

Material Product Data Sheet

Tungsten Carbide – Nickel Alloy Powder Blends for Laser Cladding

Laser Cladding Products: MetcoClad 52052, MetcoClad 53003

1 Introduction

MetcoClad™ 52052 and MetcoClad 53003 are 60/40 blends of spherical, cast tungsten carbide (CTC-S) and self-fluxing matrix materials. This combination of a very hard phase material (tungsten carbide) and a corrosion resistant matrix results in a product that is suitable for laser cladding deposits that resist erosion from particulates in slurries.

The metallic matrix constituent of the blend is gas atomized that ensures chemical homogeneity and a spherical morphology. Both products employ a nickel chromium silicon boron matrix; however, MetcoClad 53003 has a higher chromium content for better corrosion and erosion resistance and improved flowability.

The tungsten carbide constituent is manufactured using a unique process that results in a fine non-acicular structure with greater hardness and superior hardness compared to that of conventional fused and crushed tungsten carbide. The high apparent density and improved flowability raise the amount of hard phase material present in the clad deposit.

1.1 Typical Uses and Applications:

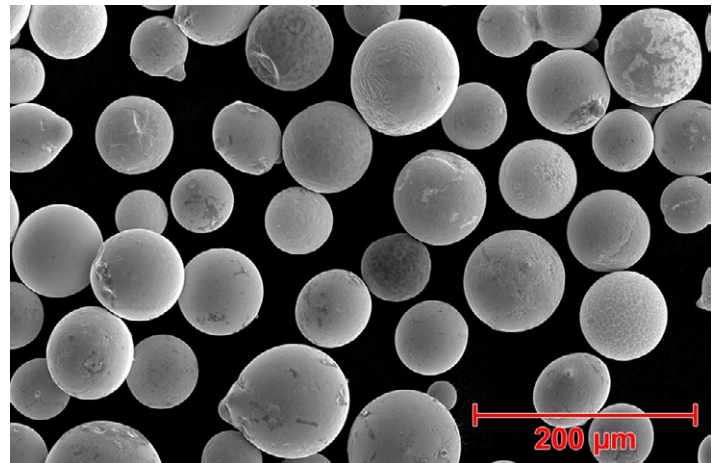
- Down hole tools such as stabilizers and drill collars
- Slurry pump impellers
- Conveyor and extruder screws used for manufacturing of plastics or ceramics
- Agricultural shearing blades
- Drill collars and tool joints used for oil exploration and drilling equipment

These materials can be used to coat substrates of:

- Mild steel
- Stainless steel
- Nickel alloys
- Heat-treatable steels when preheated to 300 °C (570 °F) to avoid extensive cracking in the deposit

Quick Facts

Classification	Carbide blend
Chemistry	WC 40(NiCrSiBC)
Manufacture	Gas atomized blend
Morphology	Spheroidal
Service Temperature	≤ 500 °C (930 °F)
Apparent Density	6 – 8 g/cm ³
Hardness	2700 – 3100 HV0.1
Purpose	Wear and erosion resistance
Process	Laser Cladding



Typical Morphology of MetcoClad 52052 Powder Blend

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (typical)								
	Hard Phase 60 %			Metal Matrix 40 %					
	W	C	Fe	Ni	Cr	Si	B	Fe	C
MetcoClad 52052	Balance	3.8	< 0.3	Balance	6.8 – 8.3	3.1 – 3.9	1.4 – 1.9	1.7 – 3.3	0.1 – 0.4
MetcoClad 53003	Balance	3.8	< 0.3	Balance	9.5 – 12.5	3.4 – 4.3	1.9 – 3.6	2.1 – 3.5	0.3 – 0.6

2.2 Particle Size Distribution, Apparent Density and Former Designation

Product	Nominal Particle Range (µm)	Apparent Density (g/cm ³)	Former Product Designation
MetcoClad 52052	-106 +45	6.0 – 8.0	---
MetcoClad 53003	-106 +45	6.0 – 8.0	WOKA 6050S PlasmaDur 53003

Size analysis using sieve (ASTM B214).

2.3 Key Selection Criteria

- Choose MetcoClad 52052 for laser cladding applications where high hardness, wear resistance and resistance to slurry erosion is needed.
- MetcoClad 52052 produces crack-free overlays and overlays have better impact resistance compared to overlays of MetcoClad 53003.
- MetcoClad 53003 weld overlays have a matrix hardness of approximately 50 HRC which provides very good abrasion and erosion resistance with fair impact resistance.
- MetcoClad 53003 is a versatile product that can be used in both PTA and laser cladding processes thanks to its size and the use of spherical carbide.

2.4 Related Products

- Oerlikon Metco offers a wide variety of tungsten carbide wear-resistant coating materials. Please refer to our materials guides or contact your Oerlikon Metco Sales Representative for more information on available products.
- Alternative overlays applied using the PTA welding processes can be achieved using PlasmaDur 51937.
- PlasmaDur 51022 and PlasmaDur 51027 contain the same matrix alloy as MetcoClad 53003, but feature a

- fused and crushed tungsten carbide with lower hardness.
- MetcoClad 52001, which is the carbide hard phase constituent of MetcoClad 52052 and MetcoClad 53003, can be purchased by customers who wish to use their own custom matrix alloy for laser cladding, or mix and create blends in different ratios.
- Where spray and fuse applications suffice, WOKA 53025 and WOKA 53045 use fused tungsten carbide that provides very good abrasion resistance characteristics. WOKA 53025 shows excellent weldability producing a crack-free, highly impact resistant deposits while deposits made from WOKA 53045 exhibit high erosion resistance.
- Spray and fuse products that contain tungsten carbide with a nickel-based self-fluxing alloys matrix include Metco 36C, Metco 31C-NS, Metco 34F and WOKA 7703, among others. These materials are applied using thermal spray processes.
- Nickel- and cobalt-based self-fluxing alloys without hard phase that are thermal sprayed and subsequently fused materials include Metco 12C, Metco 14E, Metco 18C and other products. These materials form fully dense coatings with good corrosion resistance.

3 Coating Information

3.1 Key Overlay Characteristics

Characteristic			MetcoClad 52052	MetcoClad 53003
Recommended Coating Process			Laser Cladding	Laser Cladding
Microhardness	CTC-S	HV0.1	2700 – 3100	2700 – 3100
Hardness	Matrix	HRC	37 – 44	50 – 55
Hardphase / Matrix Blend Ratio			60 / 40	60 / 40

All values reported are nominal.
Thickness limitations are dependent on application parameters and hardware.

3.2 Welding Parameters

Please contact your local Oerlikon Metco Account representative for the availability of starting PTA welding parameters. For specific application needs, Oerlikon Metco can provide parameter advice and parameter development services may be available.

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
MetcoClad 52052	1075604	5 kg (approx. 11 lb)	Special Order	Global
MetcoClad 53003	1064835	5 kg (approx. 11 lb)	Special Order	Global
	1063638	25 kg (approx. 55 lb)	Special Order	Global

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 Data Sheets

See the refer to 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.
MetcoClad 52052	50-1521
MetcoClad 53003	50-1245

Information is subject to change without prior notice.