oerlikon
metco

Product Data Sheet
Hardfacing Alloy with Extremely Hard, Cubic Molybdenum Borides

Wire Products: Metco 8226

Patent pending

1 Introduction

Metco™ 8226 is an iron-based alloy specifically designed to produce overlays using conventional wire welding processes that replicate the microstructure of tungsten carbide PTA overlays.

Metco 8226 grows extremely hard molybdenum boride particles homogeneously throughout the entire weld bead. These molybdenum boride particles are harder and smaller than the tungsten carbide hard phase in PTA weld overlays — a characteristic that enhances impact resistance.

Metco 8226 is particularly suitable for applications where resistance to gouging or high-stress abrasion is required. Coatings of Metco 8226 pair the toughness required for high impact applications with superb wear resistance that rival most other wear-resistant coatings on the market. Its welded microstructure looks similar to tungsten carbide - nickel PTA overlays while simultaneously avoiding the long, needle-like particles known to cause problematic embrittlement in chromium carbide overlays and many nanostructured steel alloys.

1.1 Typical Uses and Applications

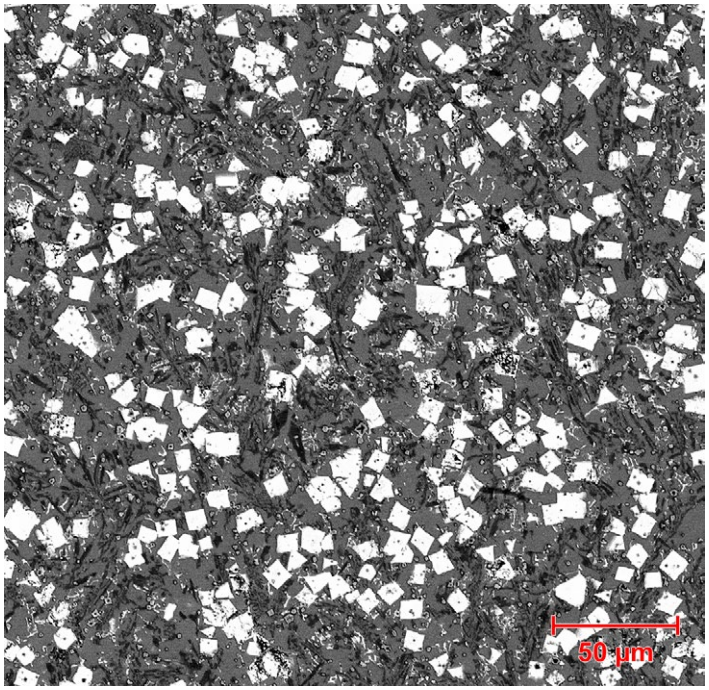
Metco 8226 overlays are suggested for use in any application where wear resistance to gouging or high-stress abrasion is required.

Specific applications include:

- Shaker screens
- Grader blades and other ground engaging tools
- Chute blocks
- Pipe inner walls
- Mill liners
- Slurry pipes
- Shovel wear packages
- Cutter rings
- Primary and secondary crusher teeth
- Grouser risers
- Other mining applications

Quick Facts

Classification	Alloy, iron-based
Chemistry	Proprietary
Manufacture	Composite wire
Abrasion Resistance	0.09 to 0.11 g lost (ASTM G65A low stress abrasion)
Service Temperature	540 °C (1000 °F)
Impact Resistance	> 6 000 impacts @ 20 J without failure
Overlay Hardness	65 to 70 HRC
Hard Phase	> 40%
Purpose	Gouging and high stress abrasion resistance
Processes	GMAW, BMAW, SAW



Typical as-welded coating microstructure of Metco 8226. Note distribution of complex Molybdenum Boride particles with hardness of approx. 2600 HV.

