oerlikon
metco

Material Product Data Sheet
Ceria-Yttria Stabilized Zirconium Oxide HOSP Powder

Thermal Spray Powder Products: Metco 205NS

1 Introduction

Coatings of Metco™ 205NS, a ceria-yttria stabilized zirconia (CeO_2-Y_2O_3-ZrO_2), surpasses the cyclic and thermal fatigue resistance of state-of-the-art 8 % yttria stabilized zirconia ($8Y_2O_3$-ZrO_2). Metco 205NS coatings also have lower thermal conductivity at elevated temperatures.

The combination of outstanding thermal shock resistance, low thermal conductivity and resistance to high temperature corrosion makes Metco 205NS ideally suited for demanding thermal barrier applications.

Plasma sprayed ceramic thermal barrier coatings (TBCs) are used to protect gas turbine engine hot section components from environmental degradation as well as to increase turbine engine operating efficiency. Stabilized zirconia compositions containing calcia, magnesia, or yttria have performed well in clean fuel conditions, but have shown susceptibility for degradation if the fuel has sodium, sulfur, chlorine, or vanadium contaminants. As a result, there is considerable commercial interest for new ceramic compositions that have increased cyclic fatigue resistance, superior resistance to hot corrosion, low thermal conductivity and predictable coating performance.

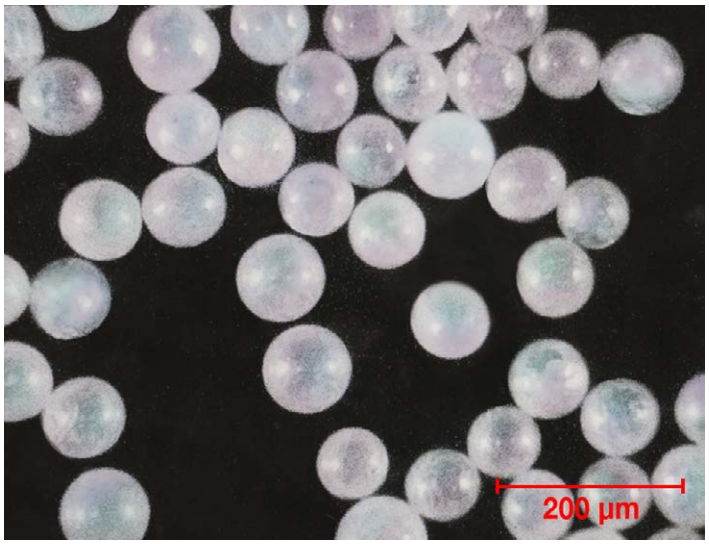
Metco's extensive development efforts using several new formulations and simulated laboratory tests have resulted in the creation of a unique ternary oxide composition.

1.1 Typical Uses and Applications

Typical components where Metco 205NS can offer advantages over currently used 8 % yttria stabilized zirconia coatings:

- Gas turbine engine combustion cans, hot-section blades, shrouds and platforms
- Diesel and gasoline engine piston crowns, valves and cylinder heads
- As a thermal barrier shield or housing for heatexchangers
- As an intermediate strain-tolerant intermediate coating layer with a dense, erosion-resistant top coat for applications where thermal shock and erosion are critical

Quick Facts	
Classification	Ceramic, zirconia based
Chemistry	ZrO_2 24CeO_2 2.5Y_2O_3
Manufacture	Agglomerated & HOSP™
Morphology	Spheroidal
Apparent Density	2.2 ± 0.1 g/cm^3
Purpose	Thermal barrier
Service Temperature	1250 °C (2280 °F)
Process	Atmospheric plasma spray



2 Material Information

2.1 Chemical Composition

Product	Chemical Composition (wt. %)				Phase Constituents (%)	
	ZrO_2	CeO_2	Y_2O_3	Other Oxides	Cubic and t'	Monoclinic ZrO_2 (max)
Metco 205NS	Balance	24 – 26	2 – 3	1 (max)	Balance	10

Includes a maximum of 2.5 % HfO_2, counted as ZrO_2

2.2 Particle Size Distribution

Product	Nominal Range	D90	D50	D10
Metco 205NS	–125 +11 µm	70 – 90 µm	40 – 50 µm	15 – 25 µm

Microtrac analysis by laser light diffraction per ASTM C 1070.
Other particle size distributions are available on request.

2.3 Key Selection Criteria

- Metco 205NS is designed for application using the atmospheric plasma thermal spray process.
- Choose Metco 205NS for heat insulation coating applications up to 1250 °C (2280 °F) with a properly chosen and applied bond coat system.
- Choose Metco 205NS when pure or off-white coatings are not critical to coating appearance.
- Coatings of Metco 205 can be used for thermal protection when high temperature corrosion is of concern.

2.4 Related Products

- Metco 205NS can be used at service temperatures similar to other Metco 7 – 8 % yttria-stabilized zirconia materials, such as Metco 204 series (agglomerated and plasma-densified) Metco 22XX series and Metco 23XX series (agglomerated and sintered) coating materials.
- Metco 205NS can be used at service temperatures that are significantly higher than Metco 210 and Metco 201 families of materials.
- Coatings of Metco 143 are harder and more resistant to erosion and scuffing than coatings of Metco 205NS.
- Coatings of Metco 205NS provide superior hot corrosion resistance than coatings of Metco 202NS, Metco 204 materials, Metco 210 materials or Metco 210NS.

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	Typical Data
Recommended Spray Process	Atmospheric Plasma Spray
Recommended Bond Coat	High temperature MCrAlY, such as Amdry 995C, Amdry 9951, Amdry 9624 or Amdry 997
Substrate Preparation	Ensure that the substrate is degreased with all scale and surface oxidation removed by grit blasting prior to the application of the bond coat
Coating Density	5.3 – 5.5 g/cm^3
Coating Porosity (by image analysis)	5 – 10 vol. %
Thermal Conductivity [a]	0.9 W/m·K
Maximum Service Temperature	1250 °C 2280 °F

[a] Conductivity is based on laser flash method and is for as-sprayed condition. Thermal conductivity will change based on microstructure and porosity, as well as serverce temperature and time in service.

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 Plasma Guns
Metco 9MB series
Metco 3MB series
Metco 11MB

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 205NS	1000599	12.5 lb (approx. 5.7 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 50-300 (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).

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