Overview of Fine Ceramics Business

Hiroshi Tanaka
Representative Director and President,
Japan Fine Ceramics Co., Ltd.
01 Corporate profile
02 Overview of main products
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Corporate profile
Corporate profile

Name | Japan Fine Ceramics Co., Ltd.

Head office | Sendai, Miyagi Japan

Business | Development, production, and sales of fine ceramic products Integrated production system, from materials to processing

Established | 1984

Capital | 300 million yen (wholly owned subsidiary of JGC Holdings Corporation)

Employees | 460

Sales offices | Tokyo Sales Office
Nagoya Sales Office

Production sites | Miyagi Prefecture: Head Office Factory, MMC Factory, Tomiya Factory
Aichi Prefecture: Meito Factory
Iwate Prefecture: Iwate Factory
## History

<table>
<thead>
<tr>
<th>Period</th>
<th>From</th>
<th>Action</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1984</strong></td>
<td>1984</td>
<td>Established as a public-private joint venture R&amp;D company with funding from JGC predecessor, Miyagi Prefecture, The 77 Bank, and local businesses</td>
<td>April 1984</td>
</tr>
<tr>
<td><strong>1992</strong></td>
<td>1992</td>
<td>Became a wholly owned subsidiary of JGC predecessor</td>
<td>April 1992</td>
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<td></td>
<td></td>
<td>Operations begin at a new factory ready for volume production of thin-film integrated circuit components</td>
<td>May 2001</td>
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<td><strong>2002</strong></td>
<td>2002</td>
<td>Iwate Factory established in the prefecture at Kanegasaki, starting operation in November</td>
<td>June 2007</td>
</tr>
<tr>
<td><strong>2008</strong></td>
<td>2008</td>
<td>Successful development of silicon nitride substrates with high thermal conductivity</td>
<td>August 2009</td>
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<td></td>
<td></td>
<td>M&amp;A with Meito Giken Co., Ltd. (contract processing business)</td>
<td>January 2012</td>
</tr>
<tr>
<td><strong>2014</strong></td>
<td>2014</td>
<td>Acquired MMC business from Nihon Ceratec Co., Ltd. (currently NTK Ceratec Co., Ltd.; new business)</td>
<td>April 2014</td>
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<td></td>
<td></td>
<td>Opened the Tomiya site (Factory 1)</td>
<td>June 2018</td>
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<td></td>
<td></td>
<td>Merged with Meito Giken Co., Ltd.</td>
<td>July 2020</td>
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<tr>
<td></td>
<td></td>
<td>Completion of the second and third Tomiya factories (for volume production of high thermal conductivity silicon nitride substrates)</td>
<td>October 2020</td>
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</tbody>
</table>

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02 Overview of main products
A closer look at fine ceramics

Inorganic materials distinguished not only by enhanced characteristics of typical ceramics (that is, thermal resistance and hardness) but also by new electrical, magnetic, optical, or chemical properties

Source: Kagaku Jiten (chemistry dictionary), second edition

Business segments

<table>
<thead>
<tr>
<th>Engineering Ceramics</th>
<th>Electronic Ceramics</th>
<th>Metal-Matrix Composites (MMCs)</th>
<th>Contract Precision Ceramic Machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>General industrial equipment parts</td>
<td>Thin-film circuit substrates</td>
<td>Al/SiC composites</td>
<td>Lapping</td>
</tr>
<tr>
<td>Precision manufacturing equipment parts</td>
<td>Ceramic substrates</td>
<td>Si/SiC composites</td>
<td>Polishing</td>
</tr>
<tr>
<td>Used mainly as parts in semiconductor manufacturing equipment and pumps</td>
<td>Used mainly as parts in optical communication equipment and sensors</td>
<td>Al-Si composites</td>
<td>Grinding</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Ultra high-precision planing, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used mainly as parts in flat panel display (FPD) manufacturing equipment and semiconductor manufacturing equipment</td>
<td>Contract machining mainly of parts in semiconductor manufacturing equipment</td>
</tr>
</tbody>
</table>
Balanced business portfolio in four areas

