oerlikon
metco

Material Product Data Sheet
Chromium Carbide – 25 % Nickel Chromium Densified Powders

Powder Products:
Woka 7302, Woka 7304, Woka 7305, Woka 7307, Woka 7310

1 Introduction

Woka™ 7300 series products are spheroidal, agglomerated powders for thermal spray that are plasma densified. The Woka 7300 series materials are sintered prior to densification. These materials consist of 75 % chromium carbide as a hard, wear-resistant phase that has a minimal tendency for decomposition during the thermal spray process. A 80 % nickel, 20 % chromium matrix functions as a binder for the carbides and is responsible for the excellent corrosion and oxidation resistance exhibited by coatings of these materials. Densification of the powders produces higher apparent densities compared to powders of similar chemistry, such as Woka 7200 series products, which leads to denser coatings with improved corrosion resistance.

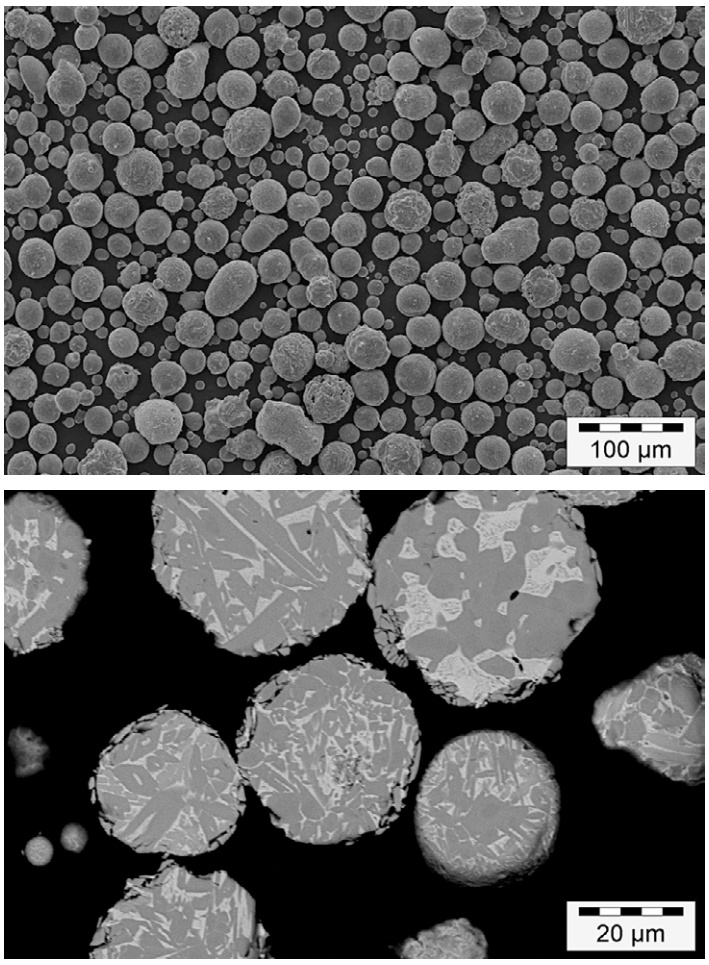
Coatings of these materials are known as some of the best materials for use in applications with combined wear and corrosion. They protect against abrasion, fretting, various forms of erosion and tribological corrosion at elevated temperatures up to 870 °C (1600 °F). They are well known as materials for thermal sprayed alternatives to hard chromium plating with better corrosion resistance in chloride, acidic and alkaline environments. HCl environments should be avoided.

HVOF coatings of these materials are dense, show good bond strength and are more homogeneous than coatings applied using atmospheric plasma spray or combustion powder Thermospray™.

1.1 Typical Uses and Applications

- Hydraulic rods
- Turbine blades
- Engine valve spindles
- Fuel rod mandrels
- Valves used in chemical processing
- Ball valves

Quick Facts	
Classification	Carbide, chromium-based
Chemistry	Cr_3C_2 25(80Ni 20Cr)
Manufacture	Agglomerated [and sintered] and densified
Morphology	Spheroidal
Apparent Density	3.0 – 4.0 g/cm^3
Service Temperature	< 870 °C (1600 °F)
Purpose	Wear and corrosion resistance
Process	HVOF



SEM Photomicrographs showing the morphology (top) and the microstructure (bottom) of Woka 7300 series powders.

