

# Material Product Data Sheet

## Nickel – 20% Chromium Powders for Thermal Spray

**Thermal Spray Powder Products:**  
**Metco 43C-NS, Metco 43F-NS, Metco 43VF-NS,**  
**Metco 5640NS, Amdry 4535**

### 1 Introduction

Metco™ 43C-NS, Metco 43F-NS and Metco 43VF-NS are nickel-chromium alloy powders manufactured by water atomization with a characteristic irregular particle shape.

Metco 5640NS and Amdry™ 4535 are nickel-chromium alloy powders of similar chemistry, manufactured using gas atomization and using premium nickel raw materials. Their spherical shape ensures freely flowing powder feed during thermal spray processing.

The primary use of these powders is as an oxidation-resistant thermal sprayed bond coat material used under a variety of thermal sprayed ceramic top coats. They can also be used for repair and buildup coatings.

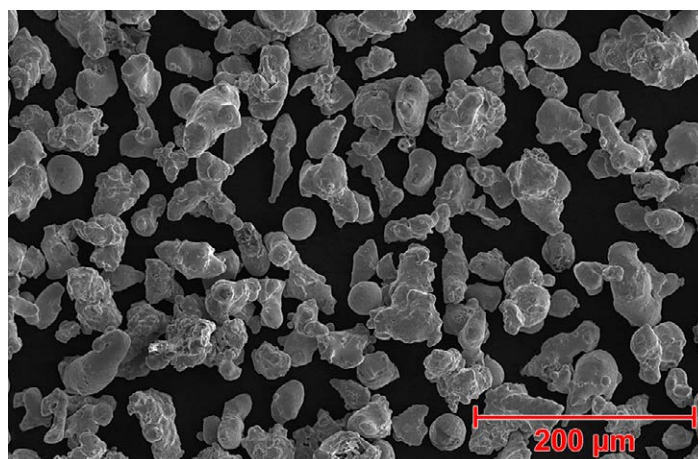
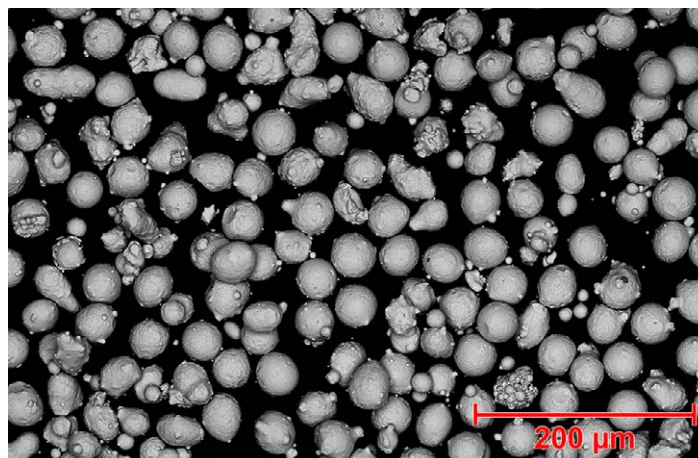
The high chromium content of these materials enhances their resistance to oxidation and corrosion. The coatings generated by these materials are generally smooth as-sprayed and have a bright appearance.

#### 1.1 Typical Uses and Applications

- As a bond coat to improve the adherence of a subsequently sprayed ceramic top coat deposits
- As an intermediate coating to mitigate thermal expansion coefficient mismatch
- As an oxidation and corrosive gas resistant bond coat for service temperatures up to 1000 °C (1830 °F)
- Dense, abrasion and oxidation resistant coatings for salvage and buildup applications, such as on carbon and low alloy carbon steel substrates

### Quick Facts

|                     |                                                                  |
|---------------------|------------------------------------------------------------------|
| Classification      | Alloy, nickel based                                              |
| Chemical formula    | Ni 20Cr                                                          |
| Manufacture         | Gas or water atomized                                            |
| Morphology          | Spheroidal or irregular                                          |
| Apparent density    | 3.1 – 4.6 g/cm <sup>3</sup>                                      |
| Flow (Hall)         | 14 – 27 s / 50 g                                                 |
| Melting point       | 1400 °C (2550 °F)                                                |
| Service temperature | 1000 °C (1830 °F)                                                |
| Purpose             | Corrosion-resistant bond coat                                    |
| Process             | Atmospheric plasma spray, HVOF or combustion powder Thermospray™ |



SEM photomicrographs: Top: Amdry 4535 (gas atomized), bottom: Metco 43F-NS (water atomized).

