

Material Product Data Sheet

Pure Chromium Carbide Powder for Thermal Spray

Thermal Spray Powder Products: Metco 70C-NS, Metco 70F-NS

1 Introduction

Metco™ 70C-NS and Metco 70F-NS are chromium carbide powders with 99.0%+ Cr₃C₂ phase and an orthorhombic crystalline structure. The remaining constituents consist of hexagonal phases of chromium and carbon (as Cr₇C₃ and Cr₂₃C₆). The powders have been designed for coating application using atmospheric plasma spray.

Sprayed coatings of Metco 70C-NS and Metco 70F-NS can withstand temperatures above 535 °C (995 °F). The carbide coatings have a high percentage of porosity when sprayed without any binder as a result of poor interparticle cohesion. These factors lower the high temperature and erosion resistance that would otherwise allow coatings of this material to perform well at temperatures up to 1100 °C (2010 °F). The benefits of the chromium carbide can be maximized by spraying it with a metal matrix that can act as a binder and increase the stability of the coating as well as form a uniform bond with the substrate.

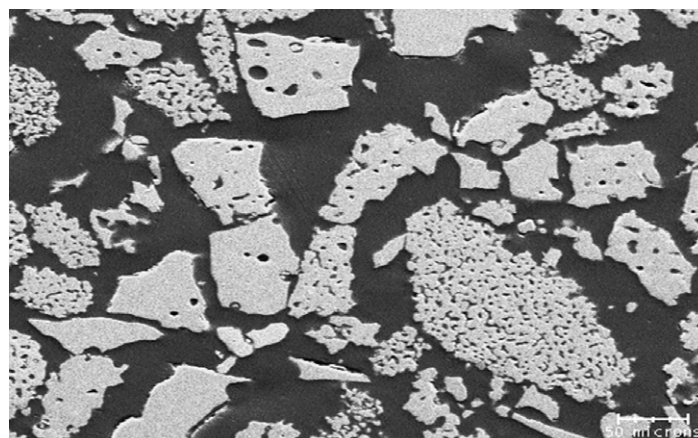
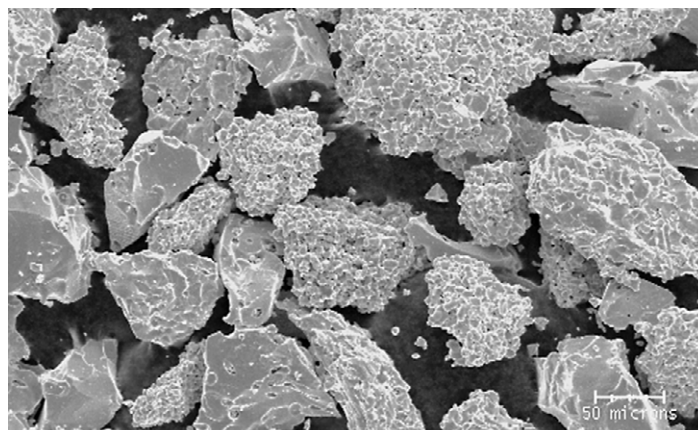
Typically, chromium carbide coating technology is of great interest because of its high hardness, thermal stability, wear and oxidation resistance. As the coatings have a thermal coefficient of expansion similar to that of steel, residual coating stresses at the coating-substrate interface are reduced on steel substrates. It is also used as an excellent grain growth inhibitor during sintering of WC-Co cutting tools.

1.1 Typical Uses and Applications

- Piston rings
- High friction coatings (brake pads)
- Rod mandrels
- Hot forming dies
- Machine parts
- Hydraulic valves
- Wear protection on aluminum parts
- Grain refinement in carbide cutting tools

Quick Facts

Classification	Carbide, chromium-based
Chemistry	Cr ₃ C ₂
Manufacture	Dense sintered / fused and crushed
Morphology	Angular / blocky
Melting point	1930 °C (3506 °F)
Service Temperature	≤ 900 °C (1650 °F)
Apparent Density	2.7 – 3.0 g/cm ³
Purpose	High temperature wear, oxidation and corrosion resistance
Process	Atmospheric plasma spray or Combustion Powder Thermospray™



SEM Photomicrograph of Metco 70C-NS. Top: Morphology, bottom: cross-section.

