



www.toho-titanium.co.jp/en



# Amazing Tlanium





The Toho Titanium Group pursues

the infinite possibility of titanium and related technologies, and contributes to building a sustainable society by continuously supplying excellent products and services.

## Future Metal — Titanium

Titanium metal has various excellent properties. It is light, durable, corrosion resistant and biocompatible. Since it was first adopted in the aerospace industry, titanium metal has expanded its applications to encompass a wide range of fields, including aircraft engines and airframes, chemical and power generation plants, seawater desalinization, construction materials, automobiles and motorcycles, as well as healthcare and consumer products. First introduced for practical use in 1948, this innovative metal is expected to find even wider application in areas where its superior properties provide remarkable advantages.



#### Titanium ore Chlorination Titanium tetrachloride Reduction Titanium sponge Melting

Titanium ingot ligh-purity titanium

**Business** 

## Who We Are

Since its founding in Chigasaki City, Kanagawa Prefecture in 1953, Toho Titanium has been pursuing the infinite possibility of titanium and related technologies through its business activities. Toho Titanium is engaged in the manufacture and sale of titanium metal products such as sponge, ingot, high-purity titanium, powder and fabricated titanium





products, as well as products produced from materials obtained in the titanium production process or with related technologies, such as catalysts for polyolefin production, high-purity titanium dioxide for electronic parts and ultra-fine nickel powder for multi-layer ceramic capacitors (MLCCs).

**Titanium Metal** 

**Business** 

More information

on the website

# Catalysts and Chemicals Business

# Chlorination & Reduction Technology

The major products manufactured by the Toho Titanium Group are titanium sponge and titanium ingot cast by vacuum melted titanium sponge.

Our titanium sponge is produced by applying a combination of our own technology and titanium tetrachloride is generated by chloride reaction with titanium ore (main ingredient is TiO<sub>2</sub>) and, afterward reacted with magnesium to remove chlorine by the so-called "Kroll Process" and consequently titanium sponge is produced.

We employ vacuum distillation to effectively remove magnesium and magnesium chloride entrapped in the titanium sponge after the reduction reaction. This allows us to produce high-quality titanium sponge that is suitable for melting. Our square-type DC Slab<sup>®</sup>, EB ingot (produced by EB cold hearth melting) and round-type VAR ingot (produced by conventional double or triple vacuum arc remelting) can be applied to a wide range of products to accommodate customer needs.

Our businesses lines also include the manufacture and sale of high-purity titanium used for sputtering targets for semiconductor thin-film formation, and a wide variety of titanium powders, as well as fabricated titanium products.

#### **Major Products**



DC Slab®





Titanium sponge

#### Ingot (square-type)





Titanium Metal

# Catalysts World-Class Products and Services



Toho Titanium also develops, manufactures and sells catalysts for production of polyolefin (mainly polypropylene or PP), a commodity plastic, using as a raw material titanium tetrachloride, which is produced in the titanium production process. "THC Catalysts," our main product line, offer high performance and stable quality, and allow us to satisfy customer needs according to their PP production process and product type.

## Chemicals

## The Evolution of Electronic Parts

Toho Titanium produces and supplies materials for the electronic parts of devices and appliances used in daily life, such as smartphones, personal computers and cars. High-purity titanium dioxide is a material for multi-layered ceramic capacitors (MLCCs), positive temperature coefficient (PTC) thermistor, and dielectric resonators. Ultra-fine nickel powder is a material for MLCCs.



#### High-purity titanium (round-type) Arcraft engines and airframes Mulfier and engine parts Mulf

# Titanium Used Widely in Our Daily Lives



THC Catalysts

Multi-Layered Ceramic Capacito

(MLCC)

More information

electrode

itanium dioxide)

Flectrode

More information

on the website

on the website

#### **Major Products**



Raw materials of polyolefin catalysts

#### **Major Products**



Ultra-fine nickel powder



High-purity titanium dioxide





# **Examples of Research** and Development



#### **Company Information**

Corporate Name	Toho Titanium Co., Ltd.	Capita
Foundation	August 20, 1953	Stock
Headquarters	JR Yokohama Tower 22nd Floor, 1-1-1 Minamisaiwai, Nishi-ku, Yokohama, Kanagawa 220-0005, Japan Phone: +81-45-394-5522	Busine



#### Nanagement System Certifications

#### Environmental Management System ISO 14001

We hold ISO 14001 certification, an international standard for environmental management systems for our Chigasaki Plant (including Toho Technical Service Co., Ltd.'s Headquarters and Plant, and Tatsuta Environmental Analysis Center Co., Ltd.'s Kanagawa Laboratory), the Kurobe Plant and the Wakamatsu Plant.