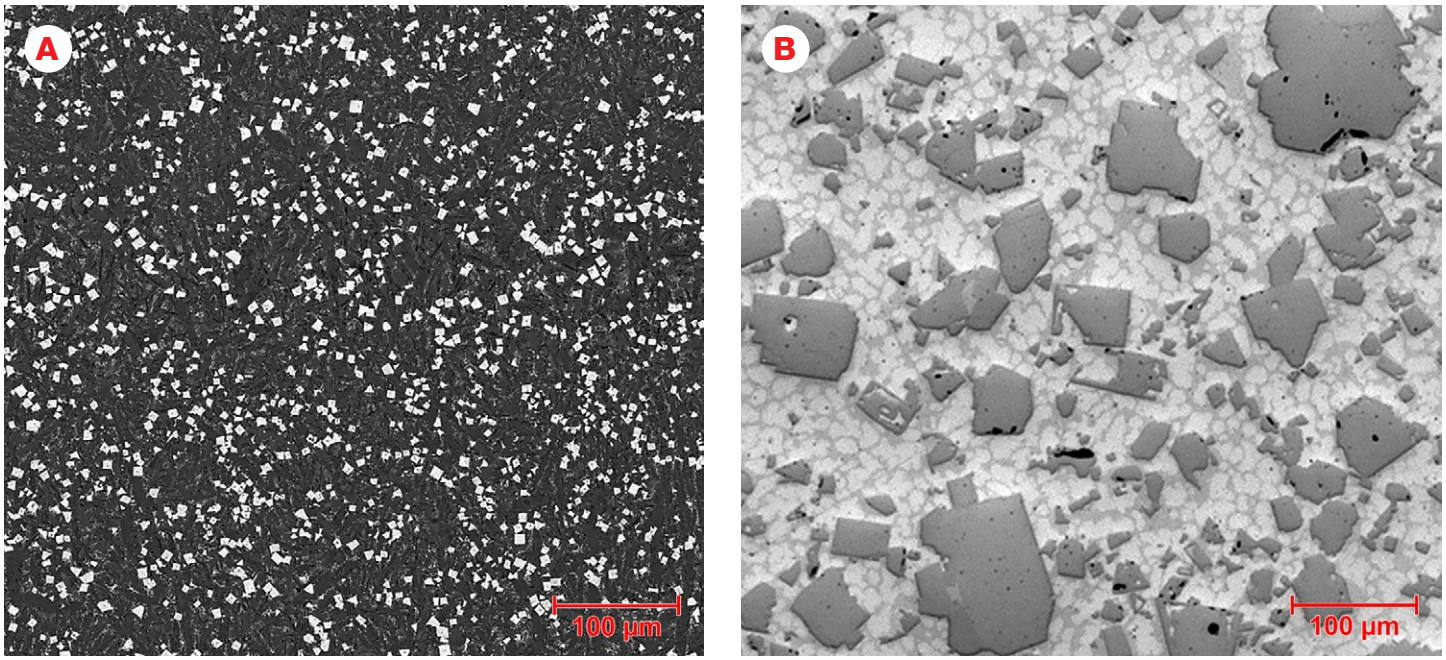
2 Material Information

2.1 Physical Properties and Characteristics

Product	Nominal Chemistry	Product Form	Size	Recommended Process	Previously Sold As
Metco 8226	Proprietary FeMoCr alloy	Composite Wire	1/16 in (1.6 mm)	GMAW	Vecalloy 752
			7/64 in (2.78 mm)	BMAW, SAW	

2.2 Key Selection Criteria

- **Fine-Scale Microstructure:** Metco 8226 forms a unique microstructure that exhibits good high stress abrasion and gouging resistance. The Metco 8226 microstructure somewhat mimics the structure of a tungsten carbide-based (WC) matrix composite hardfacing. The thermodynamics of Metco 8226 drive the precipitation of extremely hard, cubic, complex molybdenum borides. The complex borides have a very high hardness comparable to WC. These complex boride particles are roughly 10 to 50 µm in size with an inter-particle spacing of 75 µm or less. Furthermore, the complex boride particles are embedded in a hard, martensitic matrix also contains a high fraction of fine-scale carbides and borides. The combined high hardness of both the molybdenum boride particles and the matrix result in a structure that is very resistant to high stress abrasion and gouging.
- **Homogeneity:** Metco 8226 forms a high fraction of both carbides and borides as precipitates. The microstructure is the same throughout the deposit, whether near the weld interface or the deposit surface. The carbide size and spacing is very homogeneous throughout the entire deposit. The carbides are precipitated, thus they do not float nor settle and there are no regions that are enriched or depleted of the hard borides and carbides.
- **Consistent Performance:** The homogeneous microstructure results in consistent performance from the surface of the weld down to the weld interface. For example, ASTM G65 testing on the weld surface and halfway into the weld thickness generate the same results. The entire weld thickness will perform according the performance specifications of the material.