2 Material Information

2.1 Chemical Composition (all products)

	Weight Percent (nominal)					
Product	Cr	Ni	C_{TOTAL}	Fe	O	Others
Woka 7300 Series	Balance	17.5 – 22.5	9.0 – 10.2	< 0.5	–	–

2.2 Particle Size Distribution and Apparent Density

	Nominal Range µm	D95 µm	D5 µm	Primary Carbide Size µm	Apparent Density g/cm³
Woka 7302	–45 +15	45	15	Coarse	3.4 – 4.0
Woka 7304	–30 +10	30	10	Coarse	3.3 – 3.9
Woka 7305	–38 +10	38	10	Coarse	3.3 – 3.9
Woka 7307	–45 +20	45	20	Coarse	3.4 – 4.0
Woka 7310	–25 +5	25	5	Coarse	3.2 – 3.8

Size analysis below 20 µm using laser diffraction (Microtrac), Size analysis 20 µm and above using sieve. Other particle size distributions are available on request.

2.3 Key Selection Criteria

Main selection criteria for choosing a Woka 7300 series product are:

- Particle size distributions are optimized for a variety of HVOF guns on the market today. Woka 73xx series products can be used with several different HVOF guns depending on the particle size distribution. See Section 2.4 for recommendations.
- Desired as-sprayed surface roughness. For the smoothest possible surface, choose a product with the lowest particle size distribution appropriate for the HVOF spray gun to be used.
- When a more economical solution is needed, choose one of the Woka 73xx series products.

2.4 Related Products

- For better wear resistance or higher coating hardness choose:
  - A tungsten carbide material when service temperatures are below 500 °C (930 °F). Oerlikon Metco offers an extensive portfolio of tungsten carbide materials. A few examples are WC 12Co and WC 17Co. Other products are available with corrosion resistance matrixes.
  - Woka 75xx series products, which can be used at service temperatures up to 700 °C (1290 °F).
- For better corrosion resistance in sulfuric acid (H_2SO_4) or saline (NaCl) solutions choose materials that contain both chromium carbide and tungsten carbide, such as Woka 75xx or Woka 37xx series products.
- For better resistance to acidic salt environments choose:
  - A tungsten carbide materials with a cobalt-chromium matrix such as Woka 365x series products or Woka 360x series products.
  - A material that contains both chromium carbide and tungsten carbide, such as Woka 75xx or Woka 37xx series products.
- Diamalloy 3007 is a clad material [Cr_3C_2 20(Ni 20Cr)]. Coatings of Diamalloy 3007 show outstanding properties in applications with erosion, cavitation, heavy abrasion or substantial friction wear at service temperatures between 540 °C – 870 °C (1000 °F – 1600 °F) .
- Within Oerlikon Metco's portfolio are various chromium carbide blends such as Diamalloy 3004 and Metco 5255, as well as specialty products such as Amdry 5241. Blends are commonly more economical when compared to products of greater manufacturing complexity such as densified powders. Furthermore, some aerospace specifications require blended products.

2.5 Recommended Spray Guns

	Diamond Jet	WokaJet / WokaStar / JP5000	K2	Jet Kote	Top Gun / HV2000	CJS
Woka 7302	●	●	●	●		
Woka 7304	●					●
Woka 7305	●				●	
Woka 7307	●	●				
Woka 7310	●	●				●

3 Coating Information

3.1 Key Thermal Spray Coating Information

Characteristic		Typical Data [a]	
Recommended Process		HVOF	
Microhardness	HV0.3	900 – 1200	
Macrohardness	HR15N	> 90	
Bond Strength		> 70 MPa	> 10000 psi
Porosity		< 2 %	
Corrosion Resistance		Excellent in 1 M NaOH and 1 M NaCl, good in 0.5 M H_2SO_4	
Maximum Service Temperature		870 °C	1600 °F
Deposition Efficiency		30 – 60 %	

[a] Depending on the HVOF spray gun used, parameter used and coating thickness applied.

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 HVOF Spray Guns
DiamondJet series guns
WokaJet series guns
WokaStar series guns

4 Commercial Information

4.1 Ordering Information and Availability

	Order No.	Package Size	Availability	Distribution
Woka 7302	1041172 1041160	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock Stock	Europe Americas
Woka 7304	1041181	5 kg (approx. 11 lb)	Special Order	Global
Woka 7305	1041152	5 kg (approx. 11 lb)	Stock	Global
Woka 7307	1063549	5 kg (approx. 11 lb)	Special Order	Global
Woka 7310	1050674	10 lb (approx. 4.5 kg)	Special Order	Global

Note: For products available in both kilogram and pound weights, the kilogram package will be supplied to unspecified regions (Africa, Asia/Pacific, Japan and Middle East) unless the pound package is specifically requested by the customer. Customers in Americas and Europe can order the package size not specified for their region as a special order.

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 to prevent moisture pickup.

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
Woka 7300 series	50-880

www.oerlikon.com/metco
info.metco@oerlikon.com