

Material Product Data Sheet

Magnesia-Stabilized Zirconium Oxide Thermal Spray Powders

Thermal Spray Powder Products: Metco 210NS-1, Metco 210

1 Introduction

Coatings of magnesia stabilized zirconia powders have low thermal conductivity and a high melting point, making them excellent high temperature thermal barriers. Coatings with Metco™ 210 series powders are resistant to particle erosion in high temperatures and resist wetting of molten zinc, iron, steel, copper and aluminum.

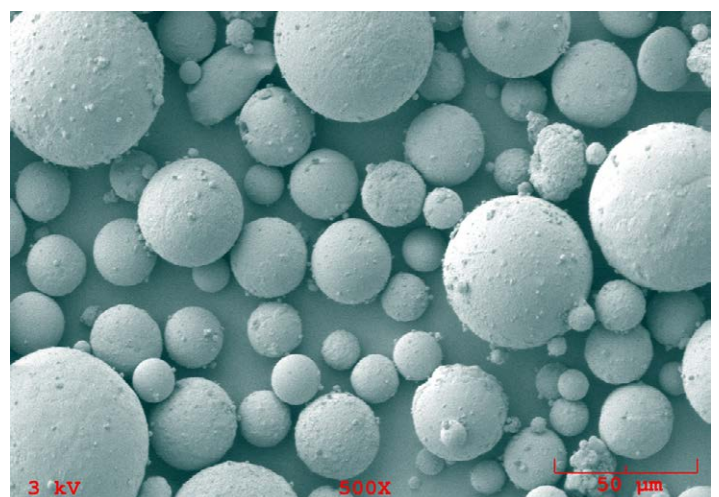
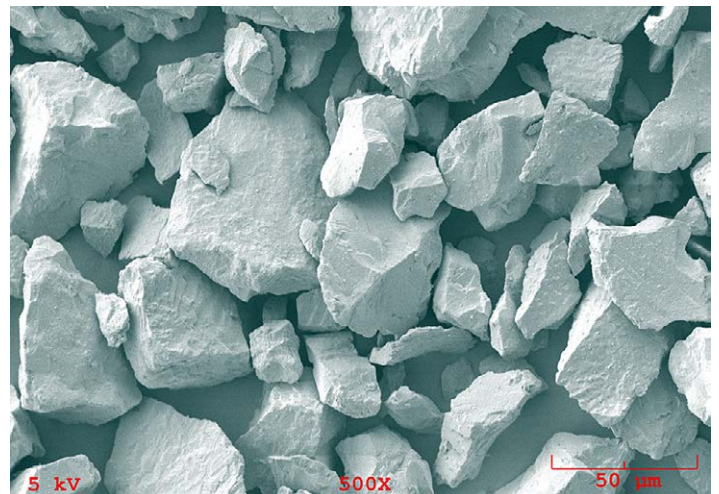
Metco 210 is a fused and crushed powder. Metco 210NS-1 is manufactured using Oerlikon Metco's HOSP™ process, which makes spherical powders that are superior to the angular fused and crushed powders. The free-flowing spherical shape of HOSP particles results in high purity and excellent flow during material feed. The consistent powder particle size results in more uniform particle melting during spraying.

1.1 Typical Uses and Applications

- Thermal barrier coatings for turbine engine combustion section components.
- Coatings on various types of molds and troughs to resist the effects of molten aluminum or copper.
- Missile nose cone coatings to resist particle erosion at temperatures above 845 °C (1550 °F).
- Thermal barrier coatings on brazing and heat treating fixtures.
- Coatings on tuyeres for iron forging or refining operations.

Quick Facts

Classification	Oxide ceramic, zirconia based
Chemistry	ZrO ₂ 24MgO
Manufacture	Fused & crushed or agglomerated & HOSP™
Morphology	Angular & blocky or spheroidal
Apparent density	2.1 – 2.5 g/cm ³
Service temperature	900 °C (1650 °F)
Melting point	2140 °C (3880 °F)
Purpose	Thermal protection
Process	Atmospheric Plasma Spray or Combustion Powder Thermospray™



Top: Fused and crushed. Bottom: Agglomerated & plasma densified (HOSP™)

2 Material Information

2.1 Chemical Composition and Phase Constituents

Product	Chemical Composition (wt. %)			Phase Constituents (% max)	
	ZrO ₂ ⁽¹⁾	MgO	Other Oxides (max)	Monoclinic ZrO ₂	Face-Centered Cubic ZrO ₂
Metco 210NS-1	Balance	15 – 30	7	10	Balance
Metco 210	Balance	15 – 30	7	N.R.	N.R.

