

Yamanashi Prefecture

Oxide Corporation (Hokuto City)

Manufacturer of optical oxide monocrystals for the age of photonics in the 21st century

Crystal Systems Inc. (Hokuto City)

The world's top-ranking manufacturer of R&D-purpose single crystal synthesizers

Koike Co., Ltd. (Chuo City)

Manufacturing high-quality and high functionality single crystal wafers for surface acoustic wave devices

Mirapro Co. (Hokuto city)

Manufacturing bellows which are made of metal but expand and shrink

**Manufacturing of oxide
single crystals for the
wide variety of photonics
applications in the 21st
century**

Oxide Corporation

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Yamanashi Prefecture

Established in 2000
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Yasunori Furukawa
President

Based on fundamental research of National Institute for Material Science, an independent administrative agency, OXIDE Corporation develops their original manufacturing technology and high-performance, high-quality single crystals, as a R&D-oriented venture company.

The first venture company from a National Research Laboratory

OXIDE was established in October 2000, as a customer-driven manufacturing company of oxide single crystals. Their technologies are the new crystal growth technique and new materials that can be grown with it. They are based on the inventions at National Institute for Research in Inorganic Materials (NIRIM) of Japan. Oxide single crystals are the key materials for a wide variety of optical applications including the rapidly growing photonics network technology.

Realizing high-performance, high-quality single crystals by developing new technology

The company first introduced Stoichiometric LiNbO_3 and LiTaO_3 single crystals into the market. Stoichiometric crystals are superior to their conventional counterparts in almost every respect, and will find widespread use in tele-communications, optical storage and frequency doubling and parametric conversion. In 2003, the company even won a technology award sponsored by the Japan Association of Crystal Growth. The next year, in response to patents obtained by Osaka University, the company developed a crystal for ultraviolet laser equipment.

Leading the market for optical single crystals for wavelength conversion

In 2005, the company relocated its head office to Hokuto City, thus increasing its production capacity greatly. With the growth of optical communication demand, the high-performance, high-quality single crystals are getting important key materials. Although the market is still in its early stage, the company presumably enjoys a share of more than 60% in the field of optical single crystals for photonic applications. OXIDE manufacture SLN SLT, PPMgSLT, PPMgLN, CLBO, BBO, SBN, TiO_2 , GdVO_4 , Yb:YAG, DAST crystals. Aiming at being the leading supplier of new oxide single crystals, OXIDE will continue to introduce new products to meet customer's demands.

Manufacturing single
crystals by the double
crucible process



SBN crystal
For optical modulators, domain
engineering devices, and other
new opt-electric devices



**The world's top-ranking
manufacturer of
R&D-purpose single
crystal synthesizers**

Crystal Systems Inc.

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Established in 1995
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Dr. Isamu Shindo
President

The company is the world's top-ranking manufacturer boasting a world share of 70% in equipment for manufacturing single crystals, which are increasingly important as a key material for semiconductors and other electronic devices.

Single crystals are a must in mobile telephones and other optical telecommunication devices.

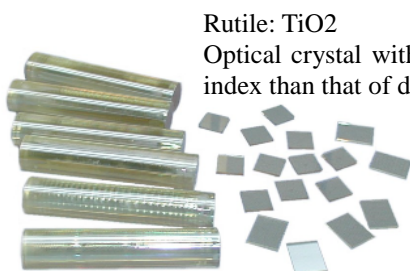
Crystals have its molecules arranged neatly such as quartz, diamond, and ruby. The neat arrangement of their crystals allows the material to display their characteristics most sensitively and accurately. Crystals are therefore becoming increasingly important as key materials for semiconductors, optical communication, and other frontier technological areas.

Developing single crystal growth equipments based on four ellipsoidal mirrors

Traditional "infrared lamp image furnaces," used for growing single crystals have one or two ellipsoidal mirror system in which temperature homogeneity were not enough for high quality single crystals. The company then developed the four ellipsoidal mirrors furnace which can achieve very uniform temperature conditions and succeeded in manufacturing large and high-quality single crystals in a short time.

The company's products are cherished by universities and institutes all over the world, having won a world share of 70%.