2 Material Information

2.1 Chemical Composition

Product	Nominal Chemical Composition (wt. %)				Phase (wt. %)
	Cr	C	C _{FREE}	Fe	Cr ₃ C ₂
Metco 70C-NS	86	13	≤ 0.3	≤ 0.7	99
Metco 70F-NS	86	13	≤ 0.3	≤ 0.7	99

2.2 Particle Size Distribution

Product	Nominal Particle Size Distribution (µm)	D90 (µm)	D50 (µm)	D10 (µm)
Metco 70C-NS	-106 +45	105 – 110	70 – 75	45 – 50

Product	Nominal Particle Size Distribution (µm)	-44 +22 µm (wt. %)	-22 µm (wt. %)	-5.5 µm (wt. %)
Metco 70F-NS	-44	15 – 50	50 – 70	10 max

Upper particle size above 45 µm determined by sieve analysis, lower particle size analysis 45 µm and below by laser diffraction (Microtrac).

2.3 Key Selection Criteria

- Choose Metco 70C-NS or Metco 70F-NS when coatings are required that have:
 - High microhardness (1200 HV)
 - High wear resistance at high temperatures
 - High temperature corrosion and oxidation resistance
 - High friction surfaces
- Metco 70C-NS and Metco 70F-NS are often blended by customers with various types of nickel-chromium powders. These nickel-chromium materials are also available from Oerlikon Metco. Please contact your account representative for information on these products to meet your specific requirements.
- Choose Metco 70F-NS when thinner and/or smoother coatings are desired, or for applications where an internal plasma spray gun with lower power output will be used or for use with combustion powder spray guns.

2.4 Related Products

- Amdry 5843 and Metco 5842 produce coatings that are resistant to erosion and abrasion and can be used in applications that have contact with water-based solutions. These materials are recommended for service temperatures up to 500 °C (930 °F).
- WOKA 36XX series materials are best chosen for applications where both corrosion and erosion protection are required at service temperatures up to 500 °C (930 °F).
- Metco 81NS, Metco 81VF-NS and Diamalloy 3004 are chromium carbide – nickel chromium blends that have better deposition efficiency with less decarburization. These materials exhibit similar wear and abrasion resistance than Metco 70C-NS and Metco 70F-NS at temperatures as high as 870 °C (1600 °F).
- Diamalloy 3007 is a chemically clad chromium carbide that is used to produce very dense coatings that are good for high temperature corrosion and wear resistance.
- WOKA 71XX series products are agglomerated and sintered chromium carbide particles embedded in a nickel-chromium matrix. These products produce extremely hard coatings with excellent resistance to wear and corrosion, especially in alkaline environments.

2.5 Customer Specifications

Product	Customer Specification
Metco 70C-NS	Pratt & Whitney PWA 1306
Metco 70F-NS	U.S. Military A-A-59315/32

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	Typical Data
Recommended Spray Process	Atmospheric Plasma Spray
Maximum Service Temperature	900 °C 1650 °F
Finishing Method	Wet grind using 60 grit silicon carbide wheels

3.2 Coating Parameters

Please contact your Oerlikon Metco Account Representative for parameter availability. For specific coating application requirements, the services of Oerlikon Metco's Coating Solution Centers are available.

Recommended Spray Guns

Atmospheric Plasma Spray	Combustion Powder Spray
Metco 9MB series *	Metco 6P-II
Metco F4 series *	Metco 5P-II
TriplexPro series *	
SM-F100 CONNEX	
Metco 11MB	
SM-F220	

* Recommended for both Metco 70C-NS and Metco 70F-NS. Other materials not recommended for use with Metco 70C-NS

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 70C-NS	1000588	12.5 lb (approx. 5.7 kg)	Stock	Global
Metco 70F-NS	1001592	10 lb (approx. 4.5 kg)	Stock	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents gently prior to use to prevent segregation.
- Open containers should be stored in a drying oven to prevent moisture pickup.

4.3 Safety Recommendations

See SDS 50-127 (Safety Data Sheet) in the localized version applicable to the country where the material will be used. SDS are available from the Oerlikon web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).