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

Powder Products:
Woka 7201, Woka 7202, Woka 7203, Woka 7204, Woka 7205, Woka 7207, Woka 7210, Woka 7215, Woka 7218

1 Introduction

When compared to coating materials containing tungsten carbide, coating materials that contain chromium carbide are often used because they can withstand higher service temperatures up to 870 °C (1600 °F).

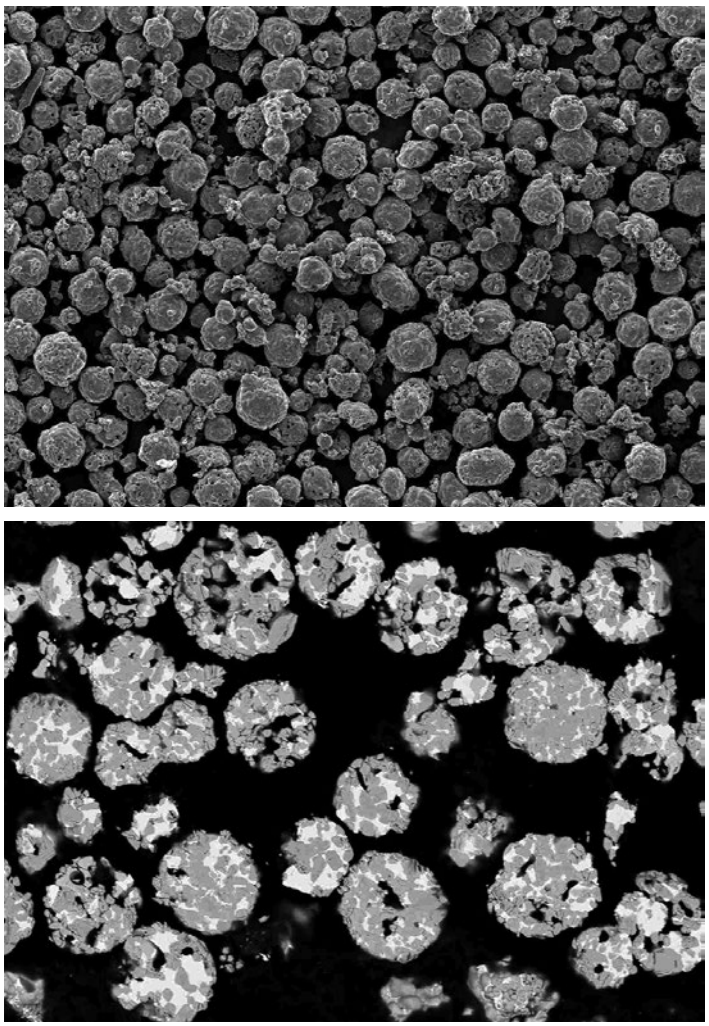
Woka™ 7200 series of products are spheroidal, agglomerated and sintered powders for thermal spray that contain 75 % chromium carbide as a hard, wear-resistant phase that has a minimal tendency for decomposition during the thermal spray process. A nickel-chromium (80 % / 20 %) matrix functions as a binder for the carbides, and is also responsible for the excellent corrosion and oxidation resistance of these coatings.

Coatings of Woka 7200 series materials protect against abrasion, various forms of erosion and tribo-corrosion at elevated temperatures. They are well-known as an alternative to hard chromium plating with better corrosion resistance in sodium chloride, acidic and alkaline environments. Environments with HCl as a corrosive medium 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 flame sprayed coatings.

1.1 Typical Uses and Applications:

- Hydraulic cylinders and piston rods
- Valve stems
- Boiler coatings
- Chemical processing tooling
- Turbine components
- Sieves and cones
- Ship engine valve spindles
- Furnace rolls in metal production
- Pump housings

Quick Facts	
Classification	Carbide, chromium-based
Chemistry	Cr_3C_2 25(Ni 20Cr)
Manufacture	Agglomerated and sintered
Morphology	Spheroidal
Apparent Density	2.3 – 3.1 g/cm^3
Service Temperature	< 870 °C (1600 °F)
Purpose	Corrosion and wear resistance
Process	HVOF or combustion powder Thermospray™



SEM photomicrographs showing the morphology (top) and the microstructure (bottom) of a Woka 7200 series materials.