Microstructure comparison of Metco 8226 deposit **[A]** versus WC-Ni GMAW deposit **[B]**. Note the fine hard phase and more homogeneous structure created by Metco 8226 versus the very large hard phase particles in the GMAW deposit.

2.3 Related Products

- Choose Metco 8224 when higher impact resistance is needed. However, compared to Metco 8224, deposits of Metco 8226 have a good compromise between abrasion performance and impact performance, with impact resistance that is still better than many common hard facing materials.. Metco 8226 delivers a uniquely high level of hard phase constituents (carbides + borides) that can be achieved using the GMAW process. Deposits contain an elevated level of hard phases that provide additional resistance to high stress abrasion and gouging compared to Metco 8224. In addition, Metco 8224 is chromium-free and should be considered for applications where the use of chromium is a concern.

- If yet higher gouging and wear resistance is still needed, WOKA 53003, applied using PTA or laser cladding, can be used. It produces a microstructure with a higher volume fraction of larger carbides.

- Metco 8233 can be used in applications where even higher impact resistance is required or additional functionality such as non-magnetism or compatibility with a Mn-steel substrates is needed. Metco 8233, however, is not as abrasion resistant as Metco 8226

- Oerlikon Metco produces a wide range of other products designed for mining applications. Products are available in wire and powder form appropriate for application using thermal spray, PTA, laser cladding and other welding processes. Please contact your Oerlikon Metco Account Manager for more information..

