## Titanium sponge

＜Quality＞

| Product | Code | JIS | Ti (%min) | Other contaminants (% max.) | | | | | | | | | Hardness (BHN) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fe | Cl | Mn | Mg | Si | N | C | H | O | |
| Soft Sponge | S-90 | — | 99.8 | 0.03 | 0.08 | 0.002 | 0.04 | 0.02 | 0.006 | 0.01 | 0.003 | 0.05 | 90max |
| | S-95 | — | 99.7 | 0.04 | 0.08 | 0.002 | 0.04 | 0.02 | 0.006 | 0.01 | 0.003 | 0.06 | 95max |
| Mild Sponge | M-100 | JIS 1 | 99.6 | 0.08 | 0.10 | 0.005 | 0.05 | 0.02 | 0.010 | 0.02 | 0.004 | 0.07 | 100max |
| | M-120 | JIS 2 | 99.5 | 0.12 | 0.12 | 0.010 | 0.06 | 0.03 | 0.015 | 0.02 | 0.005 | 0.10 | 120max |
| Hard Sponge | H-140 | JIS 3 | 99.4 | 0.15 | 0.12 | 0.020 | 0.07 | 0.03 | 0.020 | 0.03 | 0.005 | 0.15 | 121 ～140 |
| | H-160 | JIS 4 | 99.3 | 0.18 | 0.12 | 0.020 | 0.07 | 0.03 | 0.025 | 0.03 | 0.005 | 0.25 | 141 ～160 |

・Shape：irregular, partial diameter (reference): 0.84mm～12.7mm 90% or more

・Applications：titanium mill products(plate, pipe, bar, wire), material for titanium alloy, getter for rare gases

・Packing：drum can (capacity:250 kg), grease can (capacity:20 kg, 18ℓ) etc.

＜Physical properties＞

| Boiling point | Melting point | Specific gravity |
|---|---|---|
| 3,260℃ | 1,668℃ | 4.50（20℃） |

## $TiCl_4$ (Titanium tetrachloride)

＜Quality＞

| Product | Code | %min. $TiCl_4$ | Other contaminants (% max.) | | | Harzen color numbers max. |
|---|---|---|---|---|---|---|
| | | | Si | V | Fe | chromaticity |
| Pure titanium tetrachloride | Pure $TiCl_4$ | 99.9 | 0.001 | 0.0001 | 0.001 | 20 |

・ Applications：material for various titanium oxides, material for organic titanium compounds, catalyst for polymerization, CVD material in the manufacture of TiC, TiN etc.

・Packing：drum can (capacity: about 280 kg) etc.

＜Physical properties＞

| Boiling point | Melting point | Specific gravit |
|---|---|---|
| 136.4℃ | -25℃ | 1.726（25℃） |

・ Titanium tetrachloride is highly reactive with water. When it comes into contact with moisture it undergoes hydrolysis, emitting large amounts of fumes and heat, and forming hydrochloric acid and titanium hydroxychlorides characterized as Ti(OH)mCln.

・Titanium tetrachloride is a powerful solvent, and mixes fully with or reacts with many other solvents.

・ Pure titanium tetrachloride has virtually no corrosive effect on iron at ordinary temperatures, but it is very corrosive at 200℃ or higher.

## Titanium tetrachloride aqueous solution

＜Composition＞

| Typical component（16.5% products） | | Typical components（9.3% products） | |
|---|---|---|---|
| Ti | 16.5 ±0.5% | Ti | Approx.9.3%（$TiO_2$ 204±5g/ℓ） |
| Cl | 31 ±2.0% | Cl | 26.5～28.1%<br>（Specific gravity：1.32）<br>（350～371g/ℓ） |
| Fe, Al, Mn, V | Each 1ppm or less | Fe | 5ppm or less |
| | | Al, Mn, V | Each 1ppm or less |
| Si, Mg, Ca | Each 10ppm or less | Si, Ca | Each 10ppm or less |
| Specific gravity | Approx. 1.52 | Specific gravity | 1.300～1.340 |

・Applications：material for titanium oxides, various catalysts

・Packing：drum can (capacity: 200～250 kg),rigid polyethylene tank (capacity:25 kg) etc.

