

# Material Product Data Sheet

## Chromium Carbide – 20 % Nickel Chromium Powders

### Powder Products:

**Woka 7101, Woka 7102, Woka 7103,  
Woka 7104, Woka 7105**

### 1 Introduction

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

Woka™ 7100 series of products are spheroidal, agglomerated and sintered powders for thermal spray that contain 80 % chromium carbide as a hard, wear-resistant phase and nickel – 20 % chromium matrix that serves several purposes. The NiCr matrix inhibits the decomposition (decarburation) of the chromium carbide during the thermal spray process and functions as a binder for the carbides in service. In addition, the composition of the matrix is responsible for the excellent corrosion and oxidation resistance of these coatings.

When applied using the HVOF spray process, coatings of these materials are very dense, have very good bond strength and are more homogeneous compared to plasma or combustion powder Thermospray™ coatings.

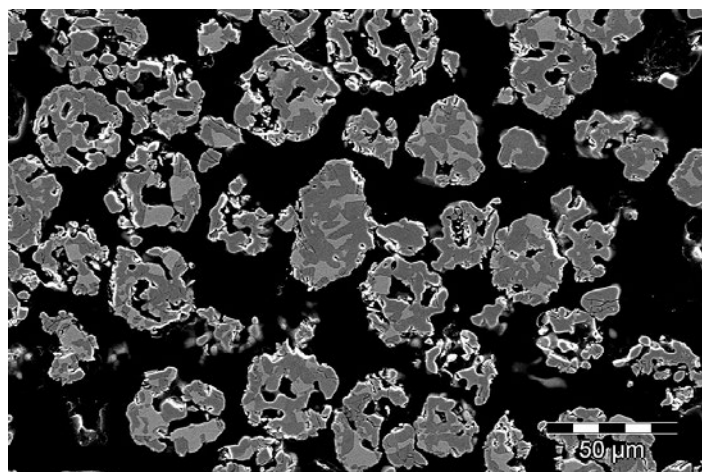
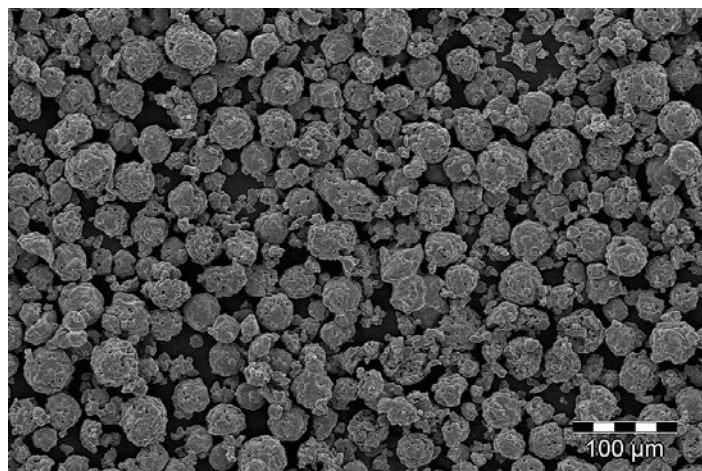
Coatings of Woka 7100 series materials protect against solid particle erosion (SPE), high temperature wear (abrasion, erosion, tribocorrosion and cavitation) and high-temperature corrosion. They are an excellent choice for use as thermal sprayed alternatives for hard chromium plating, especially in environments that contain NaCl or NaOH. However, HCl environments should be avoided.

#### 1.1 Typical Uses and Applications

- Hydraulic cylinders
- Hydraulic piston rods such as those used for earth-moving equipment
- Boiler coatings
- Sieves and cones
- Furnace rolls in metal production
- Dampening fountain rollers

### Quick Facts

Classification	Carbide, chromium-based
Chemistry	Cr <sub>3</sub> C <sub>2</sub> -20(Ni 20Cr)
Manufacture	Agglomerated and sintered
Morphology	Spheroidal
Service Temperature	< 870 °C (1600 °F)
Purpose	Corrosion and wear resistance
Process	HVOF



SEM Photomicrographs showing the morphology (top) and the microstructure (bottom) of a Woka 7100 Series Materials.

