High Performance Tantalum for Semiconductors
The H.C. Starck Advantage

H.C. Starck’s tantalum has the highest purity levels with very stable thermal, electrical and mechanical properties for a broad range of semiconductor applications and device operating temperatures. A major advantage of tantalum is its compatibility with silicon and silicon dioxide for chip processing. Tantalum targets are used to deposit thin film coatings via physical vapor deposition (PVD) sputtering.

Application in Integrated Circuits

> Diffusion barrier for copper metallization
  > Immiscible with copper, bonds well with silicon and silicon oxide and has a low thermal expansion coefficient

> Resistors and on chip capacitors
  > Tantalum oxide has high dielectric constant with low temperature variation for capacitors
  > Tantalum nitride has a near zero temperature coefficient of resistance for thin film resistors

Benefits

> Purity of the sputter target material is maintained in the deposited film
> The process is much easier to control than chemical vapor deposition (CVD)
> Prevent interaction of copper seed layer and silicon in diffusion barrier
> Stable resistivity with temperature on chip resistor (oxynitrides)
> Stable capacitance with temperature on chip capacitor (tantalum oxide has a high dielectric constant)

End Products

> Copper interconnect metallization
> Printer components
> Optical and industrial glass
> Magnetic recording media
> Flat panel displays
> Thin film resistors

Forms Available

> Tantalum blanks
> Tantalum strips
> Finished tantalum plates
> Near-net shapes

H.C. Starck’s high purity tantalum is electron beam (EB) melted under high vacuum and with controlled melt rates. Grain size and crystallographic texture are controlled through the use of special thermo-mechanical processes and are customized for specific applications.

Tantalum is very ductile and can be fabricated into plates that are either diffusion bonded for planar sputter systems or formed into shapes such as the hollow cathode sputter target or radiofrequency coils (RF) coils.
Tantalum Purity Levels

Tantalum purity is measured by GDMS (Glow Discharge Mass Spectrometry) and gasses are measured by Leco analyzers.

H.C. Starck's tantalum is supplied to semiconductor level quality standards including ship to control and is certified as conflict-free material by the EICC as a "Conflict-Free Smelter" of tantalum for H.C. Starck's sustainable procurement process.

### Tantalum Dimensional Tolerances

<table>
<thead>
<tr>
<th>Nominal Thickness**</th>
<th>Thickness Tolerance</th>
<th>Length, Width, and Diameter Tolerances</th>
<th>Flatness Tolerances*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Round to Round</td>
<td>Square to Round</td>
<td></td>
</tr>
<tr>
<td></td>
<td>„R2R“</td>
<td>„S2R“ (Rectangular Plates Only)</td>
<td></td>
</tr>
<tr>
<td>0.1250&quot;</td>
<td>+ .050&quot; / - 0</td>
<td>+ .020&quot; / - 0</td>
<td></td>
</tr>
<tr>
<td>- .0299&quot;</td>
<td></td>
<td>+0.1875&quot;/ -0</td>
<td>+0.020&quot; / -0</td>
</tr>
<tr>
<td>0.3000&quot;</td>
<td>+.050&quot; / -0</td>
<td>+.025&quot; / -0</td>
<td>+0.040&quot; / -0</td>
</tr>
<tr>
<td>- .04739&quot;</td>
<td></td>
<td>+0.25&quot; / -0</td>
<td>+0.030&quot; / -0</td>
</tr>
<tr>
<td>0.4740&quot;</td>
<td>+ .050&quot; / - 0</td>
<td>+ .030&quot; / - 0</td>
<td></td>
</tr>
<tr>
<td>- .0650&quot;</td>
<td></td>
<td>NA</td>
<td>+0.060&quot; / -0</td>
</tr>
</tbody>
</table>

*Per foot

**Typical fully recrystallized, equiaxed microstructure with grain size less than 80 microns.
The conditions of your use and application of our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis at least must include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by H.C. Starck. All information is given without warranty or guaranty. It is expressly understood and agreed that the customer assumes and hereby expressly releases H.C. Starck from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance and information. Any statement or recommendation not contained herein is unauthorized and shall not bind H.C. Starck. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under any patents of any kind. Properties of the products referred to herein shall, as a general rule, not be classed as information on the properties of the item for sale. In case of order please refer to issue number of the respective product data sheet. All sales and deliveries are based on the latest issue of the product data sheet and the latest version of our General Conditions of Sale and Delivery.

The values in this publication are typical values and do not constitute a specification.