

Material Product Data Sheet

Nickel Chromium Aluminum Cobalt Ytria Composite Powder

Thermal Spray Powder Products: Metco 461NS

1 Introduction

Metco™ 461NS is a patented nickel chromium aluminum cobalt yttria composite powder designed to produce self-bonding coatings that can be used for oxidation and corrosion resistant applications at temperatures up to 980 °C (1800 °F).

Plasma sprayed coatings of Metco 461NS can be utilized either as a protective barrier to hot corrosion environments or as a bond coat for ceramic thermal barrier coating applications.

The addition of chromium promotes oxidation resistance. The addition of aluminum and cobalt enhances the self-bonding properties of Metco 461NS coatings to the substrates and overcomes the poor bonding characteristics typical of nickel-chromium alloys due to high residual stresses within the coatings.

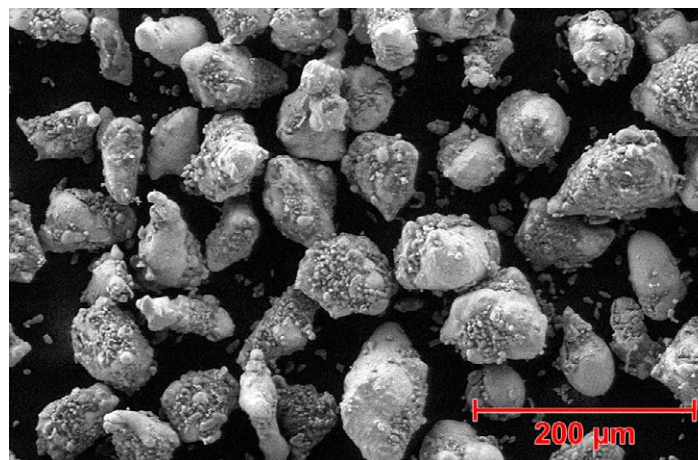
Aluminum also improves the high temperature oxidation resistance of the Metco 461NS coatings. Ytria reacts with the aluminum during spraying to promote the formation of a ductile complex ceramic oxide, $Al_2O_3-Y_2O_3$, which improves the high temperature cohesive strength of the coating and aids in applications where flexing is an important consideration.

1.1 Typical Uses and Applications

- Salvage and buildup on mis-machined or worn parts made of corrosion resistant steels, machinable carbon steels, nickel alloys or iron
- Exhaust mufflers and heat treating fixtures for oxidation resistance

Quick Facts

Classification	Composite, nickel-based
Chemistry	Ni 17.5Cr 5.5Al 2.5Co 0.5YO
Manufacture	Mechanically clad
Morphology	Irregular
Apparent Density	2.5 – 4.0 g/cm ³
Melting Point	660 °C (1215 °F)
Service Temperature	≤ 980 °C (1800 °F)
Purpose	High temperature oxidation and corrosion resistance
Process	Atmospheric plasma spray or combustion powder Thermospray™



SEM Photomicrograph of Metco 461NS showing the morphology of this composite powder product

2 Material Information

2.1 Chemical Composition

Product	Nominal Chemical Composition (wt. %)						
	Ni	Cr	Al	Co	Y ₂ O ₃	Others (max)	Organics (max)
Metco 461NS	Bal.	14.0 – 20.0	2.0 – 8.0	1.0 – 5.0	0.3 – 1.2	6.5	5.5

2.2 Particle Size Distribution and Other Properties

Product	Nominal Particle Size Distribution (µm)	Manufacturing Method	Morphology
Metco 461NS	-150 +45	Mechanically Clad	Irregular

Upper particle size via sieve analysis in accordance with ASTM B214; lower particle size analysis via laser diffraction (Microtrac). Other particle size distributions are available on request.

2.3 Key Selection Criteria

- Metco 461NS can be used for high temperature oxidation and corrosion resistant coatings. Coatings of Metco 461NS are self-bonding and have improved ceramic ductility due to the formation of Al₂O₃-Y₂O₃.
- Metco 442 and Metco 444 are both self-bonding stainless composite powders. Coatings of these powders can be used as wear and corrosion resistant coatings. Coatings of Metco 442 exhibit higher macrohardness; however, the maximum service temperature Metco 442 coatings is 760 °C (1400 °F), and that of Metco 444 coatings is 870 °C (1600 °F).
- Oerlikon Metco also offers a wide range of MCrAlY alloy products ("M" represents either nickel or cobalt or both). Atmospheric plasma, HVOF or controlled atmosphere plasma coatings of these materials exhibit excellent high temperature oxidation and hot corrosion resistance and can also be used as protective bond coats for thermal barrier ceramic top coats.

2.4 Related Products

Product	Customer Specification
Metco 461NS	Haynes Corporation PS5-2008

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	Typical Data	
Recommended Spray Process	Atmospheric plasma spray or combustion powder Thermospray™	
Macrohardness	80 – 100 HRB	
Microhardness	175 – 250 HV300	
Density	6.8 – 7.0 g/cm ³	
Porosity	2 – 10 vol. %	
Oxide Content	5 – 25 vol. %	
Thermal Conductivity	20 – 30 W/m-K	
Coefficient of Linear Expansion	13 x 10 ⁻⁶ cm/cm °C	7.2 x 10 ⁻⁶ in/in °F
Maximum Service Temperature	870 °C	1600 °F

Data is provided is typical and variability can be expected. Changes in spray process, spray equipment or spray parameters can significantly change coating results.

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	Combustion Powder
Metco 9MB series	Metco 5P-II
Metco F4 series	Metco 6P-II series
TriplexPro series	
SimplexPro series	

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 461NS	1000601	5 lb (approx. 2.25 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 50-184 (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).

Information is subject to change without prior notice.