

Material Product Data Sheet

High Purity Silicon Powder for Thermal Spray

Thermal Spray Powder Products: Metco 4810

1 Introduction

Coatings of Metco™ 4810 are effective as environmental barrier bond coats for Ceramic Matrix Composite (CMC) components or for use as a thermal spray coating on sputter targets used in PVD (Physical Vapor Deposition) and HIPIMS (High Power Impulse Magnetron Sputtering) processes to apply subsequent coatings for electronic and semi-conductor applications.

Metco 4810 is a fused and crushed silicon powder of excellent purity (99.0%+).

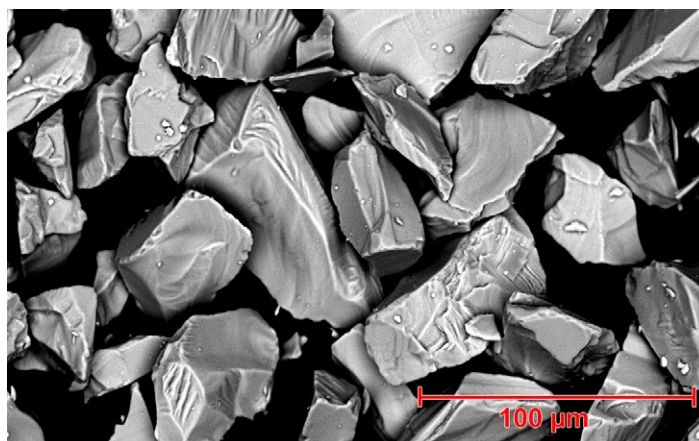
Metco 4810 can be applied as a coating using either atmospheric plasma spray (APS) or chambered plasma spray such as LPPS or LVPS (ChamPro™).

1.1 Typical Uses and Applications

- Thermal sprayed bond coat in an EBC coating system on CMC turbine blades, vanes and combustor liners to protect against steam recession at service temperatures up to 1300 °C (2370 °F)
- Thermal spray bond coat material in an EBC coating system designed to protect components against CMAS attack
- PVD and HIPIMS sputter target coatings for use on electronic and semi-conductor applications

Quick Facts	
Classification	Metal (metalloid), silicon-based
Chemistry	Si 99.0% +
Manufacture	Fused and crushed
Morphology	Irregular
Service Temperature	≤ 1300 °C (2370 °F)
Thermal Expansion Coefficient	3.5 – 4.5 x 10 ⁻⁶ °C ⁻¹ (1.9 – 2.5 x 10 ⁻⁶ °F ⁻¹)
Thermal Conductivity *	10 – 20 W/m·K
Purpose	Environmental barrier bond coat or coatings on sputter targets
Process	Atmospheric plasma spray or ChamPro™

* Microstructure dependent



SEM photomicrograph of Metco 4810

2 Material Information

2.1 Chemical Composition

Product	Nominal Chemical Composition (wt. %)		
	Si	All Other (max) *	O ₂ *
Metco 4810	Balance	1.0	0.3 – 0.4

* All Other expresses total impurities including O₂ content

2.2 Particle Size Distribution

Product	Nominal Particle Size Distribution (µm)	Manufacturing Method	Morphology	Typical Apparent Density (g/cm ³)
Metco 4810	-75 +15	Fused and crushed	Irregular	1.0

Upper particle size determined via sieve analysis; lower particle size determined via laser diffraction (Microtrac) analysis.

2.3 Key Selection Criteria

- Metco 4810 produces coatings that have:
 - A low thermal expansion coefficient
 - Excellent thermal shock resistance when applied as a bond coat for low expansion ceramic coatings (e.g., ytterbium disilicate, alumina, mullite, magnesia, alumina-spinel)
 - Excellent thermal stability up to 1300 °C (2370 °F)
 - Can be applied using either atmospheric or chambered plasma spray processes (APS or ChamPro)
- Metco 6157 (ytterbium disilicate) can be used as an intermediate coating in EBC systems to reduce thermal stresses in the coating system resulting from mismatched thermal expansion coefficients.
- Metco 6160 (ytterbium monosilicate) is resistant to water vapor and CMAS attack and is used as a top coat material in EBC systems.
- Oerlikon Metco also has ceramic materials, such as titania, which can be used to coat sputter targets for other applications.
- Ceramic materials such as high purity alumina and high purity yttria powders are used to apply coatings on tooling used to manufacture semi-conductor wafers and LCD panels.

2.4 Related Products

- Metco 6150 is a mullite-type material that can be used as an intermediate layer or top coat over Metco 4810 as part of an EBC (Environmental Barrier Coating) system to protect CMC components.

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification	Typical Data	
Recommended Spray Process	Atmospheric Plasma Spray or ChamPro	
Thermal Expansion Coefficient	3.5 – 4.5 x 10 ⁻⁶ °C ⁻¹	1.9 – 2.5 x 10 ⁻⁶ °F ⁻¹
Thermal Conductivity	10 – 20 W/m·K depending on coating microstructure	
Maximum Service Temperature	1300 °C	2370 °F

Data provided is typical and variability can be expected. Changes in spray process, spray equipment or spray parameters can significantly change coating results.

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

ChamPro	Atmospheric Plasma Spray	
SinplexPro 03C	Metco F4 series	TriplexPro series
	Metco 9MB series	SinplexPro series

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Metco 4810	1087736	5 lb (approx. 2.25 kg)	Special Order	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents gently 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 50-1669 (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).