

Material Product Data Sheet

Tungsten Carbide – 10 % Cobalt – 4 % Chromium Powder for High Performance Flash Coatings

Powder Products: WOKA™ 3911A

1 Introduction

For many years thermal spray technology has struggled to compete economically with hard chrome plating for industrial applications, specifically hydraulic cylinders.

Hard chrome plating has the advantage to apply thin layers of smooth coating that require little to no finishing, saving time and cost over the most comparable thermal spray method of HVOF. Through proper material and process design, thin dense ‘flash’ coatings of WC-CoCr have been developed using WOKA 3911A powder. These coatings have lower thickness and roughness than traditional HVOF carbide coatings while remaining corrosion resistant due to the high coating density. The low roughness allows for less post deposition finishing, polishing / grinding, and the lower thickness uses less material and process time making them more economical than traditional HVOF coatings.

Tungsten carbide acts as the wear-resistant hard phase component. The cobalt chromium matrix improves corrosion and erosion resistance, compared with carbides having a cobalt-only matrix.

This class of thermal spray powders is particularly suitable for applications where both wear and corrosion resistance is needed. They also offer better corrosion and cavitation resistance than tungsten-carbide-cobalt coatings. This material is designed to produce high-efficiency and high-performance alternatives to hard chromium plating.

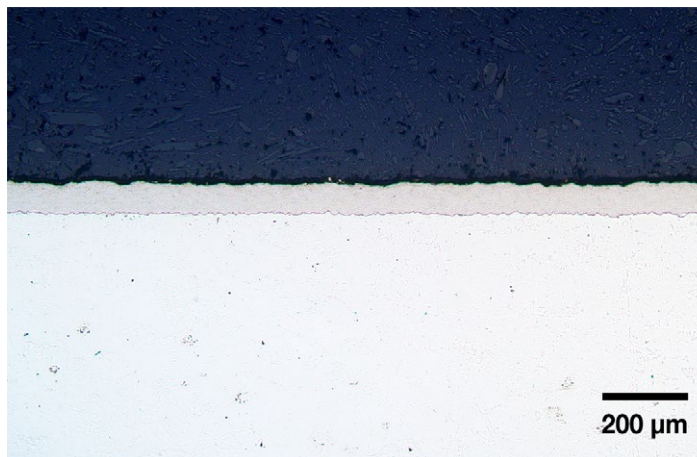
1.1 Typical Uses and Applications

Typical applications include:

- Hard chrome plating replacement
- Hydraulic rods
- Mining and heavy machinery
- Oil field equipment
- Extruder screws

Quick Facts

Classification	Carbide, tungsten-based
Chemistry	WC 10Co 4Cr
Manufacture	Sintered and crushed
Purpose	Corrosion and wear resistance
Melting Point	Approx. 1480 °C (2700 °F)
Service Temperature	≤ 500 °C (930 °F)
Process	HVOF / HVOF



Optical photomicrograph of WOKA 3911A coating showing the high density and low roughness of coatings typical of this powder product.

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)					
	W	Co	C _{total}	Cr	Fe	O
WOKA 3911A	Bal.	8.5 – 11.5	4.8 – 6.1	3.4 – 4.6	0.5 max	0.2 max

2.2 Particle Size Distribution

Product	Nominal Size Distribution [µm]
WOKA 3911A	-20 +5

Particle size distribution: Analysis by sieve per ASTM B214 for all upper limits; values of 38 µm and lower based on laser scattering per ASTM B 822 (Microtrac).

2.3 Key Selection Criteria

- WOKA 3911A is a specialized material which produces coatings that combine excellent abrasion and erosion resistance with outstanding corrosion and cavitation resistance even at low coating thickness.

2.4 Related Products

- For standard thickness thermal spray coatings, choose from our agglomerated and sintered carbide materials of the same chemistry, such as Woka 365X series products. These products typically require more post-spray finishing if a polished surface is required for the application.
- For aerospace applications such as landing gears, consider Metco 516X series products.
- 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.
- 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.

2.5 Recommended Spray Process and Spray Guns

Product	HVOF	HVAF
	WokaJet / WokaStar	M3 / AK07 / etc
WOKA 3911A	●	●

3 Coating Information

3.1 Ordering Information and Availability

Specification	Typical Data
Recommended Spray Process	HVOF / HVOF
Corrosion Resistance	Good in NaCl (1M), fair in HCl (1M), H ₂ SO ₄ (0.5M) and NaOH (1M)
Porosity ^a	< 0.5 %
Finishing	Diamond grind / polish
Maximum Service Temperature	500 °C 930 °F

^a Data is for WOKA 3911A applied using liquid-fuel HVOF. Value is dependent on spray gun chosen, spray gun hardware and spray parameters used.

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

WOKAJet series
WOKAStar series
HVOF

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size ^a	Availability	Distribution
WOKA 3911A	2379766	5 kg (approx. 11 lb)	Stock	Global

^a Larger and/or custom packaging can be arranged for large volume users

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 No.
WOKA 3911A	50-2972

Information is subject to change without prior notice.