



## IT-related Chemicals

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**Masaki Matsui**

Representative Director &  
Managing Executive Officer

# IV

## IT-related Chemicals

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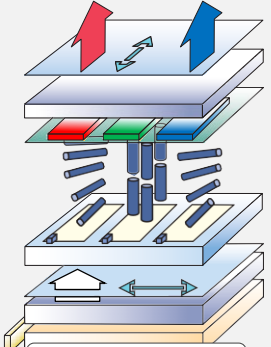
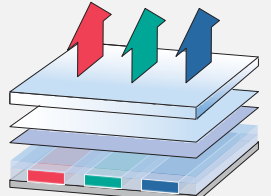
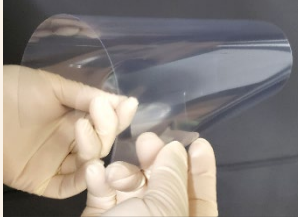
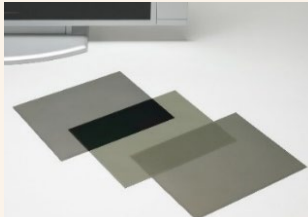
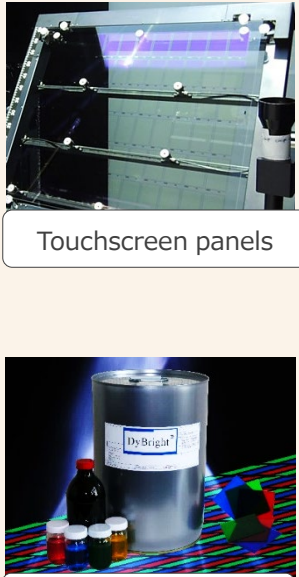
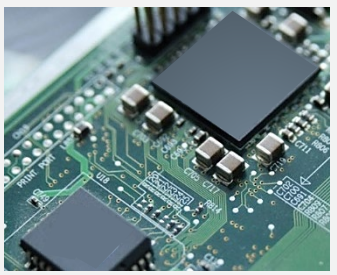
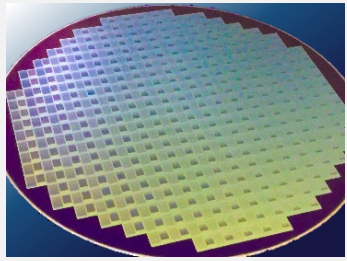



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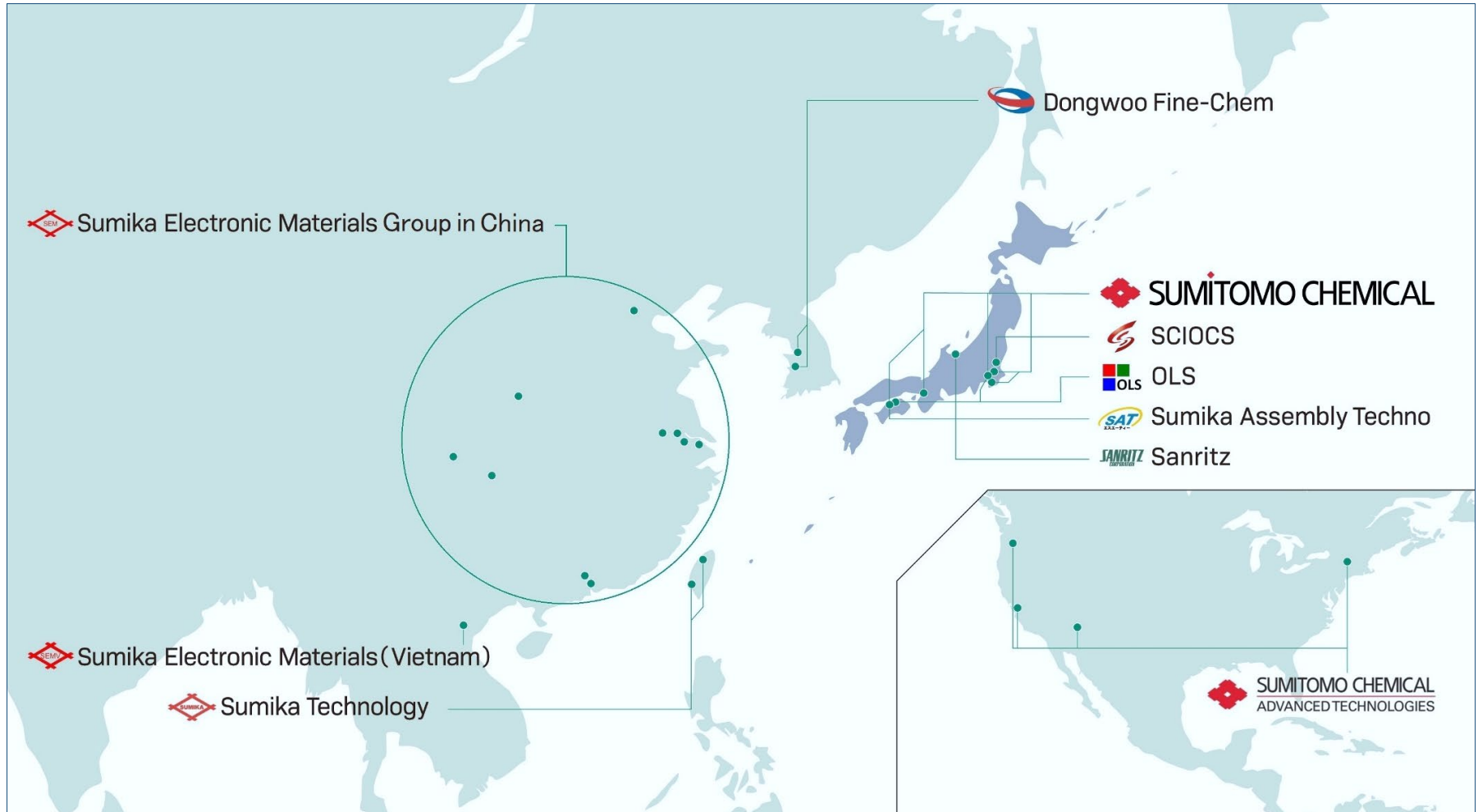
# IV-1

