

Material Product Data Sheet

Gadolinia-Containing Zirconium Oxide and Gadolinium Zirconate Powders for Thermal Spray

Thermal Spray Powder Products: Metco 6041, Metco 6042 and Metco 6043

1 Introduction

Oerlikon Metco's gadolinium-zirconium oxide thermal spray powders are designed to produce coatings for advanced thermal barrier applications when applied using the atmospheric plasma spray (APS) process.

Metco™ 6041 is an agglomerated and sintered alloyed powder developed for conformance to the applicable Siemens Energy specification. When properly applied, coatings sprayed using traditional APS equipment can meet the engineering design requirements of the Siemens' coating specification.

Metco 6042 and Metco 6043 conform to the Pratt and Whitney specifications. These powders are agglomerated and plasma-densified (HOSP™) materials.

Coatings of these products exhibit low thermal conductivity and improved CMAS resistance compared to APS coatings of legacy YSZ materials.

For maximum effectiveness and mechanical durability, these products should be applied as the top coat in a three-layer coating system that also consists of an appropriate MCrAlY bond coat layer and an intermediate layer of a 7% – 8% yttria-stabilized zirconia (YSZ).

Metco 6041 is patented by Siemens Energy. Metco 6042 and Metco 6043 are patented by Pratt and Whitney. These products can be only sold to customers approved by the respective OEM.

1.1 Typical Uses and Applications

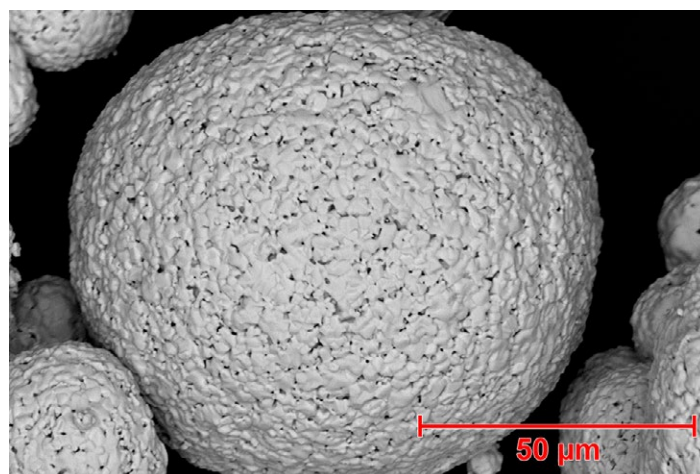
Typically used on industrial gas turbine or aero engine turbine components such as:

- Various types of buckets and vanes
- Combustion liners
- Transition ducts

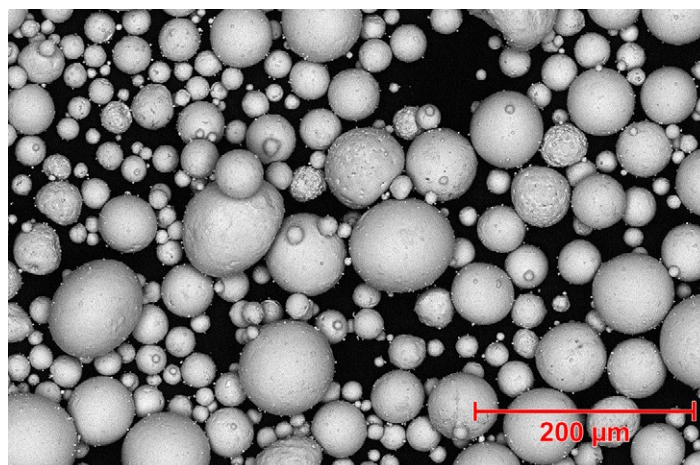
Quick Facts

Classification	Oxide Ceramic, GdZr-based
Chemical formula	$Gd_2O_3-ZrO_2-RE_xO_y$ ^a
Manufacture	Agglomerated and Sintered or Agglomerated and Plasma Densified
Morphology	Spheroidal
Service Temperature	≤ 1500 °C (2730 °F)
Purpose	Thermal Barrier
Process	Atmospheric Plasma Spray

^a RE = Rare Earth



Typical SEM photograph of Metco 6041, a spherical, agglomerated and sintered Gadolinium Zirconate powder.



