

Material Product Data Sheet

Ytterbium Disilicate Powder for Thermal Spray

Thermal Spray Powder Products: Metco 6157

1 Introduction

Metco™ 6157 is an agglomerated and sintered Ytterbium Disilicate ($\text{Yb}_2\text{Si}_2\text{O}_7$) material developed specifically for application using the atmospheric plasma spray process. Plasma sprayed coatings of Metco 6157 are greater than 98% dense and are typically used as part of an Environmental Barrier Coating (EBC) system with service temperatures up to 1350 °C (2460 °F) over a silicon bond coat.

Environmental Barrier Coatings are used to protect Ceramic Matrix Composites (CMCs) that are typically constructed from lightweight, silicon-based materials. Key design requirements of EBCs are low thermal expansion coefficients compared to traditional thermal barrier YSZ coatings, low thermal conductivity and phase stability over time, and temperature.

The usual bond coat materials for ytterbium disilicate coatings are silicon or silicon-based cermet. In some applications, mullite or another low expansion, high temperature ceramic or cermet can be used as an intermediate layer. It is critical to prevent penetration of water vapor to the substrate material as this attacks the silica-based oxide scale, undermining the service life and effectiveness of the EBC coating system.

Since spraying rare earth silicate materials can form amorphous phases that can result in premature cyclic failure, it is important to optimize the heat treatment of the EBC coating system after spraying and before subjecting the coating to service. Frequently, the heat treatment cycle and process is proprietary to the turbine engine OEM.

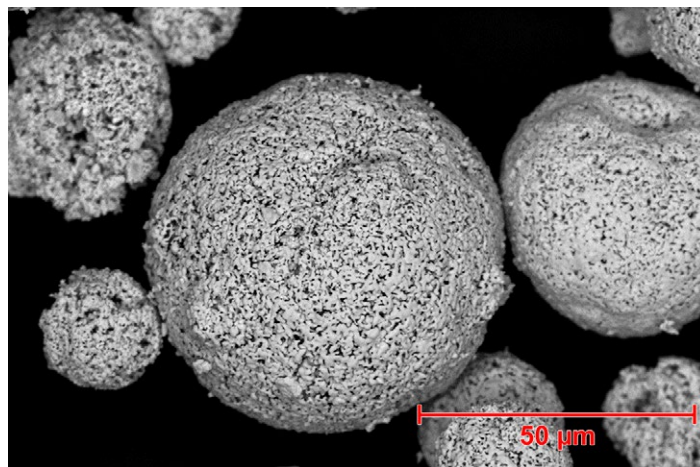
1.1 Typical Uses and Applications:

- Airfoils
- Combustor Liners
- Blade Tracks / Shrouds
- Exhaust Components

Quick Facts

Classification	Ceramic, ytterbium oxide-based
Chemistry	$\text{Yb}_2\text{Si}_2\text{O}_7$
Manufacture	Agglomerated and sintered
Morphology	Submicron
Service Temperature ^a	≤ 1350 °C (2460 °F)
Purpose	Thermal insulation / environmental isolation
Thermal Expansion Coefficient	$4.5 - 5.0 \cdot 10^{-6}/^\circ\text{C}$
Thermal Conductivity	$1.8 - 2.0$ W/m·K
Process	Atmospheric plasma spray

^a Dependent on engine service conditions



2 Material Information

2.1 Chemical Composition

Product	Nominal Composition (wt. %)				
	Yb ₂ O ₃	SiO ₂	Al ₂ O ₃	Na ₂ O	Other Oxides
Metco 6157	Balance	23	< 0.1	< 0.1	0.5 max

2.2 Particle Size Distribution

Product	Nominal Range (µm)	D90 (µm)	D50 (µm)	D10 (µm)
Metco 6157	-90 +11	60 – 80	30 – 45	15 – 25

Upper particle size analysis via sieve, lower particle size analysis via laser diffraction (Microtrac)

2.3 Key Selection Criteria

- Choose Metco 6157 as a functional top layer in an EBC coating system and/or when the following properties are required:
- Coatings with excellent high temperature service properties
- Coatings with excellent thermal stability
- Application using atmospheric plasma spray
- Coatings exhibit a thermal expansion coefficient that is compatible with CMC / silicon substrates and bond coats

2.4 Related Products

- Metco 4810 or Metco 4811 are recommended for potential bond coat materials (refer to Materials Data Sheet DSMTS-0125)
- For intermediate ceramic layers, Metco 6150 is recommended (refer to Materials Data Sheet DSMTS-0124)

3 Coating Information

3.1 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 F4MB-XL series

SinplexPro series

TriplexPro series

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 6157	1089564	5 lb (approx. 2.26 kg)	Special Order	Global

4.2 Handling Recommendations

- Store in the original container in a ventilated location approved for flammable liquids.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Container must be rolled or shaken to fully re-suspend sediments prior to opening.

4.3 Safety Recommendations

See SDS 50-1859 (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).