# Business Overview: Our Major Products

	End Market	Our Customers	Our Products		
Displays		 <p>LCD panels</p>  <p>OLED panels</p>	 <p>Cover window films</p>	 <p>Polarizing films</p>	 <p>Color resists</p>
			 <p>Compound semiconductor epiwafers</p>	 <p>Photoresists</p>	 <p>Processing chemicals</p>

Developing business primarily in both display-related materials and semiconductor materials

# Business Overview: Manufacturing and Sales Locations



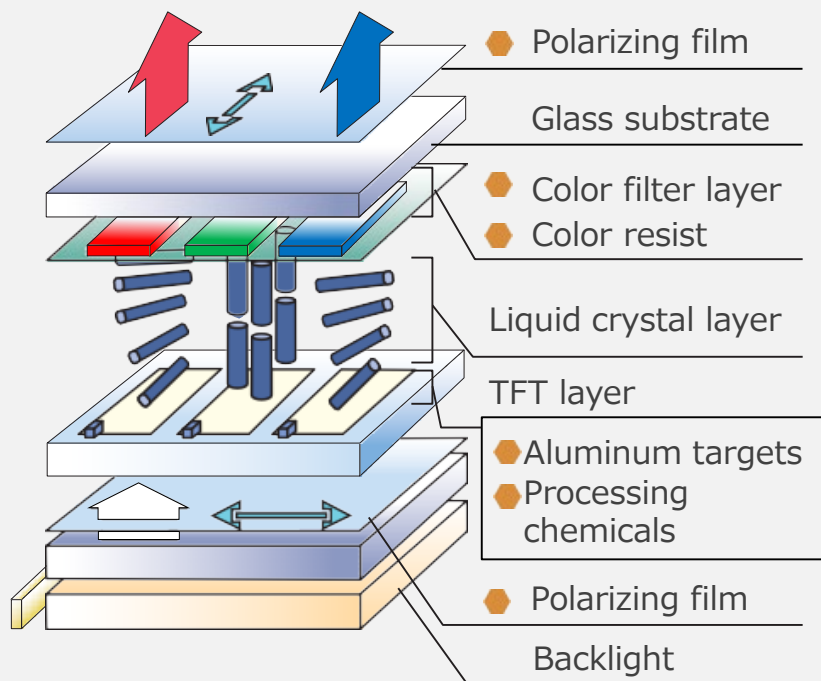
**Building a business network centered in East Asia, an area with a high concentration of display-related and semiconductor industries**

# Business Overview: Display-related Materials Business

## Interface between people and ICT technology

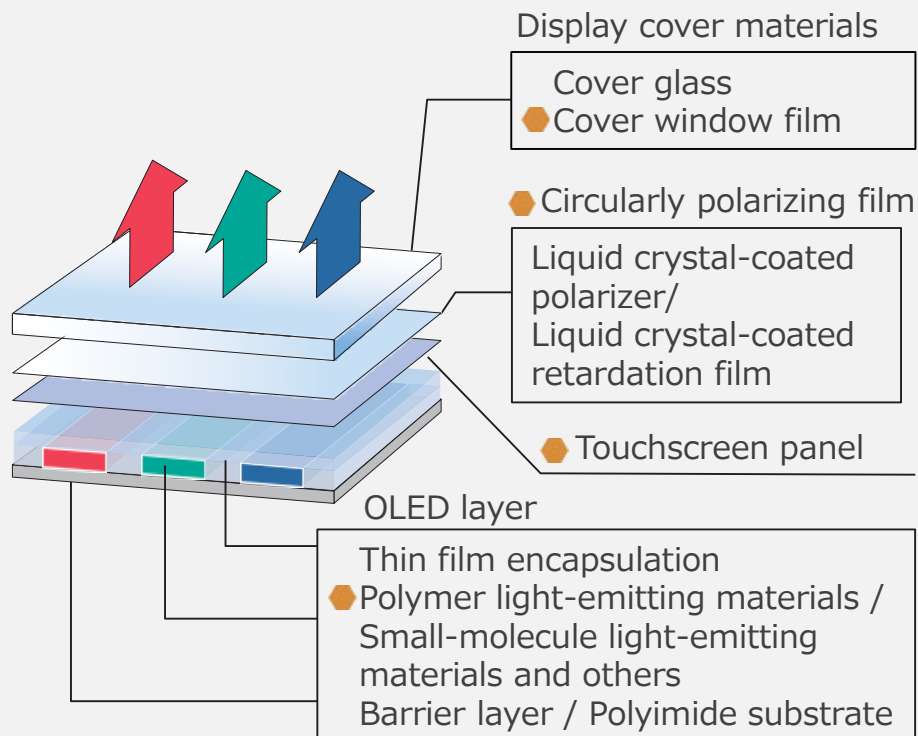
- Contribute to creating displays with outstanding portability, visibility and operability
- Deliver high-value-added products by combining our material development capabilities with our optimization technology

