



# NICKEL-TUNGSTEN

## CODE 5711

### Why use Nickel-Tungsten?

- **Free of hexavalent chromium!**
- **One of the hardest chromium alternatives available today!**
- **Ten times lower wear rate than hard chromium!**
- **Meets the hydrogen embrittlement characteristics of ASTM F 519 without a relief bake!**

SIFCO ASC is continuously developing and refining new deposits and coatings, providing the highest quality surface enhancement materials that meet industry's ever changing requirements.

SIFCO ASC's Nickel-Tungsten deposit is the perfect green alternative to chromium for repair and OEM applications that require exceptionally hard plating. The deposit was developed for aerospace, automotive, oil & gas and any other industry where the hardness of the surface is critical.

### Applications

- For OEM or dimensional repair applications that require the enhancement of localized areas to improve surface properties including hardness, wear resistance, and coefficient of friction.

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|                                     |  |
|-------------------------------------|--|
| Composition                         | 60% Ni; 40% W  |
| Structure                           | Micro-cracked  |
| Corrosion Resistance                | >500 hours with a 0.0005" thick copper preplate  |
| Coefficient of Friction             | 0.35 - 0.55  |
| Average Hardness                    | 660 - 690 VHN as plated<br>835 VHN (heat treated at 375° F for 23 hours)<br>1060 - 1150 VHN (heat treated at 923° F for 2 hours) |
| Wear Resistance (Taber)             | 14   |
| Hydrogen Embrittlement (ASTM F 519) | Passes without bake  |
| Maximum Thickness                   | 0.007"   |
| Plating Rate                        | 0.002"/hour  |

## A COMPARISON OF EHC and Ni-W PROPERTIES

(Electrodeposited Hard Chrome, Nickel-Tungsten)

|  | Test Method           | Applicable Standard                | EHC   | Ni-W   |
|--|-----------------------|------------------------------------|---|--|
| <b>Appearance</b>                              | Microscopy            |                                    | Micro-cracked                                 | <b>Micro-cracked</b>   |
| <b>Microstructure</b>                          | XRD                   |                                    |   | <b>Nanocrystalline (crystallite size 2 Nm)</b>   |
| <b>Hardness</b>                                | Vickers Microhardness | ASTM B 578                         | 800 - 1200 VHN<br>790 VHN<br>(375° F/20 hour) | <b>660 - 690 VHN<br/>835 VHN (375° F/23 hr)<br/>1060 - 1150 VHN<br/>(heat treated 932° F/2 hr)</b> |
| <b>Ductility</b>                               | Bend Test             | ASTM B 489                         | <1%   | <b>&lt;1.6%</b>  |
| <b>Wear Volume Loss</b>                        | Pin-on-disc           | ASTM G 99                          | 9 - 11 x 10 <sup>-6</sup> mm <sup>3</sup> /Nm | <b>5.0 x 10<sup>-7</sup> mm<sup>3</sup>/Nm</b>   |
| <b>Wear Abrasive</b>                           | Taber                 | ASTM D 4060                        | 3 - 6   | <b>14</b>  |
| <b>Coefficient of Friction</b>                 | Pin-on-disc           | ASTM G 99                          | 0.7   | <b>0.35 - 0.55</b>   |
| <b>Pin Wear</b>                                | Pin-on-disc           | ASTM G 99                          | Severe  | <b>Mild</b>  |
| <b>Corrosion Resistance</b>                    | Salt Spray            | ASTM B 117<br>ASTM B 537<br>Rating | Protection Rating 2<br>(1000 hr salt spray)   | <b>&gt; 500 hours with a 0.0005" thick preplate</b>  |
| <b>Hydrogen Embrittlement</b>                  | Notched Bar           | ASTM F 519                         | Pass with bake                                | <b>Pass without bake</b>   |
| <b>Fatigue</b>                                 | Axial                 | ASTM E 466                         | Significant debit                             | <b>TBD</b>   |
|  | Rotating Beam         | ISO 1143                           | Significant debit                             | <b>TBD</b>   |
| <b>Thermal Stability</b>                       | Air Oven              |                                    | 400° C  | <b>500° C</b>  |
| <b>Internal Stress</b>                         | Bent Strip            |                                    |   | <b>12 - 16 kpsi tensile</b>  |
| <b>Current Efficiency</b>                      |                       |                                    | 15 - 35%                                      | <b>35 - 40%</b>  |
| <b>Deposition Rate</b>                         |                       |                                    | 0.0005" - 0.001"/hr                           | <b>0.002"/hr</b>   |
| <b>Process Stability using Insoluble Anode</b> |                       |                                    | Good  | <b>Good</b>  |