## Ferro-titanium

＜Product standards＞

| Grade | Product | Chemical composition (% max.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Ti | C | Si | Mn | P | S | Al | Cu |
| 1 | OFT-70 | 70.0 | 0.1 | 0.1 | 0.2 | 0.01 | 0.01 | 0.2 | 0.1 |
| 2 | OFT-40 | 40.0 | 0.1 | 0.15 | 0.3 | 0.01 | 0.01 | 0.2 | 0.1 |

## High-purity titanium

＜Quality standards ＞

| contamination | Grade（ppm max） | | |
|---|---|---|---|
| | 4N<br>（≧Purity99.99%） | 4N5<br>（≧Purity99.995%） | 5N<br>（≧Purity99.999%） |
| Al | 5 | 3 | 1 |
| As | — | 3 | 1 |
| Cr | 5 | 3 | 1 |
| Cu | 5 | 3 | 1 |
| Fe | 30 | 15 | 5 |
| Mg | 5 | 3 | 1 |
| Mn | 5 | 3 | 1 |
| Ni | 10 | 5 | 1 |
| Si | 5 | 3 | 1 |
| Sn | 5 | 3 | 1 |
| W | 5 | 3 | 1 |
| K | 0.1 | 0.1 | 0.1 |
| Li | — | 0.1 | 0.1 |
| Na | 0.1 | 0.1 | 0.1 |
| Th | 0.001 | 0.001 | 0.001 |
| U | 0.001 | 0.001 | 0.001 |
| C | 50 | 50 | 50 |
| H | 20 | 20 | 20 |
| N | 50 | 50 | 30 |
| O | 400 | 400 | 300 |

・Analysis methods：LECO、GDMS

## SiO（silicon monoxide）

＜Typical figures：20～70mm＞

| | % min purity | Chemical constituents（ppm max.） | | | | | |
|---|---|---|---|---|---|---|---|
| | | Fe | Al | Cu | Ti | Ca | Mn |
| Standards | 99.95 | 20 | 50 | 20 | 20 | 50 | 20 |

・Sizes：-0.045mm、0.15～0.3mm、0.3～1.7mm、1.7～4mm、4～10mm、20～70mm

## TILOP

| Grades | % min. | Chemical constituents（% max.） | | | | | Particle diameter (μm) |
|---|---|---|---|---|---|---|---|
| | Ti | Fe | O | C | N | H | |
| TILOP-150 | 99.7 | 0.06 | 0.10 | 0.03 | 0.03 | 0.01 | -150 |
| TILOP-45 | 99.7 | 0.08 | 0.17 | 0.03 | 0.03 | 0.01 | -45 |

・Values for titanium purity exclude gas components

## TILOP (High purity)

| Grades | % min. | Chemical contaminants（ppm max.） | | | | | | | | | | | | | | Particle size (μm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ti | Fe | Al | Si | Cr | Ni | Mn | Mg | Na | K | Cl | O | C | N | H | |
| TILOP-150H | 99.98 | 40 | 5 | 5 | 5 | 10 | 5 | 10 | 0.1 | 0.1 | 10 | 800 | 200 | 200 | 100 | -150 |
| TILOP-45H | 99.98 | 50 | 5 | 5 | 5 | 10 | 5 | 10 | 0.1 | 0.1 | 10 | 1300 | 200 | 200 | 100 | -45 |

