Tungsten, a key refractory material used in a variety of applications, ranging from incandescent lamp to high-tech semiconductor devices.

[Advantages]
• Historically well cultivated products and technologies
• Properties are controllable by high-purity refining and working elements addition.
• Tungsten metal is available in the form of powders, wires, plates, blocks and machined parts.
• We support customers with hi-tech analysis technologies.

Tungsten Machined Parts

We offer variety of tungsten parts, shaped into pins, discs, rods and so on, that have the excellent properties of tungsten and tungsten alloy.

[Applications]
Anodes for X-ray Tubes "Rotanode"
We offer rotating anodes and fixed anodes for X-ray tube targets. Rotating anode targets are mainly made of ReW-Mo composite material that contains rheni-tung and molybdenum with special elements. Moreover, we offer pure tungsten anode targets and molybdenum anode targets for soft X-ray generators.

Tungsten Probe Pins Made of Rheni-tung
Rhenium tungsten (rheni-tung in short), having high toughness and high abrasion resistance, are used to make probe pins, or contact pins, to inspect large-scale integrated circuits for semiconductor devices and LCDs. H37 rheni-tung, having smooth surfaces as well as basic electric conductivity, high strength and abrasion resistance, has been developed for probe pins.

Discharge Lamp Electrodes
We offer pure tungsten parts and special element alloyed tungsten parts for xenon lamp electrodes or gas discharge lamps. For the cathodes requiring electron emission, we offer thorium tungsten W56.

Vacuum Metallizing Tungsten Elements
Tungsten elements for vacuum metallizing are made from tungsten single wires or twisted wires. Wires are form into specified shapes and thoroughly cleaned before use. We proceed with the design and manufacture after specifications are determined at meetings with customers.

Corona Discharge Parts
Gold-plated, platinum-plated or oxidized tungsten wires are applied to the corona discharge parts for copiers, laser beam printers, facsimiles and air purifiers.

Other Tungsten Parts
We offer furnace structural parts (plates, rods and blocks), nozzles, porous materials for cathodes and other materials and parts at the customer’s request.
• Tungsten refractory materials for furnace components
• Tungsten boats for metal melting

Thermocouple (+) lead wire, durable up to 2600˚C
Thermocouple (-) lead wire, durable up to 2600˚C

**Rhenium-tungsten**

Rhenium tungsten wires have greater electric resistance than pure tungsten wires. In addition, they have unique mechanical properties. These electric and mechanical properties vary according to the rhenium content. Toshiba Materials offers every kind of rhenium tungsten material to meet customers’ requests.

**[Advantages]**
- **H30:** H30 Rheni-tung wires are made of 3wt% rhenium-doped tungsten alloy. They have excellent non-sagging properties. Unlike doped tungsten wires, they have no tendency to drop abruptly in strength after secondary recrystallization. They also have high ductility, which doped tungsten wires do not have.
- **H36:** The rhenium content is augmented in H36 rheni-tung wires so that they have higher electric resistance and tensile strength.

**[Applications]**
Heater filaments of various electric tubes and filaments of small lamps that are required to have higher vibration resistance

**Tungsten wires containing thorium (thorium oxide: ThO2) particles are suitable for various electron tubes and TIG welding electrodes. Alloved thorium enhances the emission of thermions by lowering the work function barriers. In addition, thorium-tungsten wires are difficult to deform as the mechanical properties of thorium-tungsten wires are improved because thorium particles have a dispersion strengthening effect.

**[Advantages]**
- **H30:** W51 wires have excellent non-sagging properties and are tough against vibration.
- **W53, W54:** W53 and W54 wires have excellent electron emission properties and are tough against high-temperature deformation.
- **W56:** W56 wires have excellent electron emission properties and are tough against electrode abrasion.