## 2 Material Information

### 2.1 Chemical Composition

| Product       | Weight Percent (nominal) |      |      |      |      |              |
|---------------|--------------------------|------|------|------|------|--------------|
|               | Ni                       | Cr   | Si   | Fe   | Mn   | Others (max) |
| Metco 43C-NS  | Balance                  | 19.5 | 1.2  | 1.0  | 1.5  | 0.5          |
| Metco 43F-NS  | Balance                  | 19.5 | 1.2  | 1.0  | 1.5  | 0.5          |
| Metco 43VF-NS | Balance                  | 19.5 | 1.2  | 1.0  | 1.5  | 0.5          |
| Metco 5640NS  | Balance                  | 19.5 | 0.75 | 0.5  | 1.25 | 0.5          |
| Amdry 4535    | Balance                  | 19.5 | 0.75 | 0.25 | 0.25 | 0.4          |

### 2.2 Additional Powder Characteristics

| Product       | Particle Size Distribution $\mu\text{m}$ | Morphology | Manufacturing Method | Apparent Density $\text{g/cm}^3$ | Flow s/50 g | Similar To |
|---------------|------------------------------------------|------------|----------------------|----------------------------------|-------------|------------|
| Metco 43C-NS  | -106 +45                                 | Irregular  | Water Atomized       | 3.1                              | 26.5        | UNS N06003 |
| Metco 43F-NS  | -63 +10                                  | Irregular  | Water Atomized       | 3.6                              | 21.3        | UNS N06003 |
| Metco 43VF-NS | -45 +5                                   | Irregular  | Water Atomized       | 3.6                              | N.R.        | UNS N06003 |
| Metco 5640NS  | -125 +45                                 | Spheroidal | Gas Atomized         | N.R.                             | N.R.        | UNS N06003 |
| Amdry 4535    | -53 +11                                  | Spheroidal | Gas Atomized         | 4.6                              | 14.0        | UNS N06003 |

Particle size equal to or above 45  $\mu\text{m}$  determined by sieve analysis in accordance with ASTM B214, on U.S. standard sieves to ASTM E11; particle size below 45  $\mu\text{m}$  determined by laser diffraction (Microtrac) per ASTM C 1070.

N.R. = Not Reported

### 2.3 Key Selection Criteria

- Choose the product that meets the required customer material specification.
- Coatings of these materials can withstand service temperatures up to 1000 °C (1830 °F)
- Choose Metco 5640NS or Amdry 4535 for coatings with better hot gas corrosion and oxidation resistance compared to coatings of the water atomized products.
- Products with finer particle size distributions generally produce coatings with finer as-sprayed surfaces finishes, which may be desirable when post-coat machining of the coating will be performed.
- For application using HVOF, choose Metco 43VF-NS or Amdry 4535.

### 2.4 Related Products

- Self-bonding coatings with minimal surface preparation can be accomplished using mechanically clad powders such as Metco 404NS, Metco 1101, Metco 2101ZA and Metco 2101ZB. These materials can be used to produce coatings with improved oxidation and thermal shock resistance in gas turbine applications.
- For higher hot gas corrosion and oxidation resistance, self-bonding coatings of Amdry 960 and Metco 443NS (NiCr – Al Clad) can be used.

