oerlikon
metco

# Material Product Data Sheet
## Nickel-Aluminum-Molybdenum Thermal Spray Powder

**Thermal Spray Powder Products: Metco 447NS**

### 1 Introduction

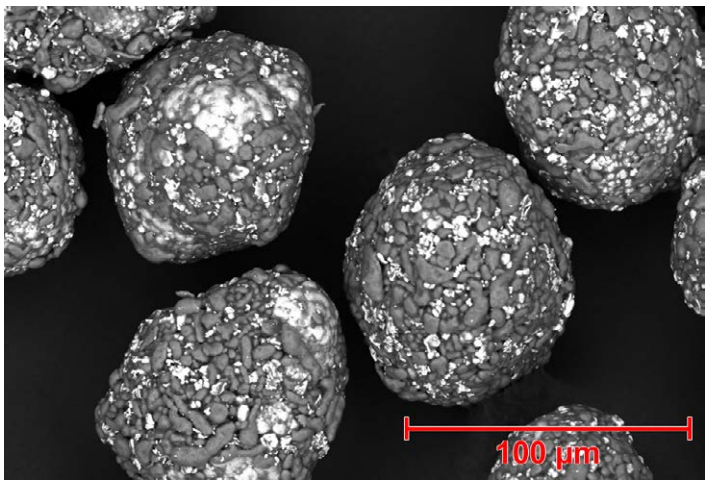
Metco™ 447NS is a nickel-aluminum-molybdenum powder designed for application of coatings using thermal spray processes. Metco 447NS is a good choice for coated surfaces requiring high toughness with moderate resistance to fretting, erosion and scuffing.

Metco 447NS is a mechanically clad material consisting of a nickel core clad with molybdenum and aluminum. During thermal spraying, nickel-aluminum and molybdenum-aluminum reactions occur, which enhances bond strength and interparticle cohesive strength.

### 1.1 Typical Uses and Applications

- Machine elements and bedways
- Wear rings
- Exhaust fans and manifolds
- Diesel engine fire decks
- Connecting rods
- Fuel pump rotors
- Valve and pump seats

| Quick Facts | |
|---|---|
| Classification | Composite or alloy, nickel-based |
| Chemistry | Ni 5Mo 5.5Al |
| Manufacture | Mechanically clad |
| Morphology | Spheroidal |
| Apparent Density | 3.5 g/cm$^3$ (nominal) |
| Service Temperature | ≤ 650 °C (1200 °F) |
| Purpose | Wear and scuff resistance |
| Process | Atmospheric plasma spray or combustion powder Thermospray™ |




SEM Photomicrograph of Metco 447NS, a mechanically clad composite material

## 2 Material Information

### 2.1 Chemical Composition

| Product | Nominal Chemical Composition (wt. %) | | | | |
|---|---|---|---|---|---|
| | Ni | Mo | Al | Others (max) | Organics (max) |
| Metco 447NS | Bal. | 5.0 | 5.5 | 1.0 | 2.7 |

### 2.2 Particle Size Distribution and Other Properties

| Product | Nominal Particle Size Distribution (µm) | Manufacturing Method | Morphology |
|---|---|---|---|
| Metco 447NS | –90 +45 | Mechanically Clad | Spheroidal |

Upper particle size via sieve analysis in accordance with ASTM B214; lower particle size analysis via laser diffraction (Microtrac).

### 2.3 Key Selection Criteria

Choose Metco 447NS for applications where:

- High toughness is required
- Moderate resistance to scuffing, fretting and erosion is required
- Good impact resistance is needed
- The combustion powder Thermospray™ process will be used to apply the coating and the exothermic reaction that occurs during spraying will help enhance bonding with this process. Metco 447NS can be applied using atmospheric plasma spray, as well.

### 2.4 Related Products

- For applications where low frictional characteristics or better scuff resistance is needed, particularly in dry-running conditions, coatings of pure molybdenum using Amdry 313X or Metco 63NS, or coatings of molybdenum-molybdenum carbide, such as Metco 64 are recommended; however the erosion resistance is not as high. Please see datasheet DSMTS-0105 or DSMTS-0106 for more information.
- When a good scuff-resistant surface with better hardness is needed, Metco 350NS can be considered. This is an iron-based composite powder that contains molybdenum and carbon. It has lower corrosion resistance than coatings of Metco 447NS. Please see datasheet DSMTS-0046.
- When a good hard bearing surface with good abrasion and sliding wear resistance is needed and corrosion or oxidation resistance is less of a concern, self-fluxing, blended materials such as Amdry 1371 or Metco 7837 can be used. These materials form hard, dense coatings owing to their nickel-based, self-fluxing matrix while maintaining good sliding wear and abrasion resistance as a result of the molybdenum content. See datasheet DSMTS-0107.
- For economical general purpose restoration or as a bond coat material, one of the nickel-aluminum materials can be considered. These materials have good corrosion resistance, but do not offer the hardness or scuff resistance of Metco 447NS. They are also more machinable. For more information, please see datasheet DSMTS-0029 or DSMTS-0043.
- If thermal spray application using wire feedstock processes is preferred, Metco 8447 (nickel-aluminum) is available in wire form that can be used as a general build up material or a bond coat material. Please see DSMTS-0002.

### 2.5 Customer Specifications

| Product | Specification |
|---|---|
| Metco 447NS | Chromalloy BZ-003 Type 57<br>Dana Perfect Circle PC 110-265<br>GE B50TF166, Class A<br>GKN Aerospace 819-24<br>Honeywell EMS 57749, Type 11, Clkass 2<br>Honeywell FP 5045, Type XVI<br>Honeywell M3961<br>MTU MTS 1079<br>Rolls-Royce OMAT 3/179<br>Rolls-Royce plc MSRR 9507/35<br>Rolls-Royce plc RRMS 40040<br>U.S. Military A-A 59315/15<br>U.S. Military MIL-P-83348 Type 1, Comp. FF, Cl. 2<br>Williams WIMS 645 |

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information

| Specification | Metco 447NS | |
|---|---|---|
| Recommended Spray Process | Atmospheric plasma spray or combustion powder Thermospray™ | |
| Maximum Service Temperature | 650 °C | 1200 °F |
| Recommended Finishing Method | Wet grind using a SiC or $Al_2O_3$ wheel | |

Data 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 3MB series | Metco 6P-II series |
| Metco F4 series | |
| TriplexPro series | |
| SimplexPro series | |

## 4 Commercial Information

### 4.1 Ordering Information and Availability

| Product | Order No. | Package Size | Availability | Distribution |
|---|---|---|---|---|
| Metco 447NS | 1000397 | 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 50-177 (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.




**www.oerlikon.com/metco**
**info.metco@oerlikon.com**