**[Applications]**
- Vibration-resistant bulb filaments
- Electron tubes
- TIG welding electrodes

**Products List**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Product name</th>
<th>Characteristics</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W41</td>
<td>Tungsten wires with recrystallization point lower than that of W31 and excel in forming.</td>
<td>Vacuum metalizing material and high temperature structural material.</td>
</tr>
<tr>
<td></td>
<td>W71</td>
<td>Non-sagging and vibration resistant cobalt included doped tungsten wire.</td>
<td>Vibration resistant bulb filaments for automotive lamps.</td>
</tr>
<tr>
<td></td>
<td>W91</td>
<td>Tungsten in non-sagging property and a best fit for high temperature use.</td>
<td>Filaments for halogen lamps.</td>
</tr>
<tr>
<td>Thoriated tungsten</td>
<td>W51</td>
<td>0.7%ThO2-W: A cobalt doped tungsten wire that excels in vibration resistance.</td>
<td>Vibration resistant bulb filaments for low power small lamps.</td>
</tr>
<tr>
<td></td>
<td>W55</td>
<td>1.0%ThO2-W: Standard thoriated tungsten wire for electron tubes.</td>
<td>Transmitting tubes and magnetrons.</td>
</tr>
<tr>
<td></td>
<td>W54</td>
<td>1.7%ThO2-W: Standard thoriated tungsten wire for electron tubes.</td>
<td>Transmitting tubes and magnetrons.</td>
</tr>
<tr>
<td></td>
<td>W56</td>
<td>2.0%ThO2-W: Thoriated tungsten wire for discharging electrodes.</td>
<td>TIG welding electrodes and various discharging electrodes.</td>
</tr>
<tr>
<td>Rhenium-tungsten</td>
<td>H30</td>
<td>0.7%Re-W: Excels in high temperature strength with improved ductility after recrystallization.</td>
<td>Heater filaments for various electric tubes and filaments for vibration-resistant lamps.</td>
</tr>
<tr>
<td></td>
<td>H35</td>
<td>1.0%Re-W: Rhenium alloyed wire with higher electric resistivity and higher strength.</td>
<td>Filaments with high electric resistivity for various electron tubes.</td>
</tr>
<tr>
<td></td>
<td>H36</td>
<td>2.0%Re-W: Rhenium alloyed wire with much higher electric resistivity and higher strength.</td>
<td>Filaments with high electric resistivity for various electron tubes.</td>
</tr>
<tr>
<td></td>
<td>H37</td>
<td>2.5%Re-W: Ultra fine wire with sufficient strength.</td>
<td>Probe pins for semiconductor inspection.</td>
</tr>
<tr>
<td></td>
<td>H38</td>
<td>3%Re-W: 5% rhenium doped tungsten alloy wire having good linearity in thermal electromotive force.</td>
<td>Thermocouple (+) lead wire, durable up to 2400˚C</td>
</tr>
<tr>
<td></td>
<td>H39</td>
<td>26%Re-W: 26% rhenium doped tungsten alloy wire having good linearity in thermal electromotive force.</td>
<td>Thermocouple (-) lead wire, durable up to 2600˚C</td>
</tr>
</tbody>
</table>
Doped Tungsten Wires for Lamps

We offer doped tungsten non-sagging wires for lamps. Doping agents are added at the powder-making stage. The powder is then sintered into ingots by electric heating. The crystalline structure, namely grain size and shape, of sintered ingots is controlled when the ingots are plastic deformed under optimal conditions.

Elconite™

Elconite™ is a sintered alloy of refractory metals such as tungsten, tungsten carbide and graphite, and high-conductivity metals such as silver and copper. We offer a variety of materials that have unique characteristics depending on the constitution of the alloying contents and additives. Elconite has two main branches, namely electric contact materials and electric discharge machining materials.

Elconite™ for Electric Contact Materials

[Advantages]
• Elconite™ has excellent electric properties that are not found in melted alloys.
• Elconite™ offers a wide range of alloy composite materials.
• Elconite™ has high arc resistance, high fusing resistance and high abrasion resistance.
• Elconite™ has high conductivity and low contact resistance.

Elconite™ for Electric Discharge Machining Materials

Elconite™ for electric discharge machining materials has two main branches. One is copper-based materials, and the other is silver-based materials. Both branches have standardized material (ED1) and improved material (ED2) with higher working speed and higher consumption resistance.

Heavy Alloys

Heavy alloy is the generic name for tungsten-based, high-density alloy and contains nickel, copper and iron as additives for homogeneous sintering. The alloy material is classified according to composition, or tungsten content (90%-96%) and the sorts of additives.

[Advantages]
• High density of 17-18.4Mg/m³
• Excellent mechanical properties such as high vibration-damping capacity and high Young’s modulus.
• Excellent radiation-shielding property
• High thermal conductivity with low thermal expansion coefficient
• Higher high-temperature strength and thermal shock resistance
• High oxidation resistance and corrosion resistance

[Applications]
• X-ray devices both for medical and industrial use, radiation-shielding components for gamma-ray devices, and isotope containers
• Vibrator balances for cellular phones, and flywheels
• Boring bars and quills
• Die parts for diecast dies, core pins and sleeves
• Electrodes
• Heat treatment furnace jigs