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metco

Material Product Data Sheet
Tungsten Carbide – 12 % Cobalt Powders

Thermal Spray Powder Products:
Woka™ 3101, Woka 3102, Woka 3103, Woka 3104, Woka 3105, Woka 3106, Woka 3108, Woka 3110 FC, Woka 3111 FC, Woka 3118

1 Introduction

These products are spheroidal powders for thermal spraying containing 88 % tungsten carbide as a hard material and a cobalt matrix that functions as a binder material for the carbide particles. All products are agglomerated and sintered powders

Coatings of these materials are harder compared to coatings of 83WC-17Co as a result of higher tungsten carbide levels. Coatings are resistant to sliding wear, hammer (impact) wear, abrasion and fretting at temperatures up to 500 °C (930 °F) in non-corrosive media.

Coatings that contain tungsten carbide protect substrates from the effects of fretting, abrasive grains, particle erosion, cavitation and dynamic contact with hard surfaces. In particular, these materials can be used for abrasion-resistant coatings in dry, non-corrosive environments at temperatures up to 500 °C (930 °F).

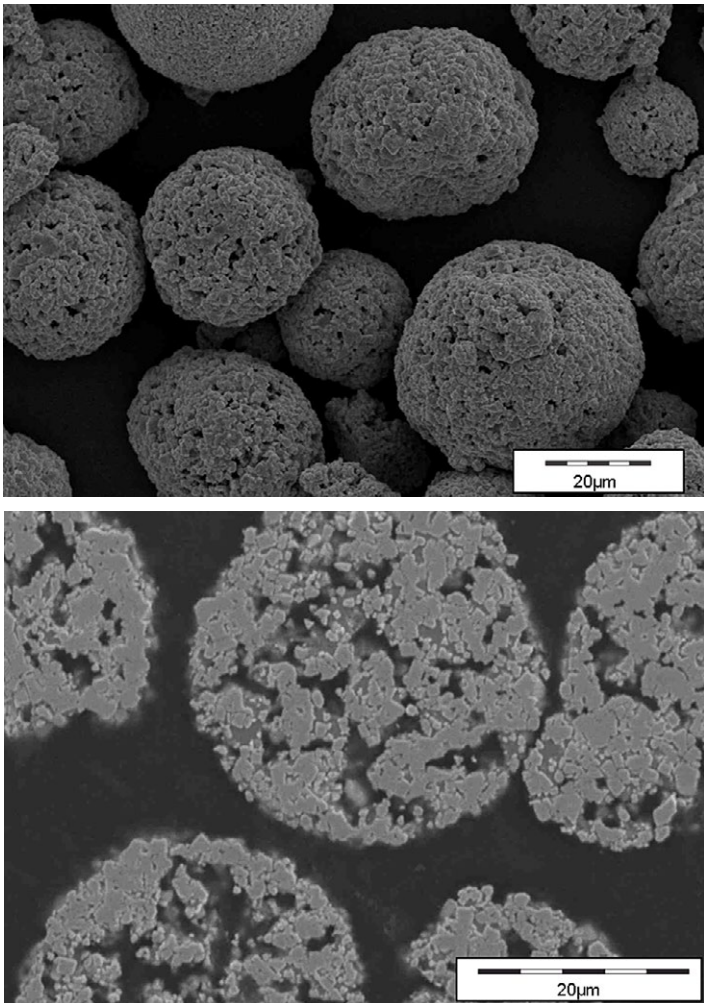
HVOF and APS (using a TriplexPro™ series gun) coatings of these materials are dense and show good bond strength.

1.1 Typical Uses and Applications

Tungsten carbide – 12 cobalt materials from Oerlikon Metco are among the best-known thermal spray powders for use in wear applications at service temperatures below 500 °C (930 °F) in non-corrosive media. Typical applications include:

- Steel rolls
- Sink rolls in zinc pots
- Corrugating rollers
- Agricultural rasp bars
- Exhaust fans
- Conveyor screws
- Sucker rod couplings
- Thread bars
- Pump housings
- Impeller shafts

Quick Facts	
Classification	Carbide, tungsten-based
Chemistry	88WC-12Co
Manufacture	Agglomerated and sintered
Morphology	Spheroidal
Purpose	Wear resistance
Apparent Density	2.9 – 5.3 g/cm^3
Flowability	Free-flowing powder
Service Temperature	≤ 500 °C (930 °F)
Process	HVOF or atmospheric plasma spray



SEM Photomicrographs of Woka 3102 showing powder morphology (top) and microstructure (bottom).

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)			
	Tungsten	Cobalt	Carbon (total)	Iron (max)
Woka 3101	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3102	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3103	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3104	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3105	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3106	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3108	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3110 FC	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3111 FC	Balance	10.5 – 13.5	5.0 – 5.8	0.2
Woka 3118	Balance	10.5 – 13.5	5.0 – 5.8	0.2

2.2 Particle Size Distribution and Apparent Density

Product	Nominal Range (µm)	Primary Carbide Grain Size	Apparent Density (g/cm^3)
Woka 3101	–53 +20	Medium	4.7 – 5.3
Woka 3102	–45 +15	Medium	4.7 – 5.3
Woka 3103	–45 +11	Medium	4.6 – 5.2
Woka 3104	–30 +10	Medium	4.5 – 5.1
Woka 3105	–38 +10	Medium	4.6 – 5.2
Woka 3106	–53 +15	Medium	4.7 – 5.3
Woka 3108	-90 +45	Medium	4.7 – 5.3
Woka 3110 FC	–25 +5	Fine	4.6 – 5.2
Woka 3111 FC	–20 +5	Fine	4.6 – 5.2
Woka 3118	-75 +45	Medium	4.7 – 5.3

