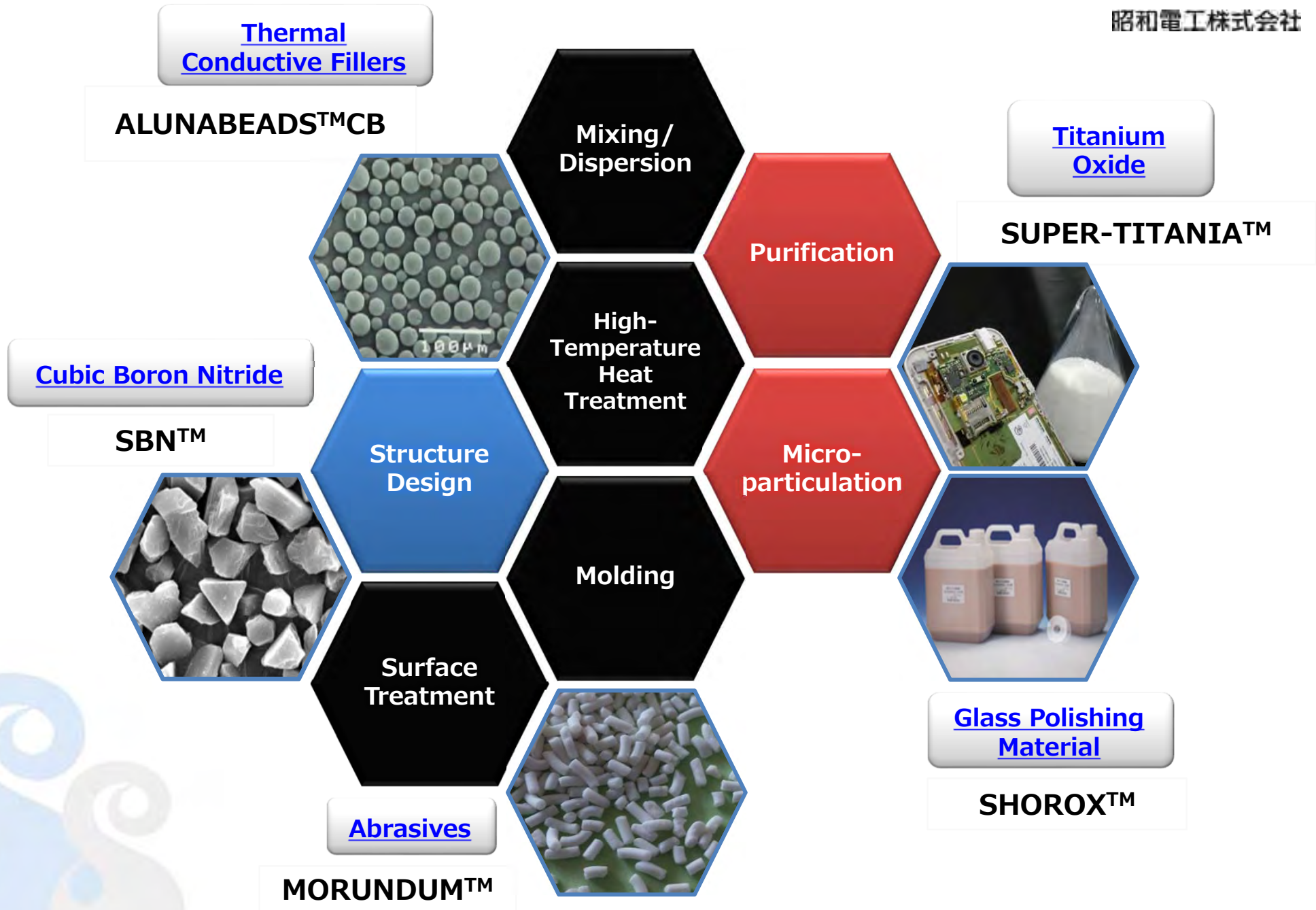


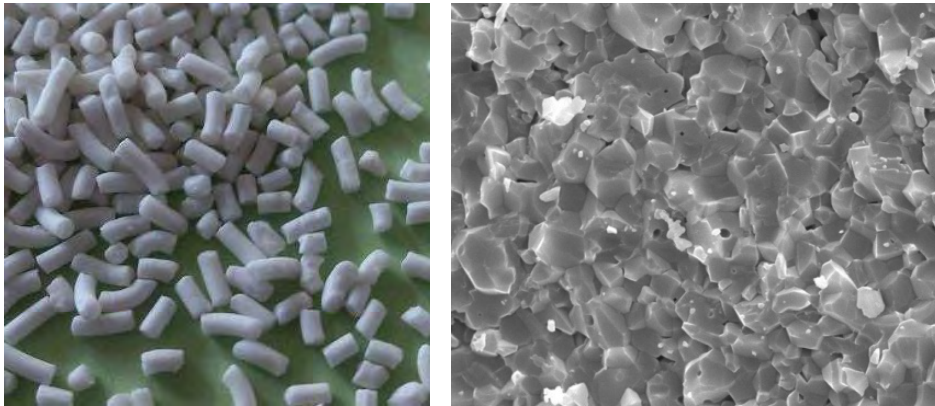
Inorganics-1 ~Ceramics~



Product example

Sinter Morundum™ SR-1

A high-purity alumina sintered body used for heavy polishing heavy grinding stones



Appearance of abrasive grains

Fracture cross-section of abrasive grains

Heavy grinding is a process for snagging or peeling using grinding stones before the rolling process in iron manufacturing.

Heavy grinding, which is conducted under extremely high load, requires **high hardness, high strength, and high heat resistance** of abrasive grains.

Our technologies

■ **Crushing and classifying technologies**

Since our technologies of crushing and classifying abrasive grains are highly effective, both pulverization and productivity can be achieved.

■ **Kneading and extrusion molding technologies**

We own kneading technology for evenly kneading several kinds of abrasive grains and extrusion molding technology to achieve high yield with specific grain sizes.

■ **High-temperature sintering technology**

Our high-temperature sintering technology developed over the years produces stable and uniform abrasive grains.

■ **Evaluation technology**

We evaluate the bonding strength between a resin layer and abrasive grains, the abrasive capacity, and abrasive grain properties.