1) Including a maximum of 2.5% HfO₃, counted as ZrO₂.
N.R. = Not Reported

2.2 Particle Size Distribution

Product	Nominal Range (µm)	Analysis by Microtrac (% cumulative)	
		-88 µm (max)	-11 µm (max)
Metco 210NS-1	-90 +11	15	1
Metco 210	-90 +11	15	0

(Note: other particle size distributions are available on request)
Microtrac by laser light diffraction per ASTM C 1070; screen analysis per ASTM Standard B214

2.3 Other Properties

Product	Apparent Density (g/cm ³)	Manufacture	Morphology
Metco 210NS-1	2.4 ± 0.1	HOSP™	Spherical
Metco 210	2.2 ± 0.1	Fused and Crushed	Angular / Blocky

2.4 Key Selection Criteria

- Choose the product that meets the required customer material specifications.
- Metco 210 is a fused and crushed product.
- Metco 210NS-1 and Metco 210NS-1-G are HOSP™ powders, which result in higher deposit efficiencies and better coating consistency than Metco 210.
- Metco 210NS-1 and Metco 210NS-1-G have slightly different particle size distributions to meet different OEM specifications. This may also affect spray parameters and deposit efficiencies.

2.5 Related Products

- Coatings of magnesia-stabilized zirconia products should exhibit improved long-term stability compared to calcium-stabilized products, but have reduced stability compared to the Metco 204 series, Metco 22XX series and

Metco 23XX series of products.

- Metco 204 series (HOSP™, agglomerated and plasma-densified), Metco 22XX and Metco 23XX series (agglomerated and sintered) products are 7 – 8 wt.% yttria-stabilized zirconia materials. These powders are spheroidal with excellent flow and high deposit efficiency during the coating process. Also, coatings of these materials can be used at higher service temperatures than the Metco 210 series of materials.
- Coatings of Metco 143 are more resistant to erosion and scuffing, and are harder than coatings produced using the Metco 201 family of materials.
- Metco 205NS (ceria-stabilized zirconium oxide) result in coatings with superior hot corrosion resistance.
- Please refer to the data sheets of the related products for further information.

2.6 Customer Specifications

Product	Customer Specification
Metco 210	Pratt & Whitney PWA 36382, Sec. 3.1.2.2
Metco 210NS-1	Jet Avion JA 1333, Class 1 Pratt & Whitney PWA 1333 Rolls-Royce OMAT 3/136 Rolls-Royce plc MSRR 9507/21

3 Coating Information

3.1 Key Thermal Spray Coating Information

Characteristic	Typical Data
Recommended coating processes	APS (Atmospheric Plasma Spray) or Combustion Powder Thermospray™
Recommended bond coat	Suitable high-temperature materials that are compatible with the substrate. NiAl, NiCr or MCrAlY bond-coats are recommended.
Typical porosity range	5 – 8%
Thermal conductivity	1.0 – 1.5 W/mK
Maximum Service Temperature	900 °C 1650 °F
Macrohardness	95 HRB – 31 HRC
Microhardness	350 – 450 HV0.3
Post finishing	Typically used as-sprayed. May be SiC or diamond ground

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 Atmospheric Plasma Spray Guns

Metco 9MB series	Metco SM F-100 Connex
Metco 11MB	Metco 3MB series
Metco F4 series	SimplexPro series
TriplexPro series	

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 210NS-1	1000578	12.5 lb (approx. 5.7 kg)	Stock	Global
	1000575	5 lb (approx. 2.25 kg)	Stock	Global
Metco 210	1000077	5 lb (approx. 2.25 kg)	Stock	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Carefully tumble contents prior to use to prevent segregation, but avoid breakdown of friable components.
- Open containers should be stored in a drying oven at temperatures to prevent moisture pickup.

4.3 Safety Recommendations

See SDS 50-150 (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 (Resources – Safety Data Sheets).

Information is subject to change without prior notice.