・Values for titanium purity exclude gas components

## TILOP64（Ti-6Al-4V）

| Grades | Chemical composition（% max.） | | | | | Chemical composition（%） | | | Particle size (μm) |
|---|---|---|---|---|---|---|---|---|---|
| | O | H | N | C | Fe | Al | V | Ti | |
| TILOP64-150 | 0.20 | 0.015 | 0.05 | 0.08 | 0.40 | 5.5～6.75 | 3.5～4.5 | Bal. | -150 |
| TILOP64-150ALL | 0.23 | 0.015 | 0.05 | 0.08 | 0.40 | 5.5～6.75 | 3.5～4.5 | Bal. | -150 |
| TILOP64-45 | 0.25 | 0.015 | 0.05 | 0.08 | 0.40 | 5.5～6.75 | 3.5～4.5 | Bal. | -45 |

・Values for titanium purity exclude gas components

## Titanium hydride-dehydride powder

| Code | % min. | Chemical components（% max.） | | | | | | | | | Particle size |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ti | Fe | Cl | Mn | Mg | Si | N | C | H | O | (μm) |
| TSP-100 | 99.5 | 0.02 | 0.04 | 0.005 | 0.02 | 0.01 | 0.03 | 0.02 | 0.02 | 0.25 | -150 |
| TSP-350 | 99.4 | 0.03 | 0.04 | 0.005 | 0.02 | 0.01 | 0.03 | 0.02 | 0.02 | 0.35 | -45 |
| TMP-100 | 99.2 | 0.05 | 0.04 | 0.01 | 0.02 | 0.01 | 0.03 | 0.02 | 0.02 | 0.50 | -150 |
| TMP-350 | 99.1 | 0.05 | 0.04 | 0.01 | 0.02 | 0.01 | 0.03 | 0.02 | 0.02 | 0.60 | -45 |

・Values for titanium purity exclude gas components

## Titanium hydride-dehydride powder（high-purityproducts）

| Code | % min. | Chemical components（ppm max.） | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ti | Cl | Mg | Fe | Ni | Cr | Al | Mn | Si | Na | K | H | C | N |
| TSPT | 99.98 | 400 | 200 | 50 | 10 | 10 | 10 | 10 | 10 | 0.1 | 0.1 | 200 | 200 | 300 |

・Values for titanium purity exclude gas components

・Values for oxygen differ according to particle size.（-150μm：2,500ppm max,-45μm：3,500 ppm max）

## Titanium hydride powder

| Code | % min. | | Chemical components（% max.） | | | | | | | Particle size |
|---|---|---|---|---|---|---|---|---|---|---|
| | TiH | (H) | Fe | Cl | Mn | Mg | Si | N | * C | (μm) |
| TSH-100 | 99.5 | (3.5) | 0.02 | 0.05 | 0.005 | 0.03 | 0.01 | 0.025 | 0.02 | -150 |
| TSH-350 | 99.4 | (3.5) | 0.03 | 0.02 | 0.005 | 0.01 | 0.01 | 0.025 | 0.02 | -45 |
| TMH-100 | 99.2 | (3.5) | 0.05 | 0.05 | 0.01 | 0.03 | 0.01 | 0.035 | 0.02 | -150 |
| TMH-350 | 99.1 | (3.5) | 0.05 | 0.02 | 0.01 | 0.01 | 0.01 | 0.035 | 0.02 | -45 |

* Analyzed as titanium powder, not shown on inspection certificate.

・Values for titanium purity exclude gas components

## Titanium hydride powder（high-purity products）

| Code | % min. | | Chemical components（ppm max.） | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TiH | (H) | Fe | Ni | Cr | Al | Mn | Si | Na | K | * C | N |
| TSHT | 99.98 | (3.5) | 50 | 10 | 10 | 10 | 10 | 10 | 0.1 | 0.1 | 200 | 250 |

* Analyzed as titanium powder, not shown on inspection certificate.

・Values for titanium purity exclude gas components

・Values for Cl, Mg differ according to particle size.

（-150μm Cl：500 ppm max, Mg：300 ppm max）（-45μm Cl：200 ppm max, Mg：100 ppm max）