The scope of the certification includes the design, development and manufacture of titanium tetrachloride, titanium sponge, high-purity titanium, titanium ingot, high-purity titanium oxide, catalysts for propylene polymerization, ultra-fine nickel powder, magnesium chloride, titanium trichloride aqueous solution, titanium tetrachloride aqueous solution, titanium powders, and fabricated

#### Group Companies

measurements certification business

titanium products and the environmental

- Toho Technical Service Co., Ltd. www.tohotec.co.jp/english/
- Businesses Manufacture and sale of welded titanium products, machined components, forged products, insoluble anodes and titanium powders (Ti powder, hydrogenated Ti powder and 64-alloy powder); sale of titanium materials and zirconium sponges Location 3-3-5, Chigasaki, Chigasaki City, Kanagawa, Japan 253-8510
- Toho Material Co., Ltd. www.toho-titanium.co.jp/en/company/pdf/tohomaterial\_en.pdf Businesses Manufacture and sale of potassium titanate and other materials for automotive brake pads, and other titanium oxide compounds Location 692-1 Tokiguchi, Tokitsu-cho, Toki City, Gifu, Japan 509-5122
- Advanced Metal Industries Cluster and Toho Titanium Metal Company Limited Businesses Manufacture and sale of titanium sponge Location Yanbu, the Kingdom of Saudi Arabia

# Exploring the Infinite Possibility of Titanium and Related Technologies

Toho Titanium manufactures a variety of products such as titanium metal and its alloys, polyolefin catalysts, high-purity titanium oxide and ultra-fine nickel powder. The growth of business covering such a wide range of products is the result of our ceaseless efforts to develop new technologies, and we are proud that these technologies have all been basically created by ourselves.

Our research and development is based on a management strategy that focuses on strengthening and establishing our business foundation through the pursuit of higher quality.

We aim to contribute to the development of a sustainable society by opening new doors to the future through research and development including innovative titanium metal manufacturing processes and high-quality products not only to meet specific customer requirements but also to achieve higher quality that is several steps ahead of their requests.







#### Near Net Shape High-Functional **Titanium Alloy Products**

Toho Titanium has developed technologies that allow us to deliver titanium alloy products having high-functional properties and shape close to final machined ones, utilizing titanium powders manufactured through the hydrogenation and dehydrogenation process that is our specialty. Providing characteristics that standard titanium alloys do not have and reducing the disadvantage of machining load, we are developing new applications of titanium alloys with a focus on large-variety and small-quantity applications.

## Porous Titanium (WEBTi<sup>®</sup>)

Through extensive research on a variety of forming and sintering conditions, we succeeded in developing porous titanium (WEBTi®) featuring high porosity and strength utilizing titanium powders manufactured through the hydrogenation and dehydrogenation process. These products are expected to be used for applications such as electrode materials, filter, and sound-absorbing materials that require porosity as well as lightweight and corrosion resistance.



02

### Solid Electrolyte for Next-Generation Lithium-Ion Batteries (Lithium lanthanum titanium oxide)

In a joint effort with Professor Dr. Yoshiyuki Inaguma of the Faculty of Science at Gakushuin University, we have been working on improving the performance of materials for metallic lithium air cells, which are expected as next-generation lithium-ion batteries (Libs), and developed a lithium-ion permeable solid electrolyte with high ionic conductivity at least five times greater than that of commercially available products.

#### High-strength titanium alloy products through powder metallurgy



Dumbbell-shaped product (as sintered)

Cylindrical-shaped product (after machining)

#### Porous titanium — Extremely thin and as flexible as paper (WEBTi<sup>®</sup>-K)



#### Solid electrolyte made of Lithium lanthanum titanium oxide (LLTO) (sheet, tube and powder)



Sheet and tube

More information on the website





#### Quality Management System ISO 9001 & JIS Q 9100

We also hold ISO 9001 certification, an international standard for quality management systems, for our Headquarters, the Chigasaki Plant, the Kurobe Plant, the Hitachi Plant, the Yahata Plant, and the Wakamatsu Plant. The scope of the certification includes the design, development and manufacture of titanium tetrachloride, titanium sponge, high purity titanium(sponge, ingot, billet), titanium and titanium alloy ingot, high purity titanium dioxide, catalysts for propylene polymerization, ultra-fine nickel powder, magnesium chloride, titanium trichloride aqueous solutions, titanium tetrachloride aqueous solution and toll melting service of high purity metal and contract manufacturing service of high purity chloride.

In addition, we hold JIS Q 9100 certification, a domestic quality management system standard for the aerospace industry, for our Headquarters, the Chigasaki Plant, the Yahata Plant and the Wakamatsu Plant with respect to the

manufacture of titanium sponge and

Toho Titanium America Co., Ltd. Businesses. Sale of titanium metals, catalysts for polyolefin

production, etc. and related market research

titanium ingot.

