Material Product Data Sheet
Spherical Cast Tungsten Carbide – Nickel Alloy Powder Blends

Powder Products:
MetcoClad 52052, MetcoClad 53003, Metco 51058

1 Introduction
MetcoClad™ 52052, MetcoClad 53003 and Metco™ 51058 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 or PTA 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. All three products employ a nickel chromium silicon boron matrix; however, MetcoClad 53003 has a higher chromium content for better corrosion and erosion resistance and improved flow. Metco 51058 has a coarser particle size distribution and provides excellent protection against high-stress abrasion for stabilizer applications.

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 flow 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/cm³ |
| Hardness       | 2700 – 3100 HV0.1 |
| Purpose        | Wear and erosion resistance |
| Process        | Laser Cladding, PTA |

Typical Morphology of MetcoClad 52052 Powder Blend
2 Material Information

2.1 Chemical Composition

<table>
<thead>
<tr>
<th>Product</th>
<th>Weight Percent (typical)</th>
<th>Metal Matrix 40 %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hard Phase 60% W C Fe Ni Cr Si B Fe C</td>
<td></td>
</tr>
<tr>
<td>MetcoClad 52052</td>
<td>Balance 3.8 &lt; 0.3 Balance 6.8 – 8.3 3.1 – 3.9 1.4 – 1.9 1.7 – 3.3 0.1 – 0.4</td>
<td></td>
</tr>
<tr>
<td>MetcoClad 53003</td>
<td>Balance 3.8 &lt; 0.3 Balance 9.5 – 12.5 3.4 – 4.3 1.9 – 3.6 2.1 – 3.5 0.3 – 0.6</td>
<td></td>
</tr>
<tr>
<td>Metco 51058</td>
<td>Balance 3.8 &lt; 0.3 Balance 6.8 – 8.3 2.8 – 3.6 1.4 – 1.9 1.7 – 3.3 0.1 – 0.4</td>
<td></td>
</tr>
</tbody>
</table>

2.2 Particle Size Distribution, Apparent Density and Former Designation

<table>
<thead>
<tr>
<th>Product</th>
<th>Nominal Particle Range (µm)</th>
<th>Apparent Density (g/cm³)</th>
<th>Former Product Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetcoClad 52052</td>
<td>–106 +45</td>
<td>6.0 – 8.0</td>
<td>---</td>
</tr>
<tr>
<td>MetcoClad 53003</td>
<td>–106 +45</td>
<td>6.0 – 8.0</td>
<td>WOKA 6050S PlasmanDur 53003</td>
</tr>
<tr>
<td>Metco 51058</td>
<td>–150 +53</td>
<td>6.0 – 8.0</td>
<td>---</td>
</tr>
</tbody>
</table>

2.3 Key Selection Criteria

- All three products are suitable for applications where high hardness, wear resistance and resistance to slurry erosion is needed.
- These are versatile products that can be used in both PTA and laser cladding processes thanks to its size and the use of the spherical carbide.
- Metco 51058 is particularly suitable for PTA processing due to its coarser size distribution.
- MetcoClad 52052 produces overlays with 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.

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.

2.5 Recommended Processes

<table>
<thead>
<tr>
<th>Product</th>
<th>Laser Cladding</th>
<th>PTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetcoClad 52052</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>MetcoClad 53003</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Metco 51058</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Note: Customers should feel free to use any of these materials for either laser cladding or PTA. The above recommendations are made on material design considerations. Customers may use these products for processes other than laser cladding or PTA, if they should choose to do so.
3 Coating Information

3.1 Key Overlay Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>MetcoClad 52052</th>
<th>MetcoClad 53003</th>
<th>Metco 51058</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended Coating Process</td>
<td>Laser Cladding</td>
<td>Laser Cladding</td>
<td>Laser Cladding or PTA</td>
</tr>
<tr>
<td>Microhardness</td>
<td>CTC-S HV0.1</td>
<td>2700 – 3100</td>
<td>2700 – 3100</td>
</tr>
<tr>
<td>Hardness</td>
<td>Matrix HRC</td>
<td>37 – 44</td>
<td>50 – 55</td>
</tr>
<tr>
<td>Hardphase / Matrix Blend Ratio</td>
<td>% 60 / 40</td>
<td>60 / 40</td>
<td>60 / 40</td>
</tr>
</tbody>
</table>

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 laser cladding or 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

<table>
<thead>
<tr>
<th>Product</th>
<th>Order No.</th>
<th>Package Size</th>
<th>Availability</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetcoClad 52052</td>
<td>1075604</td>
<td>5 kg (approx. 11 lb)</td>
<td>Stock</td>
<td>Global</td>
</tr>
<tr>
<td>MetcoClad 53003</td>
<td>1064835</td>
<td>5 kg (approx. 11 lb)</td>
<td>Special Order</td>
<td>Global</td>
</tr>
<tr>
<td>Metco 51058</td>
<td>1306774</td>
<td>10 kg (approx. 22 lb)</td>
<td>Stock</td>
<td>Global</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Product</th>
<th>SDS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetcoClad 52052</td>
<td>50-1521</td>
</tr>
<tr>
<td>MetcoClad 53003</td>
<td>50-1245</td>
</tr>
<tr>
<td>Metco 51058</td>
<td>50-2365</td>
</tr>
</tbody>
</table>