01 Engineering ceramics: ceramic production

- Precision parts taking advantage of the thermal, corrosion, and wear resistance of ceramics

02 Electronic ceramics: electronic parts/materials production

- Electrical and electronic parts taking advantage of the electrical properties of ceramics

03 Metal-matrix composites: MMC production

- Precision equipment parts taking advantage of ceramics’ light weight, high rigidity, and vibration damping

04 Contract ceramic machining

- Precision machining of ceramic products for semiconductor manufacturing equipment parts
# Engineering ceramics

## Market

### Main clients
Manufacturers of general industrial equipment
Manufacturers of semiconductor manufacturing equipment

### Competitors
Ceramics manufacturers in Japan

### Conditions
Advances in IoT and AI are expected to drive semiconductor demand and increased investment in semiconductor manufacturing. Demand is expected to recover.

## Strengths

- Providing ceramic parts and materials with outstanding thermal, wear, and corrosion resistance meeting client needs
- Minimal loss of mechanical strength at high temperatures; high wear resistance
- Outstanding resistance to thermal shock and wettability from molten metal

Parts used in general industrial equipment and semiconductor production
Electronic ceramics

**Market**

**Main clients**
Manufacturers of parts used in optical communication

**Competitors**
Ceramics manufacturers in Japan

**Conditions**
The advent of 5G communication services has brought investment in infrastructure, and capital investment is brisk. However, some caution is warranted, due to uncertainty from U.S.-China trade friction.

**Strengths**

- Providing high-quality products through integrated production, from ceramic substrates to thin-film circuit formation
- Prompt delivery and rapid response to design changes
Metal-matrix composites

**Market**

**Main clients**
Manufactures of flat panel display production equipment
Manufacturers of semiconductor manufacturing equipment

**Competitors**
Material manufacturers in Japan
MMC manufacturers overseas

**Conditions**
In the market for FPD manufacturing equipment, tenth generation investment remains stagnant, but there are prospects for ongoing growth in the fifth to sixth generation used for OLED.

**Strengths**

- Optimal metal-ceramics combinations and blending ratios for use in a variety of applications
- Combines metal and ceramic properties: lightweight and highly rigid with low thermal expansion
- World-class material manufacturing and processing methods for large products

Al/SiC composites, Si/SiC composites, Al-Si composites
Contract ceramic machining

High-precision processing

**Market**

**Main clients**
Ceramics manufacturers in Japan that supply manufacturers of semiconductor manufacturing equipment

**Competitors**
Manufacturers in Japan that accept contract machining

**Conditions**
The market is expanding. A recovery in capital investment in semiconductor manufacturing equipment has been driven by factors such as renewed demand for semiconductor memory.

**Strengths**

- Contract ceramic machining, from small lots of samples to volume production
- High-precision machining of many kinds to meet client needs
Future policies
Future policies

01 Green energy
- Solar panel sheets, fuel cells, rechargeable batteries
  - Fuel cell prototype development
  - Bearings for hydroelectric power generation
  - Integrated power modules with high heat resistance
  - High-performance heatsinks

02 Medical
- Parts for regenerative medicine and medical equipment
  - Ventricular assist device bearings
  - Orthodontic brackets
  - Dental zirconia
  - Bone regeneration parts/materials

03 Next-generation automotive
- Sapphire alternative substrates for in-vehicle devices
  - High-power IGBT heatsinks
  - MMC pressure/vibration casting
  - Collision sensor circuit substrates
  - In-vehicle camera lens molds
  - High thermal conductivity silicon nitride substrates

04 Aerospace
- Heat-resistant composites, metal substrates
  - Circuit substrates for space communication
  - Silicon carbide base material for satellite mirrors
  - Aspherical machining of satellite mirrors

05 Emerging industries
- Photolithography equipment parts used in FPD production
- Parts in high-speed electronic component mounting equipment
- Parts in semiconductor LED production equipment
- Linear motor parts for photolithography equipment
- Smartphone lens molds

Strengthen and expand initiatives in five fields through existing technologies