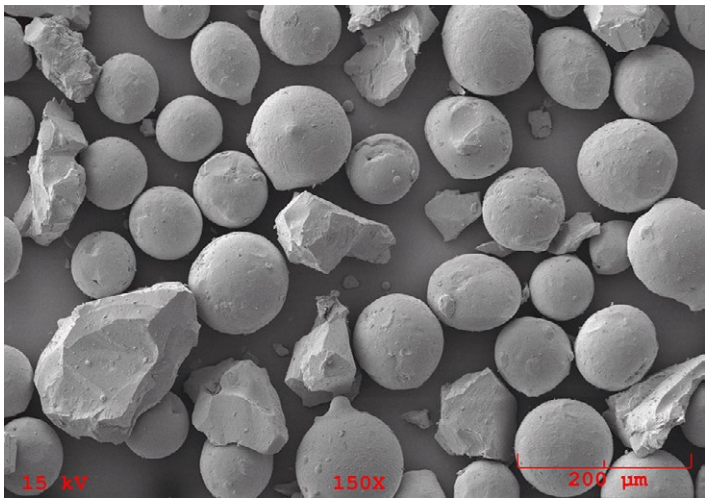
metco
joining & cladding

Material Product Data Sheet

Monocrystalline Tungsten Carbide / Nickel Chromium Boron Silicon Powder for Laser Cladding and Plasma Transferred Arc

Powder Products:
PlasmaDur 51122, PlasmaDur 51142

Quick Facts	
Classification	Carbide, tungsten-based
Chemistry	MTC / NiCrBSi matrix
Manufacture	Blended (carbide: crushed / matrix: gas atomized)
Morphology	Carbide: angular, Matrix: spheroidal
Flowability	Free-flowing powder
Service Temperature	< 500 °C (930 °F)
Purpose	Wear resistance
Process	Laser Cladding, PTA



SEM photomicrograph showing the morphology of PlasmaDur 51122 powder

1 Introduction

PlasmaDur™ powder materials presented herein contain crushed monocrystalline tungsten carbide (MTC), blended with a gas atomized, nickel-based self-fluxing alloy, designed to be used as a hardface overlay applied by Laser Cladding or Plasma Transferred Arc (PTA). Fully carburized MTC is a stoichiometric compound with a constant carbon content of 6.14 % by weight and has a stable single-phase microstructure.

The powder compositions ensure an even distribution of tungsten carbide within the metallic matrix, providing very good and even wear resistance (see photo, Section 3.2). Furthermore, there is virtually no dilution of the monocrystalline tungsten carbides during the welding process, resulting in no matrix metal embrittlement.

MTC has good wetability with nickel-based alloys during the PTA application process. The more thermodynamically stable MTC outperforms cast tungsten carbide thereby producing welds with high hardness in the range of HV0.1 1700 – 2000.

Depending on the chemistry of the nickel alloy matrix, these powders produce hardface coatings with varied abrasion and impact resistance properties. Hardface weld deposits applied using appropriate PTA welding parameters and with a matrix hardness below HRC 50 do not exhibit cracking.

1.1 Typical Uses and Applications:

Typical industries and applications include:

- Mining equipment
- Petrochemical applications
- Earth moving equipment
- Food and chemical processing decanter screws

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 overlay

2 Material Information

2.1 Chemical Composition

Product	Hard Phase Composition (wt. %)			Matrix Alloy Composition (wt. %)						
	Phase %	W	C	Phase %	Ni	Cr	B	Si	C	Fe
PlasmaDur 51122	60	93.8 – 94.0	6.0 – 6.2	40	Bal.	9.5 – 12.5	2.0 – 2.5	3.3 – 4.3	0.3 – 0.6	2.0 – 3.5
PlasmaDur 51142	60	93.8 – 94.0	6.0 – 6.2	40	Bal.	6.5 – 8.5	1.4 – 1.9	3.0 – 4.0	0.1 – 0.4	1.7 – 3.3

2.2 Particle Size Distribution, Apparent Density and Former Product Designation

Product	Nominal Particle Size Distribution (µm)	Nominal Apparent Density Range (g/cm^3)	Primary Carbide Grain Size	Former Product Designation (for reference)
PlasmaDur 51122	–180 +63	5.0 – 6.5	Coarse	WOKA 6050M
PlasmaDur 51142	–180 +63	5.0 – 6.5	Coarse	WOKA 6040M

Other particle size distributions are available on request and can be tailored for on-site conditions and special applications.