Typical SEM photograph of Metco 6042, a spherical, agglomerated and plasma-densified Gadolinium Zirconate powder.

2 Material Information

2.1 Chemical Composition, Size Distribution and Other Properties

Product	Chemistry	Nominal Size Distribution (µm)	Manufacturing Method	Morphology
Metco 6041	Proprietary	-140 +45	Agglomerated and Sintered	Spheroidal
Metco 6042	Proprietary	-120 +16	Agglomerated and Plasma Densified	Spheroidal
Metco 6043	Proprietary	-140 +16	Agglomerated and Plasma Densified	Spheroidal

Particle size equal to or above 45 µm determined by sieve analysis; below 45 µm by laser diffraction (Microtrac)

2.2 Key Selection Criteria

- Choose the appropriate product to meet the required OEM specifications
- These products are excellent choices for top coats in a thermal barrier coating system where moderate to high porosity is required (5% to 20% by volume) to provide enhanced thermal insulation in conjunction with CMAS resistance.

2.3 Related Products

- Oerlikon Metco offers 8% yttria-stabilized zirconia powders manufactured from high purity raw materials include HOSP™ (agglomerated and plasma densified) and agglomerated and sintered materials. Like Metco 6041, these high purity YSZ products produce coatings with enhanced structural stability, thermal shock and insulation properties. These materials can also be used as the intermediate coating layer to improve the performance of thermal barrier coating systems with Metco 6041 as a top coat.
 - For high purity HOSP materials, please refer to the materials designated as "XCL" or "Premium" products on Data Sheet DSMTS-0001. These products are recommended for thermal barrier coatings with standard porosity levels.
 - For high purity agglomerated and sintered materials, please refer to Metco 222A on Data Sheet

- DSMTS-0047. This material is recommended for thermal barrier coatings with higher porosity levels.
- Metco 206A is designed to produce advanced low-K thermal barrier coatings. It is also manufactured using high-purity raw materials and can be used as an intermediate coating for Metco 6041 coating systems. However, the use of this material is subject to U.S. Government licensing restrictions. See Data Sheet DSMTS-0099 for more information.
- Metco 6700 is a fine, agglomerated and sintered YSZ material designed for applications using the PS-PVD spray process to produce coatings with structures similar to those produced using EB-PVD. See Data Sheet DSMTS-0019.
- YSZ coatings and coatings of Metco 143 (see Data Sheet DSMTS-0033) typically have greater erosion resistance than coatings of Metco 6041.
- Coatings of Metco 6041 are typically less susceptible to degradation from molten CMAS (calcium-magnesium aluminosilicate) deposits than coatings of YSZ materials.
- Oerlikon Metco also offers a complete portfolio of bond coat materials, including MCrAlY materials most often used as a bond coat for these thermal barrier materials. Please see Data Sheets DSMTS-0092, DSMTS-0093, DSMTS-0094 and DSMTS-0102).

2.4 Customer Specifications

Product	Customer Specifications
Metco 6041	Siemens PD83336Y6*
Metco 6042	Pratt and Whitney PWA 36390
Metco 6043	Pratt and Whitney PWA 36326

* Metco 6041 applied using OEM-approved parameters conforms to the engineering requirements of this Siemens coating specification

3 Coating Information

3.1 Key Thermal Spray Coating Information

Coating properties and parameters are proprietary to Siemens Energy or Pratt and Whitney.

Recommended Atmospheric Plasma Spray Guns

Metco F4 series

Metco 9MB series

SinplexPro series

TriplexPro series

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 6041	1084657	2.5 kg (approx. 5.5 lb)	Special Order	Global
Metco 6042	1092338	12.5 lb (approx 5.7 kg)	Stock	Global
Metco 6043	1092343	12.5 lb (approx 5.7 kg)	Stock	Global

Note: These materials are only available to OEM-qualified buyers.

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Opened containers should be stored in a drying oven to prevent moisture pickup.
- Tumble contents prior to use to prevent segregation.

4.3 Safety Recommendations

See the SDS (Safety Data Sheet) in the version localized for 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).

Product	SDS
Metco 6041	50-1520
Metco 6042	50-1791
Metco 6043	50-1795

Information is subject to change without prior notice.