2 Material Information

2.1 Chemical Composition (all products)

Product	Weight Percent (nominal)			
	Cr	C (total)	Ni	Fe
Woka 7200 Series	Balance	9.0 – 10.2	17.5 – 22.5	< 0.5

2.2 Particle Size Distribution

Product	Nominal Range µm	D95 µm	D5 µm	Primary Carbide Size	Apparent Density g/cm³
Woka 7201	–53 +20	53	20	Coarse	2.4 – 3.0
Woka 7202	–45 +15	45	15	Coarse	2.4 – 3.0
Woka 7203	–45 +11	45	11	Coarse	2.4 – 3.0
Woka 7204	–30 +10	30	10	Coarse	2.3 – 2.9
Woka 7205	–38 +10	38	10	Coarse	2.3 – 2.9
Woka 7207	–45 +20	45	20	Coarse	2.4 – 3.0
Woka 7210	–25 +5	25	5	Coarse	2.3 – 2.9
Woka 7215	–106 +45	106	45	Coarse	2.5 – 3.1
Woka 7218	–75 +45	75	45	Coarse	2.5 – 3.1

Size analysis using laser diffraction (Microtrac). Other particle size distributions are available on request.

2.3 Key Selection Criteria

Main selection criteria for choosing a Woka 7200 series material are:

- Particle size distributions are optimized for a variety of HVOF guns on the market today. See Section 2.5 for recommendations.
- Woka 7215 is suitable for application using combustion powder Thermospray™.
- Desired as-sprayed surface roughness. For the smoothest possible surface, choose a product with the lowest particle size distribution appropriate for the spray gun to be used.

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). Metco offers an extensive portfolio of tungsten carbide materials. A few examples are WC 12Co. Other products are available with corrosion resistance matrices.
  - Woka 75xx series products, which can be used at service temperatures up to 700 °C (1290 °F).
  - At higher temperatures, chromium carbide materials with higher carbide content such as Woka 71xx series products or plasma-densified chromium carbides such as Woka 73xx series materials.
- For better corrosion resistance in sulfuric acid (H_2SO_4) or sodium chloride (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.
  - 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 [Cr3C2 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 Metco's portfolio are various chromium carbide blends such as Diamalloy 3004 and Metco 5255, as well as specialty products such as Amdry 5241.

2.5 Recommended Spray Guns

Product	HVOF						Combustion Powder Thermospray
	DiamondJet	WokaJet / WokaStar / JP5000	K2	Jet Kote	Top Gun / HV2000	CJS	
Woka 7201		●	●				
Woka 7202	●	●	●	●			
Woka 7203	●						
Woka 7204	●					●	
Woka 7205	●				●		
Woka 7207		●		●			
Woka 7210	●	●				●	
Woka 7215							●

3 Coating Information

3.1 Key Thermal Spray Coating Information

Characteristic		Typical Data [a]	
Recommended Process		HVOF	
Microhardness	HV0.3	850 – 1200	
Macrohardness	HR15N	> 90	
Wear Rate	ASTM G65 B	< 9 mm^3	< 0.00055 in^3
Porosity		< 1 %	
Corrosion Resistance		Excellent in 1 M NaOH, very good in 1M NaCl, good in 0.5 M H_2SO_4	
Maximum Service Temperature		870 °C	1600 °F
Deposition Efficiency		30 – 55 %	

[a] Depending on the HVOF spray gun used, parameter used and coating thickness applied. Please note that typical data is given for application using HVOF processes. Woka 7215 is designed to be applied using Combustion Powder Thermospray™ and coating results can be expected to be significantly different.

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	
HVOF	Combustion Powder
DiamondJet series	Metco 6P-II series
WokaJet series	
WokaStar series	

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Woka 7201	1041120	5 kg (approx. 11 lb)	Special Order	Global
Woka 7202	1041121 1041075	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock	Europe Americas
Woka 7203	1059066	5 kg (approx. 11 lb)	Stock	Global
Woka 7204	1041180	5 kg (approx. 11 lb)	Special Order	Global
Woka 7205	1041122 1041076	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock	Europe Americas
Woka 7207	1041123 1041077	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock	Europe Americas
Woka 7210	1050159	5 kg (approx. 11 lb)	Special Order	Global
Woka 7215	1075481	10 lb (approx. 4.5 kg)	Special Order	Global
Woka 7218	1065672	5 kg (approx. 11 lb	Special Order	Global

Note: For products available in both kg and lb weights, the kg package will be supplied to unspecified regions (Africa, Asia/Pacific, Japan and Middle East) unless the lb package is specifically requested by the customer.

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents prior to use to prevent segregation.
- Remove desiccant bag prior to use, where applicable.
- Open containers should be stored in a drying oven to prevent moisture pickup.

4.3 Safety Recommendations

See SDS 50-880 (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).

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