2.3 Key Selection Criteria

- PlasmaDur 51122 produce overlays with a matrix hardness of approximately HRC 50 which provides very good abrasive wear resistance but only fair impact resistance. This product is often used on oil exploration and earth moving equipment.
- PlasmaDur 51142 is a compromise compared to other products in this data sheet, with a hardface coating matrix hardness of approximately 40 HRC. This provides good abrasion and reasonable impact resistance. This material is often used in oil exploration and earth moving equipment.

2.4 Related Products

- Metco Joining & Cladding offers a wide variety of tungsten carbide wear-resistant coating materials for application using welding processes. Please contact your Metco Joining & Cladding Sales Representative for more information on available material choices.

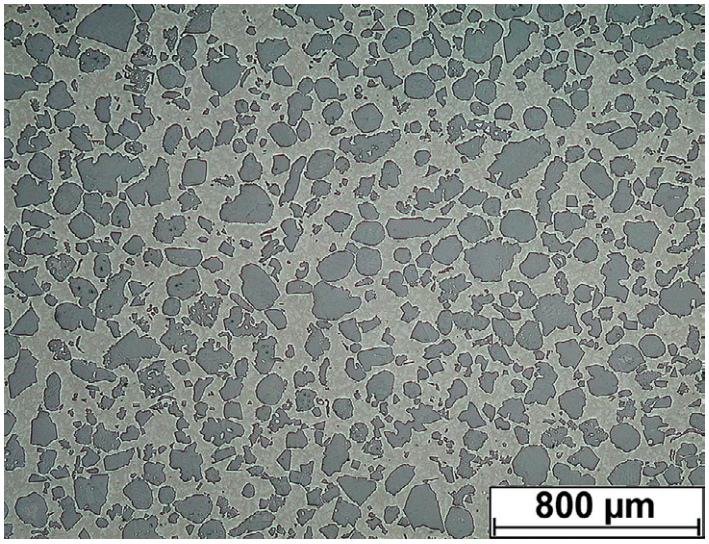
3 Coating Information

3.1 Key Overlay Characteristics

Characteristic			PlasmaDur 51122	PlasmaDur 51142	PlasmaDur 51302
Recommended Coating Process			Laser Cladding or Plasma Transferred Arc (PTA)		
Microhardness	MTC	HV0.1	1700 – 2000	1700 – 2000	1700 – 2000
Hardness	Matrix	HRC	48 – 54	37 – 44	29 – 35
Hardphase / Matrix Blend Ratio			60 / 40	60 / 40	65 / 35
Thickness Limit	mm in)		6 – 8 0.24 – 0.31	none	none

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

3.2 Typical PTA Overlay Cross Section



3.3 Welding Parameters

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

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
PlasmaDur 51122	1076555	10 kg (approx. 22 lb)	Stock	Global
PlasmaDur 51142	1097677	25 kg (approx. 55 lb)	Stock	Global
	1063633	10 kg (approx. 22 lb)	Stock	Global

4.2 Handling Recommendations

- Store in the original, closed container in a dry location.
- Blend the entire contents of the container prior to use.

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 Metco Joining & Cladding web site at www.metcojoiningcladding.com (Resources – Safety Data Sheets).

Product	SDS No.
PlasmaDur 51122	50-912
PlasmaDur 51142	50-911

www.metcojoiningcladding.com
info@metcojoiningcladding.com