Abrasive grains: resin molding

Product example

SHOROX™

SHOROX™ is a CeO₂ abrasive made from rare-earth compounds. There are two types of product: containing fluorine, or without fluorine. It is provided as a dry powder or slurry.

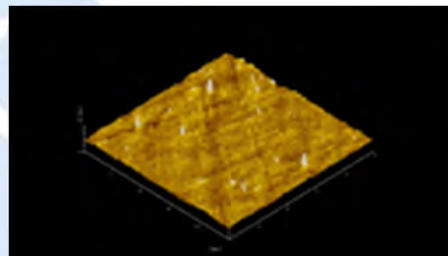
SHOROX™ is used as an abrasive for polishing various glass substrates, such as liquid crystal displays, hard disks, photomasks, optical lenses, and crystal, to a mirror-smooth and highly precise finish.



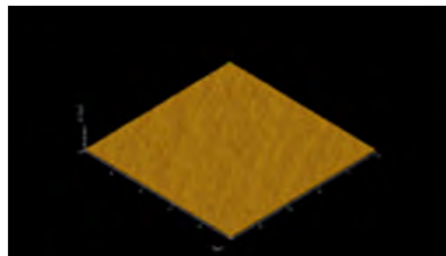
First Polish



Final Polish



SHOROX™ A polishing surface



SHOROX™ V polishing surface

Our technologies

■ **Crushing, sintering, classifying technologies**

Our crushing, sintering, and classifying technologies we have developed over the years allow us to produce CeO₂ abrasives with various levels of hardness and particle size distribution, and to design optimal abrasives for glass polishing.

■ **Polishing evaluation technology**

Our polishing evaluation technology is used to evaluate the polishing quality of abrasives in accordance with customers' requirements.

We use our experience gained from evaluations for quality improvement, process improvement, and technology development.

