

Material Product Data Sheet

Composite Hardfacing Rods of Tungsten Carbide Infiltrated with Nickel-Based Self-Fluxing Matrix

Welding Rod Products:

Metco 81022, Metco 81025, Metco 81030

1 Introduction

Oerlikon Metco's range of tungsten carbide-containing composite rods have been designed to provide excellent performance for a range of hardface overlay applications. Metco 81025 offers general wear protection under moderately abrasive and/or erosive conditions, while Metco 81022 is designed for particularly highly erosive environments. Metco 81030 also provides excellent erosion resistance and produces a tough overlay microstructure that combats impact and high stress abrasion.

These composite rods are formed with a nickel-based matrix that is hard, tough and aids deposition through self-fluxing properties. No additional fugitive binders are included in the manufacture of these liquid metal infiltrated composites. This benefits both the optimum packing of the densified spherical tungsten carbide hard phase and decreases potential contamination within the deposit.

Unlike some powder-deposited hard-facing materials, the composite rod is not constrained by the size or species of hard phases that can be applied. Generally the volume of as-deposited hard phase is greater than 50%, which is an improvement over other powder deposited coatings.

Hardfacing is applied to the substrate via an oxy-acetylene heat source, application of a nickel-based buttering layer such as Metco 1721A sprayed (but not fused) using a WT1000 torch. A preheat is advised on large parts. For precise applications, smaller width rods can be applied using GTAW.

1.1 Typical Uses and Applications:

Typical industries and applications where these rods can be used include:

- Oil and gas downhole tools used in the bottom hole assembly
- Blades on drill bits, hole openers and bi-centers
- Gauges on bits and stabilizers
- Rotary steerable pads
- Repair of matrix bit bodies

Quick Facts

| | |
|-------------------------|---------------------------------------|
| Classification | Rod, tungsten carbide |
| Chemistry | WC Ni-based self-fluxing alloy |
| Manufacture | Blended and liquid metal infiltration |
| Morphology - Hard Phase | Spherical |
| Purpose | High abrasion and erosion resistance |
| Process | Oxy-acetylene or GTAW welding |



Metco 81022 composite rod

2 Material Information

2.1 Characteristics

| Product | Composition (wt.%) | | Hard Phase Grain Size μm | Product Form | Color | Manufacturing Method | Previously Sold As |
|-------------|--------------------|--------------------|-------------------------------------|---------------|--------|---------------------------|------------------------|
| | NiCrBSi Matrix | Carbide Hard Phase | | | | | |
| Metco 81022 | 40 | 60 | -425 +63 | Solid | | | DiaClad Enduro Extend |
| Metco 81025 | 40 | 60 | -425 +75 | Composite Rod | Silver | Liquid Metal Infiltration | DiaClad Enduro Elite + |
| Metco 81030 | 60 | 60 | -600 +150 | | | | DiaClad Enduro Elite |

^a CTC-S = Cast tungsten carbide that has been spheroidized and densified

2.2 Available Rod Widths and Lengths

| Product | Width | | Rod Length | |
|-------------|---------|---------|------------|-------|
| Metco 81022 | 2.4 mm | 3/32 in | 460 mm | 18 in |
| | 3.2 mm | 1/8 in | 460 mm | 18 in |
| | 4.8 mm | 3/16 in | 460 mm | 18 in |
| | 6.4 mm | 1/4 in | 610 mm | 24 in |
| Metco 81025 | 2.4 mm | 3/32 in | 460 mm | 18 in |
| | 4.0 mm | 5/32 in | 460 mm | 18 in |
| | 7.9 mm | 5/16 in | 460 mm | 18 in |
| | 11.1 mm | 7/16 in | 460 mm | 18 in |
| Metco 81030 | 4.0 mm | 5/32 in | 460 mm | 18 in |
| | 4.8 mm | 3/16 in | 460 mm | 18 in |

2.3 Key Selection Criteria

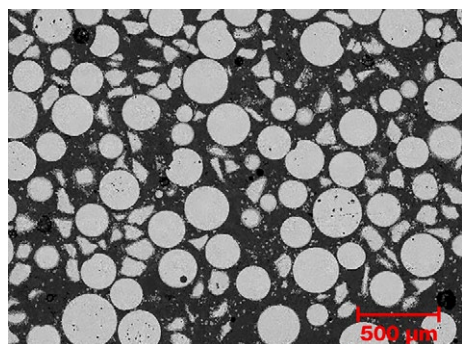
- Metco 81025 is a blend of cast (CTC-S^a) and monocrySTALLINE tungsten carbide that produces deposits with good erosion and abrasion resistance under low to medium stress. The general use is for oil and gas and industrial applications. This material is recommended for use on the gages of bottom hole tools with inserts or thermally stable polycrystalline (TSP) cutters.
- Metco 81022 is a bi-modal hardfacing product incorporating large spherical carbides in a nickel matrix. The rods are designed with a tight packing density for highly erosive applications and moderate abrasive wear. Designed for erosive conditions, use Metco 81022 with areas of high hydraulic flow on the blades of drill bits.
- Metco 81030 contains large cemented tungsten carbide pellets, which provides excellent impact resistance and erosion resistance within a tough matrix. The incorporation of spherical carbide also provides good abrasion resistance. Use Metco 81030 all over the drill bit. It can also be used on components without inserts or TSPs on the gage.