- Particle size analysis using laser diffraction (Microtrac)
- Other particle size distributions are available on request for Woka-brand products

2.3 Key Selection Criteria

- Select a material appropriate for the recommended spray process and spray gun to be used (refer to Section 2.5).
- For the lowest possible 'as-sprayed' surface roughness, choose a material with the lowest possible particle size distribution and carbide particle grain size.
- To achieve extremely smooth as-sprayed surfaces, use Woka 3110 FC or Woka 3111 FC. Their fine particle size combined with their fine primary carbide grain size produces as-sprayed surface roughness values of Ra 1.5 to 2.5 µm. This makes these products perfect when surface finishing is too costly, such as for corrugating rollers or when a very smooth finished surface is needed. To spray these fine materials, specific parameters are required. Please ask your Oerlikon Metco Account Representative for a parameter sheet.
- Different particle size distributions of Woka 31XX series products allow their use in a wide range of HVOF and plasma spray guns. These materials produce hard, well-bonded coatings that are resistant to abrasion, erosion and sliding wear. Woka 31XX series materials are not designed for use in aerospace and/or turbine applications and cannot be certified to these specifications.

2.4 Related Products

- For better corrosion resistance choose:
  - A tungsten carbide product that contains chromium within the binder matrix such as Woka 365x series products, Metco 516x series products, Metco 5847 (see datasheet DSMTS-0025) or Woka 360x series products (see datasheet DSMTS-0051).
  - Chromium carbide materials such as Woka 71xx, Woka 72xx or Woka 73xx series products (see datasheets DSMTS-0027, DSMTS-0031 and DSMTS-0058, respectively).
- For applications where service temperatures are greater than 500 °C (930 °F), but less than 700 °C (1290 °F), choose a material that contains both chromium carbide and tungsten carbide, such as Woka 75xx or Woka 37xx series products (see datasheets DSMTS-0056, DSMTS-0059, respectively).
- When service temperatures exceed 700 °C (1290 °F), choose a chromium carbide material with a nickel-chromium matrix such as Woka 71xx, Woka 72xx or Woka 73xx series products (see datasheets DSMTS-0027, DSMTS-0031 and DSMTS-0058, respectively).
- If higher hardness or better abrasion resistance is required, choose a tungsten carbide material with a cobalt-chromium matrix such as Woka 365x series products, Metco 516x series products, Metco 5847 (see datasheet DSMTS-0025) or Woka 360x series products (see datasheet DSMTS-0051).

2.5 Recommended Spray Process and Spray Guns

Product	HVOF					HVAF	APS
	DiamondJet	WokaJet / WokaStar / JP5000	K2 / Jet Kote	CJS	Top Gun / HV2000		TriplexPro-200 / 9MB / F4, etc.
Woka 3101		●	●				●
Woka 3102	●	●			●		
Woka 3103	●						
Woka 3104	●			●			
Woka 3105	●	●					●
Woka 3106	●	●	●				●
Woka 3108							●
Woka 3110 FC	●	●				●	
Woka 3111 FC	●	●				●	
Woka 3118		●					●

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification		Data (depending on spray gun and product chosen)	
Microhardness	HV0.3	850 – 1400	
Macrohardness	HR15N	> 90	
Wear Rate	ASTM G65 B	< 6 mm^3	
Porosity		< 1 %	
Corrosion Resistance		Not recommended for corrosive media	
Deposition Efficiency		40 % – 65 %	
Maximum Service Temperature		500 °C	930 °F

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	**Atmospheric Plasma**
Water-cooled DiamondJet	TriplexPro series
Air-cooled DiamondJet	Metco 9MB series
WokaJet	Metco F4 series
WokaStar	
JP5000 (Praxair / Tafa)	

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Woka 3101	1041095 1041049	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock Stock	Europe Americas
Woka 3102	1041096 1041050	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock Stock	Europe Americas
Woka 3103	1041097 1041051	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Stock Stock	Europe Americas
Woka 3104	1041177	5 kg (approx. 11 lb)	Stock	Europe
Woka 3105	1041098 1041052	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Special Order Stock	Europe Americas
Woka 3106	1041099 1041053	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Special Order Special Order	Europe Americas
Woka 3108	1042831	5 kg (approx. 11 lb)	Stock	Europe
Woka 3110 FC	1064113 1088154	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Special Order Special Order	Europe Americas
Woka 3111 FC	1041101 1041055	5 kg (approx. 11 lb) 10 lb (approx. 4.5 kg)	Special Order Special Order	Europe Americas
Woka 3118	1063529	5 kg (approx. 11 lb)	Special Order	Europe

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. Open containers should be stored in a drying oven to prevent moisture pickup.

4.3 Safety Recommendations

See the correct SDS (Safety Data Sheet) 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 No.
Woka 3101	50-877
Woka 3102	50-877
Woka 3103	50-877
Woka 3104	50-877
Woka 3105	50-877
Woka 3106	50-877
Woka 3108	50-877
Woka 3110 FC	50-877
Woka 3111 FC	50-1992
Woka 3118	50-877

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