■ **Technology development**

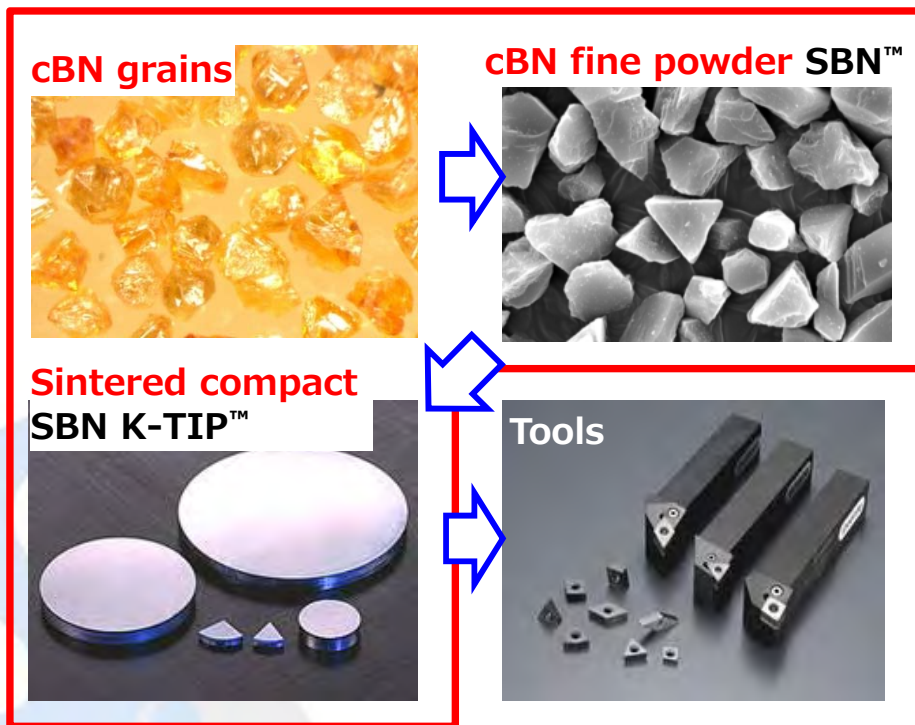
Customers require high quality in terms of polishing speed, scratches, and slurry state.

Using our polishing evaluation capability as well as production knowledge and technology we have developed over the years, we rapidly develop excellent products and stabilize their quality in accordance with customers' requirements.

Product example

Taking advantage of its characteristics of high hardness second only to diamond and no reaction with iron, cBN (cubic Boron Nitride) is used as a material of grinding and cutting tools for iron-based high hardness materials.

We manufacture sintered compacts from cBN abrasive grains and offer a range of grades for grinding and cutting various materials.



Our technologies

■ Ultrahigh pressure/temperature technology

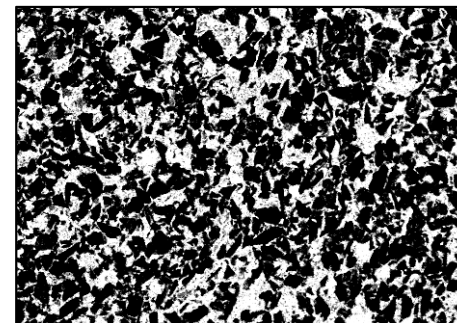
We own ultrahigh pressure/temperature sintering technology exceeding 5 GPa and 1200°C.

■ Composite sintered compact production technology

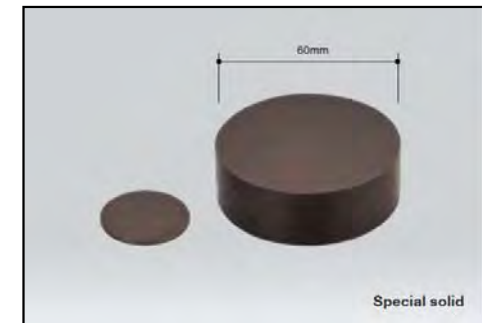
We own fine particle mixing technology to mix submicron particles together with high dispersion.

■ Sintered compact design/manufacturing technology

We not only design and manufacture sintered compacts in accordance with customers' demands but also manufacture the world's thickest-class solid cBN sintered compacts.



SEM image of cBN sintered compacts



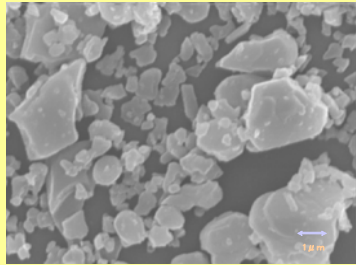
World's largest-class special solid cBN

Thermal Conductive Fillers

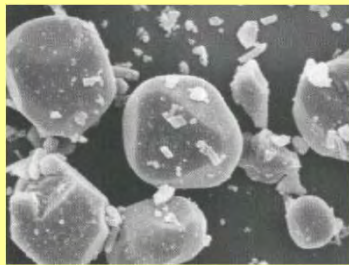
~Alumina, SHOBN™~

Product example

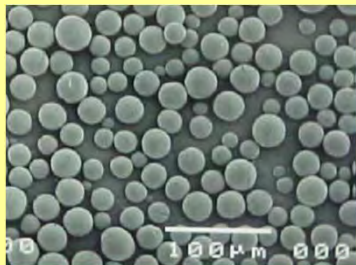
We have a lineup of various heat dissipation fillers.