3 Key Coating Information

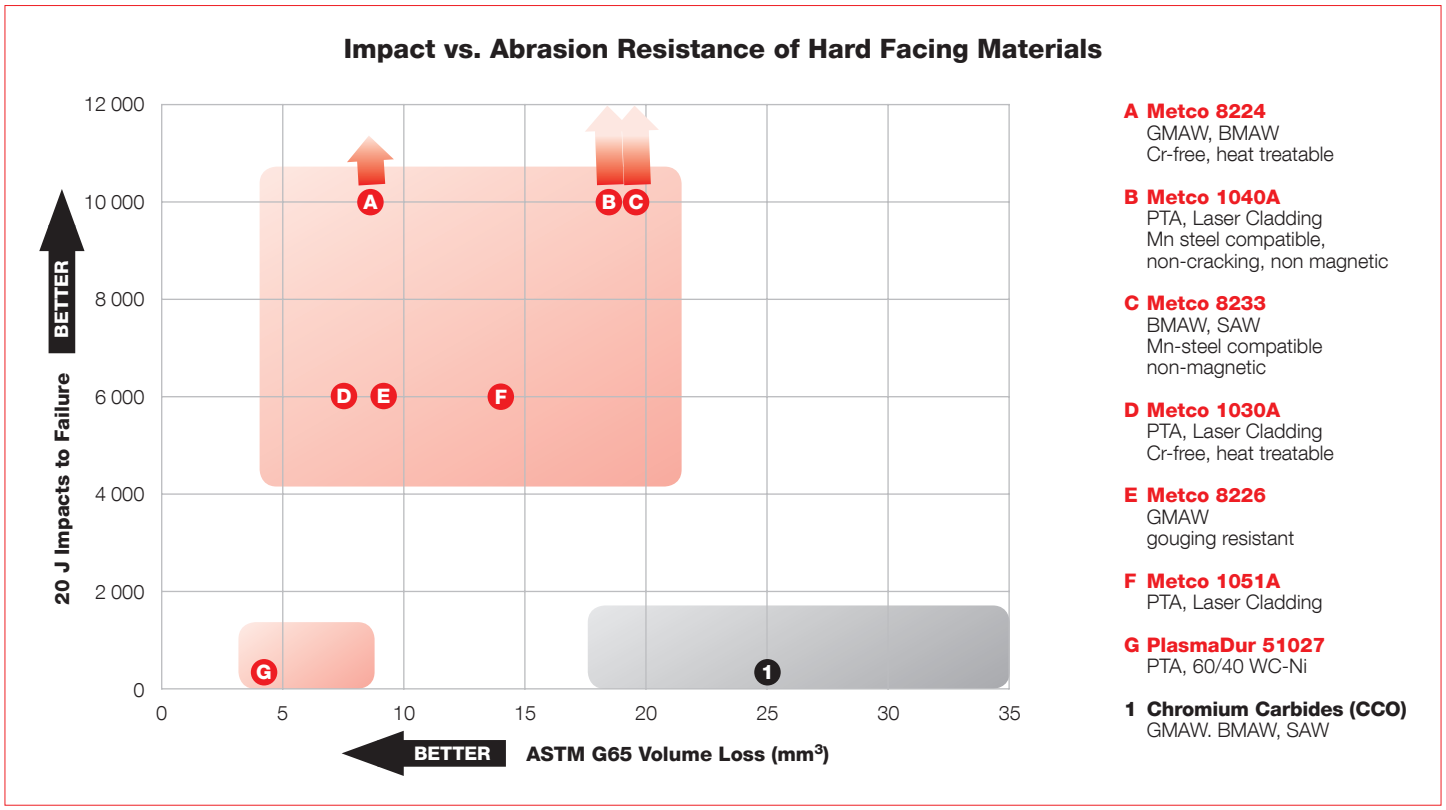
3.1 Using Metco 8226

Metco 8226 can be deposited as stringer beads or oscillated beads using GMAW, SAW or BMAW processes. Metco 8226 should be welded as a single layer deposit. Multiple layer deposits can reduce the impact resistance of the overlay.

Process	GMAW	SAW / BMAW
Wire Diameter	0.063 in (1.6 mm)	0.109 in (2.8 mm)
Current	DCEP	DCEP
Desired weld thickness	3 to 6 mm (0.12 to 0.24 in)	3 to 8 mm (0.12 to 0.31 in)
Voltage	25.5 to 27 V	25 to 27 V
Amperage (approx.)	225 A	400 A
Shielding gas	100% Ar	None
Stickout	28.6 mm (1.125 in)	32 mm (1.25 in)
Interpass temperature	< 260 °C (500 °F)	< 260 °C (500 °F)
Torch drag angle	5° to 15°	5° to 15°
Acceptable dilution	5% to 25%	15% to 35%
Expected hardness	65 to 70 HRC	65 to 70 HRC
Expected ASTM G65	0.09 to 0.1 g mass loss	0.09 to 0.1 g mass loss

3.2 Coating Development

For specific coating application requirements, the services of Oerlikon Metco's Coating Solution Centers are available. Please contact your Oerlikon Metco Account Manager for more information.



4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Form	Size	Package Size	Availability	Distribution
Metco 8226	1302398	Wire	0.063 in (1.6 mm)	25 lb (11 kg) spool	Stock	Global
Metco 8226	1305722	Wire	0.109 in (2.78 mm)	25 kg (55 lb) spool	Stock	Global
Metco 8226	1305724	Wire	0.109 in (2.78 mm)	250 kg (550 lb) drum	Stock	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.

4.3 Safety Recommendations

See SDS 50-2310 (Safety Data Sheet) in the localized version applicable to 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).

The Oerlikon Metco Difference:

Metco 8226 was developed using our patented and proprietary **Scoperta™** high throughput computational metallurgical process to evaluate millions of candidate alloy compositions. Potential candidates are then experimentally evaluated using an advanced screening process where both properties and alloy microstructure are measured.

The combined **Scoperta** computational and experimental approach allows Oerlikon Metco to rapidly design the final material with a much better accuracy than conventional empirically-based methodologies.

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