- If application using electric arc wire spray is preferred, consider Metco 8443 (Ni 18Cr 6Al 2Mn) or Metco 8450 (Ni 20Cr). For more information, please see datasheet DSMTS-0052.
- When a good, general purpose bond coat or buildup material is needed, particularly in applications where corrosion resistance or temperature is less of a concern, consider a nickel-aluminum material. Material are available for thermal spray coating application using powder or wire feedstock materials. Please see datasheets DSMTS-0029 and DSMTS-0043 (powder feedstock) or datasheet DSMTS-0002 (wire feedstock).
- For applications where very high oxidation or hot corrosion resistance is needed, Oerlikon Metco has a large portfolio of MCrAlY alloys. These materials can be used as bond coats or as corrosion coatings in higher temperature environments, and can be post-coat diffused for improved bonding and service characteristics. Please see datasheets DSMTS-0092, DSMTS-0093, DSMTS-0102.
- Oerlikon Metco also produces a variety of MCrAlY to meet proprietary OEM specifications. These materials are available to OEM-qualified buyers. See datasheet DSMTS-0094 for more information.

## 2.5 Customer Specifications

| Product Name  | Customer Specifications                                                                                                                                                                                                                       |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Metco 43C-NS  | Boeing BMS 10-67, Type VI<br>Canada Pratt & Whitney CPW 215<br>GE B50TF40, CI A<br>MTU MTS 1050<br>Pratt & Whitney PWA 1315<br>Rolls-Royce Corporation EMS 56760<br>Rolls-Royce plc 9507/8<br>Snecma DMR 33-078<br>U. S. Military A-A 59315/7 |
| Metco 43F-NS  | Canada Pratt & Whitney CPW 217<br>GE B50TF40, CI B<br>Jet Avion JA 1317<br>Pratt & Whitney PWA 1317<br>Rolls-Royce plc 9507/27<br>Snecma DMR 33-079<br>U. S. Military A-A 59315/6                                                             |
| Metco 43VF-NS | Pratt & Whitney PWA 1319<br>U.S. Military A-A-59315/20 Type I, Class I                                                                                                                                                                        |
| Metco 5640NS  | GE B50TF40, CI A                                                                                                                                                                                                                              |

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information

- The information provided in the table is for Metco 43F-NS applied using a TriplexPro plasma spray gun.
- Metco 43C-NS sprayed using a TriplexPro gun may have a somewhat rougher surface finish than that from other plasma spray guns
- Metco 43VF-NS sprayed using a TriplexPro gun may have a somewhat smoother as-sprayed surface finish, but apply with a lower deposit efficiency.
- Significant differences can be expected when using different spray guns and processes.

| Specification               | Metco 43F-NS                              |         |           |
|-----------------------------|-------------------------------------------|---------|-----------|
| Spray Gun                   | TriplexPro-210 (atmospheric plasma spray) |         |           |
| Deposit Efficiency (approx) | %                                         | 69      |           |
| Macrohardness               | As sprayed                                | HR15N   | 65 – 67   |
| Microhardness               | As sprayed                                | HV0.3   | 240 – 280 |
| Service Temperature         | Max                                       | 1000 °C | 1830 °F   |

All reported values are nominal based on standard spray conditions and parameters.

### 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

| Combustion Powder  | Atmospheric Plasma |
|--------------------|--------------------|
| Metco 6P-II series | Metco F4 series    |
|                    | Metco 9MB series   |
|                    | TriplexPro series  |
|                    | SimplexPro series  |

## 4 Commercial Information

### 4.1 Ordering Information and Availability

| Product       | Order No. | Package Size           | Availability  | Distribution |
|---------------|-----------|------------------------|---------------|--------------|
| Metco 43C-NS  | 1000054   | 5 lb (approx. 2.25 kg) | Stock         | Global       |
| Metco 43F-NS  | 1000068   | 5 lb (approx. 2.25 kg) | Stock         | Global       |
| Metco 43VF-NS | 1000438   | 5 lb (approx. 2.25 kg) | Stock         | Global       |
| Metco 5640NS  | 1030107   | 5 lb (approx. 2.25 kg) | Stock         | Global       |
| Amdry 4535    | 1001066   | 10 lb (approx. 4.5 kg) | Special Order | Global       |

### 4.2 Handling Recommendations

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

### 4.3 Safety Recommendations

See SDS 50-112 (Safety Data Sheet) in the version localized for 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).