The company's research-purpose single crystal synthesizers are cherished by universities and institutes both at home and abroad, including the Massachusetts Institute of Technology, thus being highly valued by entities all over the world. The company's leading product, "infrared lamp image furnace," is unrivaled as a high-quality single crystal synthesizer. The company is thus the world's top-ranking manufacturer boasting a world share of 70%.



Rutile: TiO₂
Optical crystal with a higher refraction
index than that of diamond

Infrared lamp image furnace



Remotely controlled from anywhere in
the world and at any time

**Manufacturing
high-quality and high
functionality single crystal
wafers for surface
acoustic wave devices**

Koike Co., Ltd.

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Established in 1946
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Hikaru Koike
President

The company manufactures lithium tantalate and quartz wafers used for substrates for filters to control the electrical signals to be communicated by mobile telephones and for video equipment and for the keyless entry of automobiles. In those wafers, the company has a world share of more than 40%.

SAW device substrates as the key for removing noises from mobile telephones and other communications equipment

Mobile telephones and other communication equipment use band pass filters designed to communicate sound and image signals clearly. These filters first convert electric signals to surface acoustic waves (SAWs), which propagate conveyed along solid surfaces. They are then collected as electric signals to extract the necessary frequencies. This role is played by SAW devices.

As mobile telephones get digitized and increasing amounts of information are communicated by video clips and other means, demand is growing for lithium tantalate wafers as substrates for SAW devices capable of handling wide-bandwidth, high-frequency signals.

The company is the world's first to have mass-produced anti-pyroelectric wafers based on lithium tantalate.

The company produces lithium tantalate wafers in a continuous process beginning with crystal growth, thus developing a technology for wafer processing with high quality and high flatness. To meet the needs for miniaturization and low-profile of SAW devices, the company developed a technology for thin-wafer manufacturing. The company also secured a license agreement from a USA company for Pyro-Free technology for inhibiting the emission of static electricity, which can become a barrier to the design and manufacture of SAW devices. The company is thus the first in the world to have succeeded in mass-producing "Pyro-Free wafers." By increasing the functionality of lithium tantalate wafers, the company has now secured a world share of more than 40% similarly to quartz wafers.

Demand is expected to continue to grow.

Lithium tantalate wafers are expected to see even higher demand due to the diversification of mobile telephones (which are expected to have topped 1 billion units in the world), personal digital assistants, and similar equipment. Quartz wafers are also expected to see demand not only for SAW devices but for pneumatic and acceleration sensors as well.



**Manufacturing bellows
which are made of metal
but expand and shrink**

Mirapro Co.

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Established in 1984
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Yoichi Tsugane
President

The company occupies the top-ranking share in Japan by manufacturing metal bellows that expand and shrink in the forms of an accordion, functioning as the heart designed to make a vacuum environment, which is a must for research and development in high-tech industries.

Bellows that are made of metal but expand and shrink

Bellows are used to absorb position changes between vacuum devices connected and vibrations and displacements generated during operation when a vacuum environment is developed as something indispensable for research in semiconductor manufacturing, medical equipment, biotech technology, and other high-tech industries. These accordion-like parts are characterized by their expansion and shrinkage despite their being of metal. Bellows come in two types: welded and formed bellows. The former is characterized by its expandability, shrinkability, and bending characteristics, while the latter is characterized by the possibility of its length being changed as desired.

Contributing to all industries as the heart of high-tech equipment

The company's welded bellows center around "large-diameter welded bellows" having unique wavy shapes, and are used for the core of semiconductor-manufacturing lines, along with areas of R&D, medical equipment, nuclear power plants, various communications, food, and other areas needing vacuum technology, based on liquid crystal technology and various high-tech equipment. They then boast the top-ranking share in Japan because of their high quality and low prices.

Increasing quality and productivity by automated welding

The company has succeeded in fully automating the welding process, which consisted mainly of manual work called "artisanship" and "work by skilled workers." The company developed a fully automatic bellows welder, thus building a 24-hour operating production system. The development of this innovative production line increased both quality and production efficiency dramatically. Although a late starter in the industry, the company is enthusiastic about developing bellows products and manufacturing processes.

Welded bellows



Formed bellows