## 2 Material Information

### 2.1 Chemical Composition

Product	Weight Percent (nominal)			
	Cr	C (total)	Ni	Fe
Woka 7100 Series	Balance	9.6 – 10.8	13.5 – 18.5	< 0.5

### 2.2 Particle Size Distribution

	Nominal Range $\mu\text{m}$	D95 $\mu\text{m}$	D5 $\mu\text{m}$	Primary Carbide Size	Apparent Density $\text{g/cm}^3$
Woka 7101	-53 +20	53	20	Coarse	2.3 – 2.9
Woka 7102	-45 +15	45	15	Coarse	2.3 – 2.9
Woka 7103	-45 +11	45	11	Coarse	2.3 – 2.9
Woka 7104	-30 +10	30	10	Coarse	2.3 – 2.9
Woka 7105	-38 +10	38	10	Coarse	2.3 – 2.9

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 7100 series material are:

- Particle size distributions are optimized for a variety of HVOF guns on the market today. See Section 2.5 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.

### 2.4 Related Products

- Diamalloy 3007 is a clad material containing 80% chromium carbide and 20% nickel-chromium matrix approved for use by several aerospace OEMs. For chromium carbide materials, the coatings show outstanding properties in applications with erosion, heavy abrasion or heavy friction wear at service temperatures between 540 °C – 870 °C (1000 – 1600 °F). Diamalloy 3007 coatings exhibit the highest microhardness and macrohardness of all Oerlikon Metco chromium carbides and have very smooth as-sprayed finishes. It is the material of choice for solid particle erosion for applications such as steam turbines.
- Woka 3600 and Woka 3650 series products, which are spheroidal, agglomerated and sintered tungsten carbide

in a cobalt-chromium matrix, can be used in similar applications to the Woka 7100 series of products in situations where higher fatigue strength, abrasion resistance or hardness is required, such as aircraft landing gears or paper calendar rolls; however service temperature is limited to less than 500 °C (930 °F).

- Like the Woka 7100 series products, Woka 7200 series products are similar in manufacture and chemistry, but with a 25% Ni-Cr matrix. Coatings of these materials are somewhat lower in hardness, but have higher ductility, with similar corrosion resistance.
- Woka 7300 series and Amdry 5260 materials are agglomerated, sintered and plasma-densified materials with a 25% Ni-Cr matrix. The powders have higher apparent densities, which lead to higher deposition efficiencies and denser coatings.
- Woka 7500 series are materials with a mixture of chromium and tungsten carbide in a metal alloy matrix. The coatings show higher hardness, better abrasion resistance and better corrosion resistance in harsh environments with complex corrosive media.
- Furthermore, within Oerlikon Metco's portfolio are various blend versions of chrome carbides such as Diamalloy 3004 & Metco 5255, as well as specialty products such as Amdry 5241.

## 2.5 Recommended Spray Guns

	Diamond Jet	WokaJet / WokaStar / JP5000	K2	Jet Kote	Top Gun / HV2000	CJS
Woka 7101			●			
Woka 7102	●	●	●	●		
Woka 7103	●					
Woka 7104	●					●
Woka 7105	●				●	

## 3 Coating Information

### 3.1 Key Thermal Spray Coating Information

Characteristic	Typical Data <sup>a</sup>	
Recommended Process	HVOF	
Microhardness	HV0.3	1100 – 1300
Macrohardness	HR15N	> 90
Wear Rate	ASTM G65 B	< 9 mm <sup>3</sup> < 0.00055 in <sup>3</sup>
Porosity	< 1 %	
Corrosion Resistance	Excellent in 1 M NaOH, very good in 1M NaCl, good in 0.5 M H <sub>2</sub> SO <sub>4</sub> , fair in 1 M HCl	
Maximum Service Temperature	870 °C	1600 °F
Deposition Efficiency	30 – 55 %	

<sup>a</sup> Depending on the HVOF spray gun used, parameter used and coating thickness applied.

### 3.3 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

Product	Order No.	Package Size	Availability	Distribution
Woka 7101	1066596	5 kg (approx. 11 lb)	Special Order	Global
Woka 7102	1041171	5 kg (approx. 11 lb)	Stock	Europe
	1041159	10 lb (approx. 4.5 kg)	Stock	Americas
Woka 7103	1041119	5 kg (approx. 11 lb)	Stock	Europe
	1041073	10 lb (approx. 4.5 kg)	Stock	Americas
Woka 7104	1041179	5 kg (approx. 11 lb)	Special Order	Global
Woka 7105	1041151	5 kg (approx. 11 lb)	Stock	Global

Note: Products are available in other regions on a special order basis. 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 50-889 (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](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).