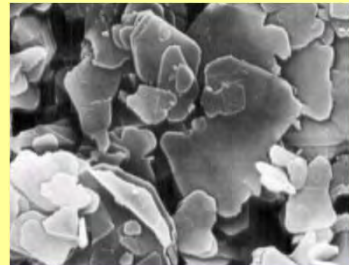
Low soda alumina (AL)



Roundish alumina (AS)



Spherical alumina
(ALUNABEADS™ CB)



Hexagonal boron nitride
(SHOBN™ UHP)

Compounded products with the combination of the above are also under development.

Mix and mold with resin.



Application example: Heat-dissipating silicone sheet

Our technologies

昭和電工株式会社

■ High-temperature heat treatment technology

We can manufacture various fillers with the particle shape and size controlled through chemical and physical reaction in various kilns and reacting furnaces capable of high-temperature heat treatment.

■ Grinding/classification technology

The smashing and classification technology we have cultivated over many years allows us to manufacture fillers with various particle sizes and distributions and to design optimal particle sizes.

■ Compounding/surface treatment technology

By compounding fillers and using surface treatment technology suited for various resins, we can provide fillers with a high filling ratio in the resin.

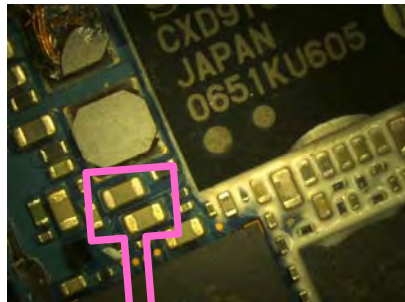
■ Evaluation technology

In addition to evaluating the physical properties of fillers, we can also evaluate various thermosetting resin compounds in accordance with customers' requirements, such as viscosity and heat conductivity.

Product example

SUPER-TITANIA™ is used as a material of multilayer ceramic capacitors (MLCC).

Example of MLCC mounted

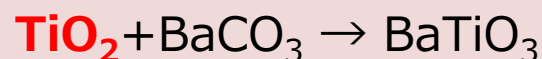
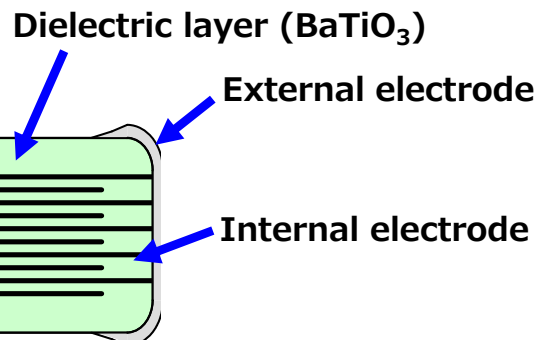


Cross section



MLCC

- Functions of MLCC
- Stabilizing voltage
 - Eliminating noise
 - Retrieving necessary signals etc.



The following are required for titanium oxide as a material of MLCC:

- Fine particles with uniform particle diameter
- High purity
- Excellent dispersibility

Our technologies

■ Fine particle synthesis technology

- Gas phase method: We own the technology to synthesize titanium oxide suitable for MLCC by using equipment we have developed.
Particle size control technology allows us to manufacture multiple grades.
- Liquid phase method: We own the technology to synthesize titanium oxide in which the crystalline properties and dispersibility of fine particles can be better controlled than by the gas phase method.

■ Fine particle facilities technology

We own the facilities and quality control technology that enables stable production of high-purity fine particles based on almost 30 years of developing gas phase technology.

■ Fine particle evaluation technology

We own the technology to evaluate and analyze fine particles from various perspectives to meet customers' requirements. The results are used to improve quality and processes and to develop technologies.

■ Technology evolution

Taking advantage of our wealth of experience with fine particle synthesis technologies using gas phase and liquid phase methods, we are constantly developing technologies to synthesize characteristic fine particles.