

# Material Product Data Sheet

## Agglomerated Zirconia Titania Yttria Composite Powder

### Thermal Spray Powder Products: Metco 143

#### 1 Introduction

Metco™ 143 is agglomerated, spray-dried zirconium oxide, titanium oxide, yttrium oxide composite powder. It is spherical in shape with excellent flowability.

Plasma sprayed coatings of Metco 143 exhibit excellent scuff resistance, high temperature erosion resistance, high temperature hardness, thermal shock resistance and resistance to sulfidation, chlorination, and sodium hot corrosion. The coatings provide a unique combination of wear, corrosion and thermal properties that no other Metco coatings can achieve.

In addition, plasma sprayed coatings of Metco 143 exhibit excellent high temperature wear and thermal shock properties. Metco 143 coating can be used for low angle solid particle erosion and sliding wear applications.

Metco 143 should be applied over a corrosion resistant, thermal sprayed bond coat, such as NiAl, NiCr or an MCrAlY. These bond coating materials are also available from Oerlikon Metco.

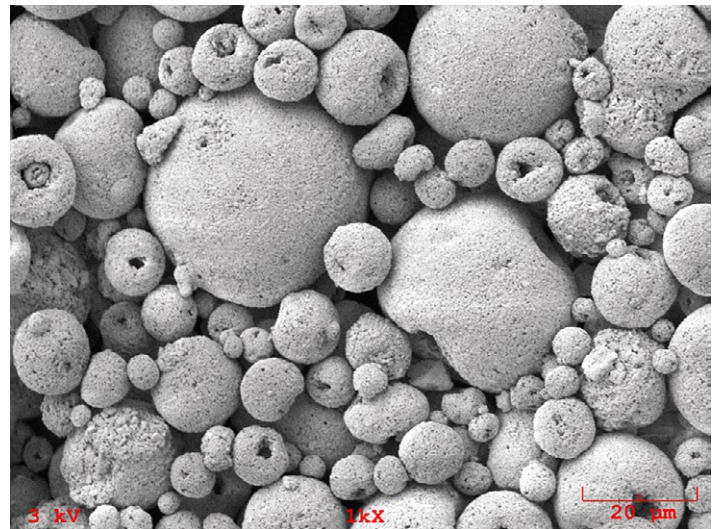
#### 1.1 Typical Uses and Applications

Usually used as a thermal spray coating for:

- Hard bearing surface coatings on cylinder liners
- Thermal barrier coatings for automotive and diesel piston rings and crowns, exhaust valves and turbine blades

#### Quick Facts

Classification	Oxide ceramic, zirconia based
Chemistry	ZrO <sub>2</sub> 18TiO <sub>2</sub> 10Y <sub>2</sub> O <sub>3</sub>
Manufacture	Agglomerated
Morphology	Spheroidal
Apparent Density	1.4 ± 0.5 g/cm <sup>3</sup>
Flow rate	100 ± 30 s / 25 g
Melting point	2535 °C (4600 °F)
Service Temperature	≤ 980 °C (1800 °F)
Purpose	Resists thermal shock, scuffing, high temperature corrosion
Process	Atmospheric Plasma Spray



## 2 Material Information

### 2.1 Chemical Composition

Product	Weight Percent (nominal)			
	ZrO <sub>2</sub> (min) *	TiO <sub>2</sub>	Y <sub>2</sub> O <sub>3</sub>	Others
Metco 143	65	15 – 20	8 – 12	Balance

\* Including a maximum of 2.5% HfO<sub>2</sub>, counted as ZrO<sub>2</sub>

### 2.2 Particle Size Distribution

Product	Nominal Range (µm)	Sieve Analysis (% cumulative)	
		+75 µm	-45 µm
Metco 143	-75 +5	3 max	80 min

Sieve analysis in accordance with ASTM B214.

Note: Other particle size distributions are available on request.

### 2.3 Key Selection Criteria

- Choose Metco 143 when coatings are required that exhibit excellent scuff wear resistance against cast iron and hard chromium plating with low frictional wear and low ring wear in LFW adhesive testing (piston ring simulation testing).
- Coatings of Metco 143 exhibit excellent thermal shock properties when air or water quenched from 1095 °C (2000 °F).

### 2.4 Related Products

- Coatings of Metco 143 exhibit significantly improved high temperature hardness compared to coatings of Metco 130 (Al<sub>2</sub>O<sub>3</sub> 13TiO<sub>2</sub>) at temperatures up to 1095 °C (2000 °F).
- Coatings of Metco 143 have better high temperature air oxidation resistance at 1095 °C (2000 °F) than coatings of Metco 210 (ZrO<sub>2</sub> 24MgO), are equivalent to coatings of Metco 105NS (Al<sub>2</sub>O<sub>3</sub>) and are slightly inferior to coatings of Metco 201NS (ZrO<sub>2</sub> 5CaO) and Metco 202NS (ZrO<sub>2</sub> 20Y<sub>2</sub>O<sub>3</sub>).

- Coatings of Metco 143 exhibit significantly better sulfidation, chlorination and sodium hot corrosion resistance than coatings of Metco 105NS, Metco 105SF and Metco 210, and are equivalent to Metco 201NS and Metco 202NS.
- Coatings of Metco 143 exhibit high temperature particle erosion resistance at 925 °C (1700 °F) that is superior to coatings of Metco 202NS and Metco 210.
- ZrO<sub>2</sub> 8Y<sub>2</sub>O<sub>3</sub> HOSP™ products (Metco 204 series), and agglomerated and sintered products (Metco 22x and Metco 23x series) exhibit higher coating deposit efficiencies than Metco 143. Coatings with these materials have better thermal cyclic properties than Metco 143 and can be used at higher service temperatures.
- Coatings with Metco 205NS (ZrO<sub>2</sub> 25CeO<sub>2</sub> 2.5Y<sub>2</sub>O<sub>3</sub>) have superior resistance to hot corrosion and increased cyclic fatigue resistance compared to Metco 143.

Please refer to the data sheets of the related products for further information.

### 3 Coating Information

#### 3.1 Key Thermal Spray Coating Information

Specification			Typical Data	
Recommended Process			Atmospheric Plasma Spray	
Bond Coat			A high temperature bond coat is required, Metco 450NS, Amdry 956, Metco 443NS, Amdry 960, Amdry 962 or Amdry 995 are recommended choices.	
Macrohardness	HR15N	as sprayed	88	
		HRC <sup>a</sup>	55	
as sprayed				
Microhardness	HV0.3	as sprayed	650 ± 50	
Bond Strength <sup>b</sup>	EPI15		34.5 MPa	5000 psi
		FM1000	13.8 – 20.7 MPa	2000 – 3000 psi
Coating Density			5.1 g/cm <sup>3</sup>	
Maximum Service Temperature			≤ 980 °C	≤ 1800 °F
Coefficient of Friction	Against cast iron		0.13	
	Against chromium plating		0.17	
Thermal Conductivity			1.35 W/m·K (25 – 1000 °C)	
Coefficient of Thermal Expansion			6.37 µm/m / °C (25 – 1000 °C)	
Machining Recommendation			Wet grind	
Surface Roughness	As sprayed	Ra		
	Diamond ground	Ra	6 – 9 µm	250 – 300 µin
			0.13 – 0.25 µm	5 – 10 µin

<sup>a</sup> Converted from HR15N

<sup>b</sup> Nominal values over an appropriate bond coat and measured in accordance with ASTM C633.

#### 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

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 143	1000579	5 lb (approx. 2.25 kg)	Stock	Global

#### 4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents 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 50-145 (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](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).

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