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Material Product Data Sheet
Ytterbia Zirconate Based Ceramic Abradable Powders

Powder Products:
Durabrade 2197, Durabrade 2198

1 Introduction

Durabrade™ 2197 and, Durabrade 2198 are ytterbia-zirconate-based ceramic thermal spray powders designed to produce high temperature abradable coatings for clearance control applications in the turbine section of industrial gas turbines. The products are manufactured exclusively for Siemens AG Power Generation Group.

Clearance control coatings are used in applications where rotating components may come into contact with the coating as a result of design intent or operational surges. The coatings are designed to minimize the wear to the rotating components while maximizing gas path efficiency by providing clearance control in seal areas.

Coatings of these abradables combine good thermal stability at high temperature, good thermal shock resistance, adequate erosion resistance and good abradability.

These ytterbia zirconate abradable coating materials have been designed with a very pure ceramic matrix that improves the high temperature performance of the coating.

The polymer component in Durabrade 2198 is added to impart porosity into the coatings when plasma sprayed with beneficial characteristics that:

- Reduce thermal conductivity
- Improve sintering resistance
- Improve abradability when cut by untipped or cubic boron nitride blades

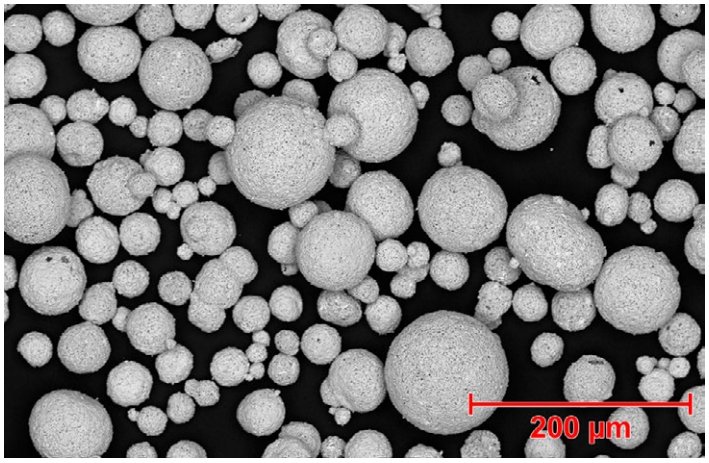
1.1 Typical Uses and Applications

Typically, coatings of these materials are used in industrial gas turbine engines for:

- High pressure turbine seal applications at service temperatures up to 1150 °C (2100 °F)
- Abradable coatings that can be run against untipped or cBN tipped blades, depending on the application.

Quick Facts	
Classification	Abradable, ytterbia zirconate based
Chemistry	Proprietary
Manufacture	Agglomerated & sintered or blended
Morphology	Spheroidal
Purpose	Clearance Control
Service Temperature [b]	≤ 1150 °C (2100 °F)
Process	Atmospheric plasma spray

[b] Long term service temperatures of at least 1250 °C (2280 °F) have been demonstrated by Siemens.



SEM photomicrographs of Durabrade 2197, showing the morphology that is typical for this product.

2 Material Information

2.1 Chemical Composition

Product	Chemistry
Durabrade 2197	Proprietary Ytterbia Zirconate Oxide Ceramic
Durabrade 2198	Proprietary Ytterbia Zirconate Oxide Ceramic + Polyester

2.2 Particle Size Distribution, Manufacturing Method, Color

Product	Nominal Particle Size Distribution (µm)	Average Particle Size (µm)	Manufacturing Method	Color
Durabrade 2197	–176 +11	61	Agglomerated & Sintered	Off White
Durabrade 2198	–176 +11	64	Agglomerated & Sintered / Blended	Off White

Particle size analysis using laser diffraction (Microtrac)

2.3 Key Selection Criteria

- Coatings of these materials can be applied with high porosity levels. Higher porosity levels improve thermal shock life, reduce erosion resistance and improve abradability. These characteristics should be carefully balanced to suit the specific application.
- Coatings of these ceramic abradable materials are readily cut by cBN tipped blades.
- Under certain design conditions, seal coatings of Durabrade 2198 can be cut by bare, untipped blades.
- Both Durabrade 2197 and Durabrade 2198 employ a high-purity ceramic that result in coatings with improved sintering resistance and extended coating life.

2.4 Related Products

- Oerlikon Metco offers the following yttria-stabilized zirconia ceramic abradable products for service temperatures up to 1150 °C (2100 °F):
  - Durabrade 2192
  - Metco 2395
  - Metco 2460NS
  - Please review Product Data Sheet DSMTS-0014 or contact your Oerlikon Metco Account Representative for additional information.

2.5 Customer Specifications

Product	Customer Specifications
Durabrade 2197	Siemens Energy DGTLV 511143001 Index A Siemens Energy PD83336Y5
Durabrade 2198	Siemens Energy PD83336X1

3 Coating Information

3.1 Post-Coating Polyester Removal

For coatings of Durabrade 2198, it is necessary to perform a post-coating burnout of the polymer. The recommended heat treatment cycle is as follows:

Process Step	Recommendation
Furnace Type	Atmospheric (air) with proper exhaust
Ramp Up	Room temperature to 450 °C (842 °F) at 5 – 8 °C/min (9 – 14.5 °F/min)
Heat Soak	450 °C (840 °F) for 8 h
Ramp Down	Turn furnace off. Allow parts to cool for at least 2 h before removing. To reduce cooling time, the furnace door can be opened after the first 0.5 h. The heat treatment cycle may vary based on part geometry, coating thickness and part size.

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 Atmospheric Plasma Spray Guns
Metco 9MBM
Metco F4MB-XL series
TriplexPro series
SimplexPro series

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Durabrade 2197	1077087	12.5 lb (approx. 5.7 kg)	Stock	Global
Durabrade 2198	1077088	12.5 lb (approx. 5.7 kg)	Special Order	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents prior to use to prevent segregation.
- Open containers should be stored in a drying oven at temperatures below 38 °C (100 °F) to prevent moisture pickup.

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 No.
Durabrade 2197	50-1384
Durabrade 2198	50-1385

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