA 50M

### 3M™ Boron Nitride Cooling Filler Flakes CFF 500-3 and 200-3

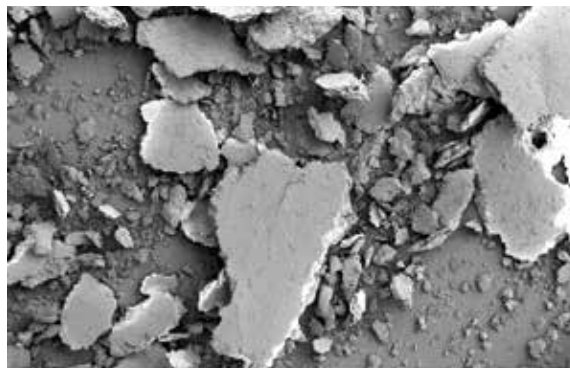
Highest through-plane thermal conductivity. Boosts thermal conductivity of compounds as secondary filler.



SEM micrograph: Grade CFF 500-3 (experimental product)

### 3M™ Boron Nitride Cooling Filler Flakes CFF 500-15 and 200-15

Preferred for lowest viscosity in epoxies and silicones. High thermal conductivity.



SEM micrograph: Grade CFF 500-15 (experimental product)

## Powder Characteristics

(Not for specification purposes)

Particle Size Distribution				Bulk Density, Scott (g/cm <sup>3</sup> )	Bulk Density, DIN (g/cm <sup>3</sup> )	Surface Area (m <sup>2</sup> /g)	Grade
d(0.1) µm	d(0.5) µm	d(0.9) µm	d(0.97) µm				
n.a.	0.5**	0.8**	–	<0.14	–	<30	Platelets CFP 001
1.5	5	n.a.***	–	–	<0.3	<15	Platelets CFP 003E
1–2	2–6	8.5–22.5	–	<0.15	–	<20	Platelets CFP 003
0.5–2	2–6	6–14	–	–	<0.15	<20	Platelets CFP 003SF
1.5–3	4.5–8	10–20	–	<0.2	–	<10	Platelets CFP 006
1.5–3	5–8	10–20	–	<0.22	–	<15	Platelets CFP 007HS
2–3.5	6–9.5	12–25	–	<0.22	–	<7	Platelets CFP 0075
2–3.5	6–12	14–32	–	<0.22	–	<6	Platelets CFP 009
2–4.5	8–14	20–40	–	<0.25	–	<5	Platelets CFP 012
65–120	125–190	200–300	–	–	0.3–0.55	<3.5	Platelets CFP 012P*
5–10	15–30	35–70	–	–	0.1–0.4	<3.5	Agglomerates CFA 50M*
8–20	40–100	120–210	–	–	0.3–0.6	<5	Agglomerates CFA 250S*
140–260	300–530	–	–	–	0.25–0.5	<7.5	Flakes CFF 500-3*
5–120	140–240	–	<450	–	0.3–0.6	<10	Flakes CFF 200-3*
20–150	160–400	–	–	–	0.5–0.7	<3.0	Flakes CFF 500-15*
5–55	65–210	–	<450	–	0.5–0.75	<3.0	Flakes CFF 200-15*

Bulk density determined according to ASTM B329/ISO 3923-2 (Scott density) and according to ISO 23145-2 (DIN density)

Particle size distribution measured by laser light scattering (Mastersizer 2000, dispersion in ethanol)

\* Particle size distribution measured by laser light scattering (Mastersizer 2000, dry, 0.1 bar)

\*\* Data determined by means of SEM pictures

\*\*\* Can include soft agglomerates with 50–100 µm

**For calculation purpose:** Density of bulk hBN 2.25 g/cm<sup>3</sup>

## Packaging

3M™ Boron Nitride Cooling Fillers are available as 1 kg samples (maximum sample quantity 10 × 1 kg) or in the following packaging sizes:

### **Platelets CFP 001 and 003SF**

**Standard Drum:** 10 kg

### **Platelets CFP 003E, 003, 006, 007HS, 0075, 009 and 012**

**Standard Drum:** 20 kg

### **Platelets CFP 012P**

**Standard Drum:** 25 kg

### **Agglomerates CFA 50M and 250S**

**Standard Drum:** 25 kg

### **Flake Grades CFF**

**Standard Drum:** 25 kg

## Product Storage, Handling and Safety

The substance boron nitride contained in the products 3M™ Boron Nitride Cooling Fillers (all grades) has been duly registered in conformance with REACH obligations according to EC directive 1907/2006 (see product Safety Data Sheet for registration number).

Unless mentioned differently, the products contain less than 0.1 wt % Diboron Trioxide (substance of very high concern – SVHC, technically unavoidable impurity, see SDS).

The products do not contain any other SVHC substance of the actual SVHC candidate list.

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