

# Material Product Data Sheet

## Chromium Carbide – NiCrAlY Powder Blend

### Thermal Spray Powder Products: Metco 5546NS

#### 1 Introduction

Metco™ 5546NS is a blend of a wear-resistant chromium carbide and a hot corrosion resistant NiCrAlY (nickel-chromium-aluminum-yttrium) alloy. The coating structure produced by Metco 5546NS consists of chromium carbide particles that are finely dispersed in the NiCrAlY matrix.

The chromium carbide constituent provides excellent high temperature erosion resistance.

The NiCrAlY provides excellent corrosion resistance and oxidation resistance at high temperatures.

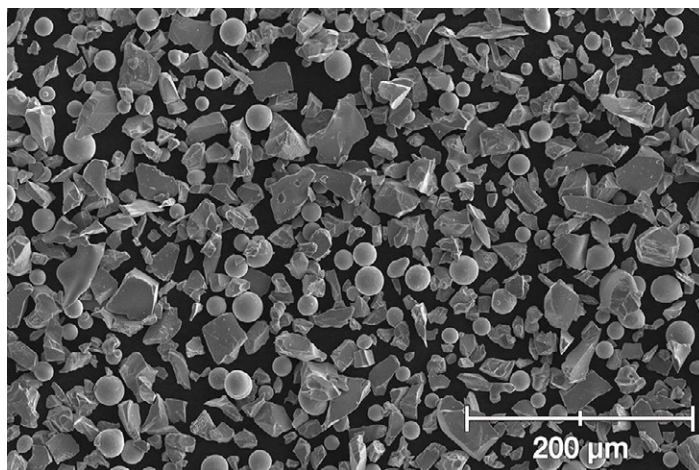
Coatings of these materials can effectively combat solid particle erosion (SPE), high temperature wear (abrasion, erosion, fretting and cavitation) and hot corrosion.

#### 1.1 Typical Uses and Applications

- Turbine blades
- Turbine air seal rings
- Turbine baffle dampers
- Turbine exhaust valve seats
- Turbine inner nozzle supports
- Support struts
- Fuel rod mandrels
- Forging tools
- Hot crushing rolls
- Hot forming dies

#### Quick Facts

Classification	Carbide, chromium-based
Chemistry	Cr <sub>3</sub> C <sub>2</sub> 25(NiCrAlY)
Manufacture	Blended
Morphology	Spheroidal / angular & blocky
Purpose	High temperature wear and corrosion resistance
Service Temperature	≤ 870 °C (1600 °F)
Process	Atmospheric plasma spray or HVOF



Morphology of Metco 5546NS

## 2 Material Information

### 2.1 Chemical Composition and Particle Size Distribution

	Chemical Composition (wt. %)		Nominal Particle Size Distribution (µm)
	Cr <sub>3</sub> C <sub>2</sub>	NiCrAlY	
Metco 5546NS	Balance	25	-45 +5.5

Nominal particle size distribution determined by laser diffraction (Microtrac).

### 2.2 Key Selection Criteria

- The optimized ratio of the chromium carbide and the NiCrAlY matrix has been engineered to produce coatings with excellent erosion resistance properties in combination with good coating toughness and hot corrosion resistance.
- Coatings applied using the HVOF process are dense and very well-bonded, with a more homogeneous structure than coatings applied using atmospheric plasma spray.

### 2.3 Related Products

- When oxidation resistance and hot corrosion resistance are the primary concern, choose a product from Oerlikon Metco's portfolio of MCrAlY materials, such as the Amdry 995 series, Amdry 365 series or Amdry 962 series.
- Oerlikon Metco offers a large portfolio of chromium carbide-nickel chromium powders that can be considered as alternatives to Metco 5546NS. These are available in a number of ratios of hard phase to matrix, with wear resistance increasing with higher hard phase. However, Metco 5546NS offers better hot corrosion resistance.
- When coating toughness is a primary concern, it is more easily achieved with Metco 81VF-NS and Metco 81NS powder blends than with Metco 5546NS. Furthermore, Metco 5546NS has a more narrow particle size range and finer cut in comparison with Metco 81VF-NS and Metco 81NS. As a result Metco 5546NS could be more prone to cracking than Metco 81VF-NS and Metco 81NS.
- Metco 430NS, a self-fusing powder blend, may be a better choice when better wear resistance and smoother as-sprayed surface finishes are needed. However, coatings

of Metco 5546NS have better corrosion resistance than coatings of Metco 430NS.

- Coatings of Metco 5546NS provide better hot corrosion and oxidation resistance than WOKA 71xx, WOKA 72xx and WOKA 73xx series products. Coatings of WOKA 72xx and WOKA 73xx series products have similar wear resistance to that of Metco 5546NS. However, when superior hardness and wear resistance is needed, WOKA 71xx series products are recommended. All of these WOKA products are spheroidal, agglomerated and sintered chromium carbide – nickel chromium powders, with particle size distribution optimized for a variety of HVOF guns.
- WOKA 73xx series products and Amdry 5260 are agglomerated, sintered and plasma-densified materials with a 25% nickel-chromium matrix. The powders have high apparent densities which lead to higher deposition efficiencies and denser coatings.
- Metco 5241 is an atomized chromium carbide – nickel chromium powder that has been engineered to offer higher deposition efficiency, lower oxide-content and lower carbon loss during spraying in comparison with other chromium carbide powders.
- When better wear resistance is required, tungsten carbide coatings are harder and more wear resistant than chromium carbide coatings. However at the same time, tungsten carbide materials have a much lower service temperature limit of 500 °C (930 °F) and the matrix materials that are often used for tungsten carbide coatings are not as corrosion or oxidation resistant as the MCrAlY matrix.

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information

Specification	Typical Data (depending on spray process and gun chosen)	
Recommended Spray Process	Atmospheric Plasma Spray or HVOF	
Finishing Recommendations	Use as-sprayed or wet grind (silicon carbide or diamond wheel)	
Maximum Service Temperature	870 °C	1600 °F

### 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	HVOF
TriplexPro series	DiamondJet Series
Metco 9MB series	WokaJet Series
Metco F4 series	

## 4 Commercial Information

### 4.1 Ordering Information and Availability

	Order No.	Package Size	Availability	Distribution
Metco 5546NS	1002400	10 lb (approx. 4.5 kg)	Special Order	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 50-829 (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](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).