Overview

Entegris’ diamond-like carbon (DLC) coatings are ultra-hard, extremely smooth, highly lubricious coatings that are harder than tool steel. UltraC™ Diamond and UltraC-HT are deposited using a low-temperature (<150°C/302°F) proprietary Plasma Enhanced Chemical Vapor Deposition (PECVD) process so that no change in substrate hardness will occur; even for S-7 and other steels with a low draw temperature. The coatings are deposited uniformly and with a high degree of conformality. The coating thickness can be as little as 1 micron thick, or thicker depending on the application and tool tolerance.

The DLC coatings can be applied to existing tool designs without the need for design changes and modifications. Entegris can also refurbish DLC coated parts, lowering the cost of ownership (COO) while maximizing the life of these high value critical components.

UltraC-HT is an innovative, multi-layer, fully dense coating based on our UltraC hard carbon coating technology. This mono-dimensionally modulated (MDM) coating system, consisting of individual layers of the two materials differing in elastic modulus, has high strength, toughness and excellent resistance to erosion and wear.

Wear Resistance

One of the primary attributes for UltraC coatings is its ability to resist wear by lowering the friction between two sliding components. This is accomplished by forming a ultra-thin transfer layer between these surfaces, which adds lubricity and eliminates the need for lubrication. This barrier has a Coefficient of Friction (COF) approaching that of Teflon®, thus eliminating galling and frictional wear. The DLC coating is not required to be applied on both sliding surfaces to achieve the benefit of the wear resistance. The low COF is sufficient to protect both surfaces even if only one surface is coated.

Specifications

<table>
<thead>
<tr>
<th>Property</th>
<th>UltraC Diamond</th>
<th>UltraC-HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrate: Compatibility</td>
<td>Metals, ceramics (AlN, Al₂O₃, quartz, YSZ, Si, graphite, etc.), many polymers and anodized metals</td>
<td>Dense, amorphous, micro-conformal layer, MDM, multi-layered</td>
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<tr>
<td>Size</td>
<td>Up to 24” x 12” x 2”</td>
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<tr>
<td>Temperature: Deposition</td>
<td>&lt;150°C (302°F)</td>
<td>&lt;150°C (302°F)</td>
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<tr>
<td>Use</td>
<td>400°C (752°F)</td>
<td>-50 to 400°C (-58 to 752°F)</td>
</tr>
<tr>
<td>Coating thickness:</td>
<td>1–10 µm</td>
<td>1–50 µm</td>
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<tr>
<td>Electrical resistivity:</td>
<td>10⁵–10⁷ Ω·cm</td>
<td>10⁴ Ω·cm</td>
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<tr>
<td>Coefficient of friction:</td>
<td>0.04–0.08</td>
<td>0.04–0.08</td>
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<tr>
<td>Hardness:</td>
<td>2450–2855 HV (24–28 GPa)</td>
<td>2040–2650 HV (20–26 GPa)</td>
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<tr>
<td>Wear resistance:</td>
<td>Excellent</td>
<td>Excellent</td>
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<tr>
<td>Corrosion resistance:</td>
<td>Resistant to most acids and alkalis</td>
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</tbody>
</table>
Features

- Super hard (about 80 to 85 Rockwell C)
- Ultra low friction (less than 0.1)
- Corrosion resistant
- Highly conformal to surface features
- Thickness available from 1 μm to 50 μm
- Deposited at low temperature
- Can be deposited on most substrates
- Consistent and repeatable thickness

Benefits

- Extremely wear resistant for longer tool life
- Less drag
- More resistant to galling
- Tooling stays cleaner longer
- Ideal for precision (close tolerance) tooling with no need to allow for coating thickness
- Very versatile
- Predictable

For More Information

To learn more about how Entegris' high-purity specialty coatings help customers enhance yields, improve productivity and meet future technological needs, call Entegris at +33 (0)4 72 52 00 40.

To review Entegris' specialty coatings offering, visit Entegris' website at www.EntegrisSpecialtyCoatings.com.

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