2.4 Related Products

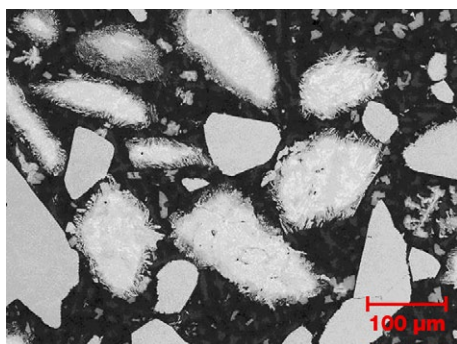
- Metco 81586 and Metco 51151B (formerly sold as DiaClad Xtreme Elite) are diamond-containing composite rods (Metco 81586) or spray and fuse powder (Metco 51151B). These two products are good candidates when extreme abrasion resistance is required. They can be applied to the gage of drill bits and stabilizers without inserts or TSPs.
- Metco 51019A is a bi-modal spray and fuse powder designed for resistance to erosion such as the blades of drill bits.
- Metco 50141A and Metco 50142A are spray and fuse and PTA versions of sustainable hardfacing products designed for low to medium stress abrasion and/or erosive environments. They are excellent candidates for large parts where cost of the raw material is the major consideration.
- WokaDur NiA is nickel wire coated with angular cast tungsten carbide and a nickel-based alloy matrix. WokaDur NiA contains 62 to 67 wt. % of hard phase and is excellent choice for hardface surfaces requiring maximum wear protection combined with corrosion resistance. WokaDur NiA is suggested if a high deposit hardness (52 to 58 HRC) is preferred.
- WokaDur NiA-Plus could provide additional hardness (58 to 65 HRC) and wear resistance due to the replace of the angular cast tungsten carbide in WokaDur NiA by spherical cast tungsten carbide.

3 Overlay Information

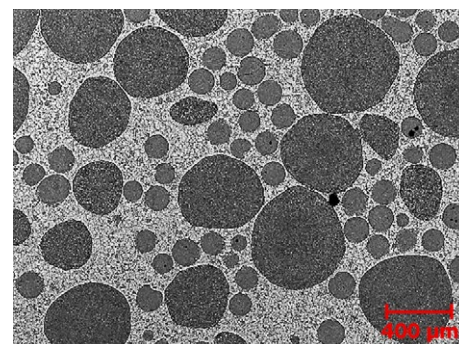
3.1 Typical Overlay Cross-sections;



Metco 81022



Metco 81025



Metco 81030

3.2 Welding Parameter Development

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 | Rod Width | Rod Length | Availability | Distribution |
|-------------|-----------|--------------------------|--------------------|----------------|--------------|--------------|
| Metco 81022 | 1306920 | 10 lbs (approx.4.53 kg) | 2.38 mm (3/32 in) | 457 mm (18 in) | Stock | Global |
| | 1306918 | 25 lbs (approx.11.34 kg) | 3.18 mm (1/8 in) | 457 mm (18 in) | Stock | Global |
| | 1306919 | 25 lbs (approx.11.34 kg) | 4.76 mm (3/16 in) | 457 mm (18 in) | Stock | Global |
| | 1303873 | 25 lbs (approx.11.34 kg) | 6.35 mm (1/2 in) | 610 mm (24 in) | Stock | Global |
| Metco 81025 | 1306915 | 10 lbs (approx. 4.53 kg) | 2.38 mm (3/32 in) | 457 mm (18 in) | Stock | Global |
| | 1306914 | 25 lbs (approx.11.34 kg) | 3.97 mm (5/32 in) | 457 mm (18 in) | Stock | Global |
| | 1305077 | 25 lbs (approx.11.34 kg) | 7.94 mm (5/16 in) | 457 mm (18 in) | Stock | Global |
| | 1305076 | 25 lbs (approx.11.34 kg) | 11.11 mm (7/16 in) | 457 mm (18 in) | Stock | Global |
| Metco 81030 | 1306916 | 25 lbs (approx.11.34 kg) | 3.97 mm (5/32 in) | 457 mm (18 in) | Stock | Global |
| | 1306917 | 25 lbs (approx.11.34 kg) | 4.76 mm (3/16 in) | 457 mm (18 in) | Stock | Global |

4.2 Handling Recommendations

- Store in the original, closed container in a dry location.
- Open containers should be stored in a drying oven to prevent moisture pickup.

4.3 Safety Recommendations

See SDS 50-2409 (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).

Information is subject to change without prior notice.