

Material Product Data Sheet

Yttria Stabilized Zirconia for Suspension Thermal Spray

Thermal Spray Suspension Products: Metco™ 6608, Metco 6609

1 Introduction

Yttria stabilized zirconia ($8Y_2O_3 ZrO_2$) for suspension thermal spray provides YSZ as submicron particles in liquid suspensions. Formulated specifically for use in suspension plasma spray (SPS), the liquid suspension feedstock is designed to provide low viscosity and high stability that is suitable for commercial and developmental suspension feed systems.

Produced from the Metco HOSP™ process, and then milled to submicron particle size, the YSZ suspensions have the same composition and exceptional purity as our highest quality $8Y_2O_3 ZrO_2$ products.

Metco™ 6608 is an ethanol-based suspension containing 25% YSZ by weight. The choice of ethanol as the liquid carrier and 25% loading is a common suspension configuration for thermal barrier coatings (TBC) development involving suspension plasma spray. Inclusion of a proprietary dispersant insures stability and low viscosity for consistent and repeatable feed rates.

Metco 6609 is the dry version of Metco 6608, with identical YSZ composition and particle size (when fully dispersed). It is pre-formulated in granular form with the dispersant intrinsically bound to the YSZ particles, which ensures homogeneous dispersion. Metco 6609 is ready to be mixed with ethanol to form stable suspensions using appropriate high speed mixing equipment by the end-user.

Users of Metco 6609 can produce fresh suspensions on an as-needed basis, without concern over sedimentation and storage issues.

Metco 6609 offers the flexibility for user-customized solid loading levels. While Metco 6608 has a fixed loading of 25% solids, with Metco 6609 the user has the option to make suspensions at the same (25%) loading level or another loading level of their choosing. Adjustment of loading levels may be useful to change coating deposition rate, or to accommodate different suspension feeder designs. The formulation of Metco 6609 ensures stability at any solids loading level when the appropriate grade of ethanol is used.

Quick Facts

Classification	Ceramic, zirconia-based liquid suspension
Chemistry	
Metco 6608	$ZrO_2 8Y_2O_3$ / ethanol
Metco 6609	$ZrO_2 8Y_2O_3$
Manufacture	Agglomerated and plasma densified (HOSP), milled and dispersion mixed
Particle size	Submicron
Service Temperature	≤ 1350 °C (2460 °F)
Melting Point	2800 °C (5072 °F)
Purpose	Thermal protection
Process	Suspension plasma spray



1.1 Typical Uses and Applications:

Usually used as a suspension thermal spray coating for:

- Advanced, micro-structured TBC coatings that are not producible by conventional atmospheric plasma spray (APS) methods

2 Material Information

2.1 Chemical Composition of Suspension

Product	Solids Content (wt. %)	Liquid Carrier	Suspension Density (g/cm ³)	Dispersant
Metco 6608	25	Denatured ethanol	1.0	Proprietary
Metco 6609	100	None	N/A	Proprietary

2.2 Chemical Composition of Solids

Product	Chemical Composition (wt. %)						
	ZrO ₂	Y ₂ O ₃	SiO ₂ max	TiO ₂ max	Al ₂ O ₃ max	Fe ₂ O ₃ max	Monoclinic Phase max
Metco 6608	Balance	7.0 – 8.0	0.05	0.05	0.05	0.05	10
Metco 6609	Balance	7.0 – 8.0	0.05	0.05	0.05	0.05	10

2.3 Particle Size Distribution

Product	D90 (µm)	D50 (µm)	D10 (µm)
Metco 6608	0.8 – 2.0	0.3 – 1.0	~ 0.1
Metco 6609 ^a	0.8 – 2.0	0.3 – 1.0	~ 0.1

^a When dispersed

2.4 Metco 6609 Ethanol Requirements

Reagent grade absolute ethanol with 5% methanol and 5% isopropanol as denaturants is the recommended liquid carrier to be used for a suspension of Metco 6609, and is commonly available from local chemical supply companies.

2.5 Key Selection Criteria

Use Metco 6608 for:

- Investigation of SPS coatings as alternative to vacuum deposition methods such as EB-PVD.
- Development of advanced microstructured TBC top coats with enhanced properties over conventional APS coatings.
- Circumstances where a ready-made suspension is convenient, or mixing equipment is not available.

Use Metco 6609 for:

- Long or frequent spraying sessions where dedicated mixing equipment is available.

2.6 Related Products

- Oerlikon Metco offers a number of 8Y₂O₃ ZrO₂ products with the same high purity chemical composition as the YSZ contained in Metco 6608.
- Oerlikon Metco offers a complete portfolio of bond coat materials that are often used for thermal barrier coatings, including MCrAlY materials. Please see datasheets DS-MTS-0092, DSMTS-0093, DSMTS-0094 and DSMTS-0102.
- If interested in production quantities of suspension plasma spray YSZ materials, please contact Oerlikon Metco with your requirements.

3 Coating Information

3.1 Key Thermal Spray Coating Information

- Specialized equipment is required for suspension plasma spray.
- Particularly suited for SPS are Oerlikon Metco's TriplexPro, SinplexPro, 9MB and other plasma spray guns adapted for SPS.
- The Metco 5MPE-SF is suitable for feeding Metco 6608
- Oerlikon Metco SPS materials are compatible with other commercially-available suspension feed systems for SPS.
- Metco 6609 requires suitable mixing equipment to disperse the powder into the ethanol liquid carrier, which should be performed just prior to spraying.

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

TriplexPro series

SinplexPro series

* With hardware options designed for SPS available from Oerlikon Metco

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Package Type	Availability	Distribution
Metco 6608	1092043	8 lb (approx. 3.6 kg)	1 gal (3.8 l) can	Stock	Global
Metco 6609	1094797	5 lb (approx. 2.25 kg)	0.5 gal (1.9 l) bottle	Stock	Global

4.2 Handling Recommendations

Metco 6608:

- 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.

Metco 6609:

- Store in the original container in a dry location.
- DO NOT store open containers in a drying oven.
- DO NOT tumble contents prior to mixing with ethanol

4.3 Safety Recommendations

See the SDS (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).

Product	SDS Index No.
Metco 6608	50-1824
Metco 6609	50-1973

Information is subject to change without prior notice.