

Material Product Data Sheet

High Purity Silicon Powder for Thermal Spray

Thermal Spray Powder Products: Metco 4810, Metco 4811

1 Introduction

Coatings of Metco™ 4810 and Metco 4811 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 standard grade, fused and crushed silicon powder of excellent purity (99.0% +).

Metco 4811 is a premium grade, very high purity (99.5% +) silicon powder material for thermal spray. It has a very low oxygen content with a spheroidal morphology for excellent flowability and is manufactured via a proprietary plasma-densification process.

These materials are designed to be applied as a coating using either atmospheric plasma spray or chambered plasma spray such as LPPS or LVPS.

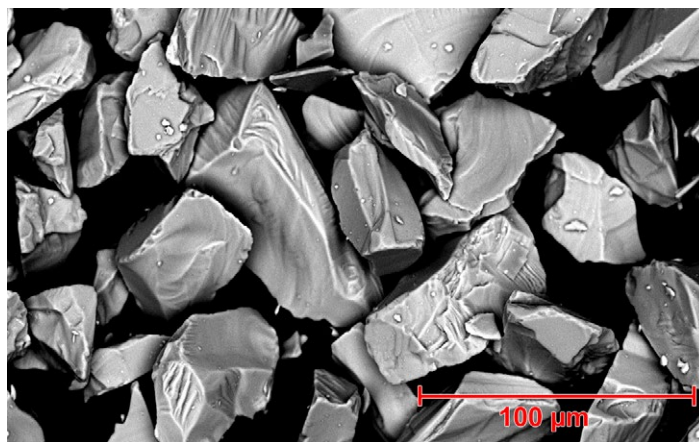
1.1 Typical Uses and Applications

- CMC bond coats for coatings on turbine blades, vanes and combustor liners with service temperatures up to 1300 °C (2370 °F)
- PVD and HIPIMS sputter target coatings for use on electronic and semi-conductor applications

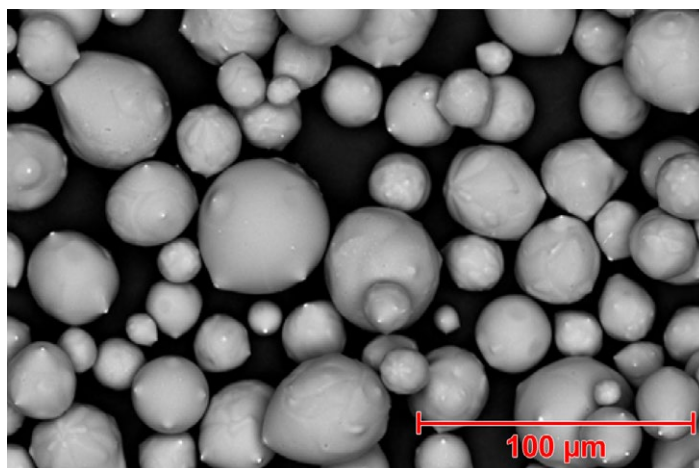
Quick Facts

Classification	Metal (metalloid), silicon-based
Chemistry	Si 99.0% + or 99.5% +
Manufacture	Fused and crushed or plasma densified
Morphology	Irregular or Spheroidal
Service Temperature	≤ 1300 °C (2370 °F)
Thermal Expansion Coefficient	3.5 – 4.5 × 10 ⁻⁶ °C ⁻¹ (1.9 – 2.5 × 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



SEM photomicrograph of Metco 4811

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
Metco 4811	Balance	0.5	0.1 max

* 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
Metco 4811	-53 +15	Proprietary plasma densification	Spheroidal	1.1

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

2.3 Key Selection Criteria

- Metco 4810 and Metco 4811 produce 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., 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 4811 is a premium grade product that results in more uniform melting during spraying, better flowability and higher apparent density for more consistent feeding characteristics and better deposit efficiency.

2.4 Related Products

- Metco 6150 is a mullite-type material that can be used as an intermediate layer or top coat over Metco 4811 as part of an EBC (Environmental Barrier Coating) system to protect CMC components (please see Material Data Sheet DSMTS-0124).
- Oerlikon Metco also has ceramic materials, such as titania, which can be used to coat sputter targets for other applications (see Material Data Sheet DSMTS-0065).
- 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 (see Material Data Sheets DSMTS-0023 and DSMTS-0122).

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
03CP	Metco F4 series
	Metco 9MB series
	TriplexPro 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)	Stock	Global
Metco 4811	1087739	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).