### LCD Panel



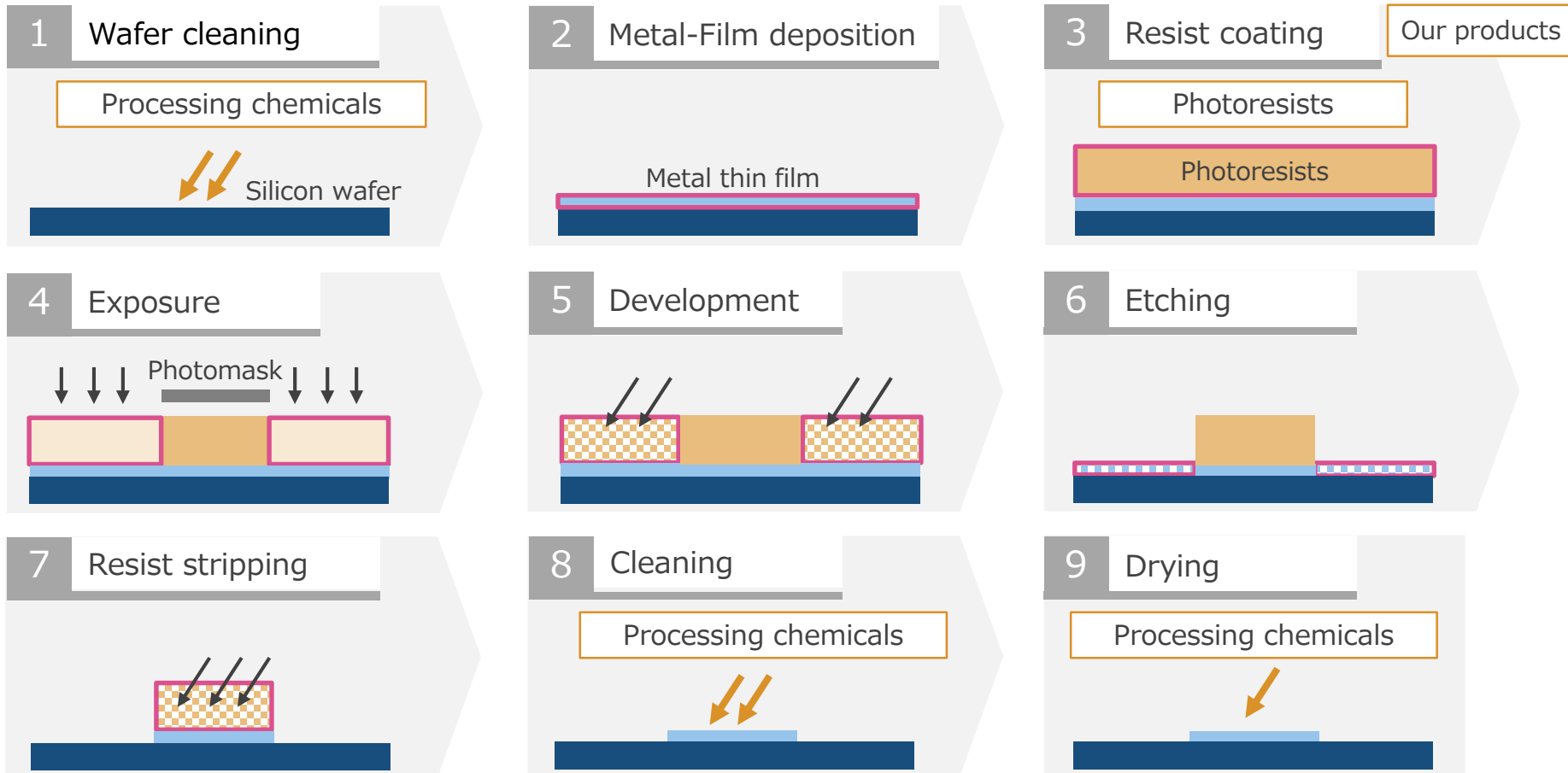
(Note) ●: Sumitomo Chemical's products

### OLED Panel



## Infrastructure supporting modern society with ultra-microfabrication technology

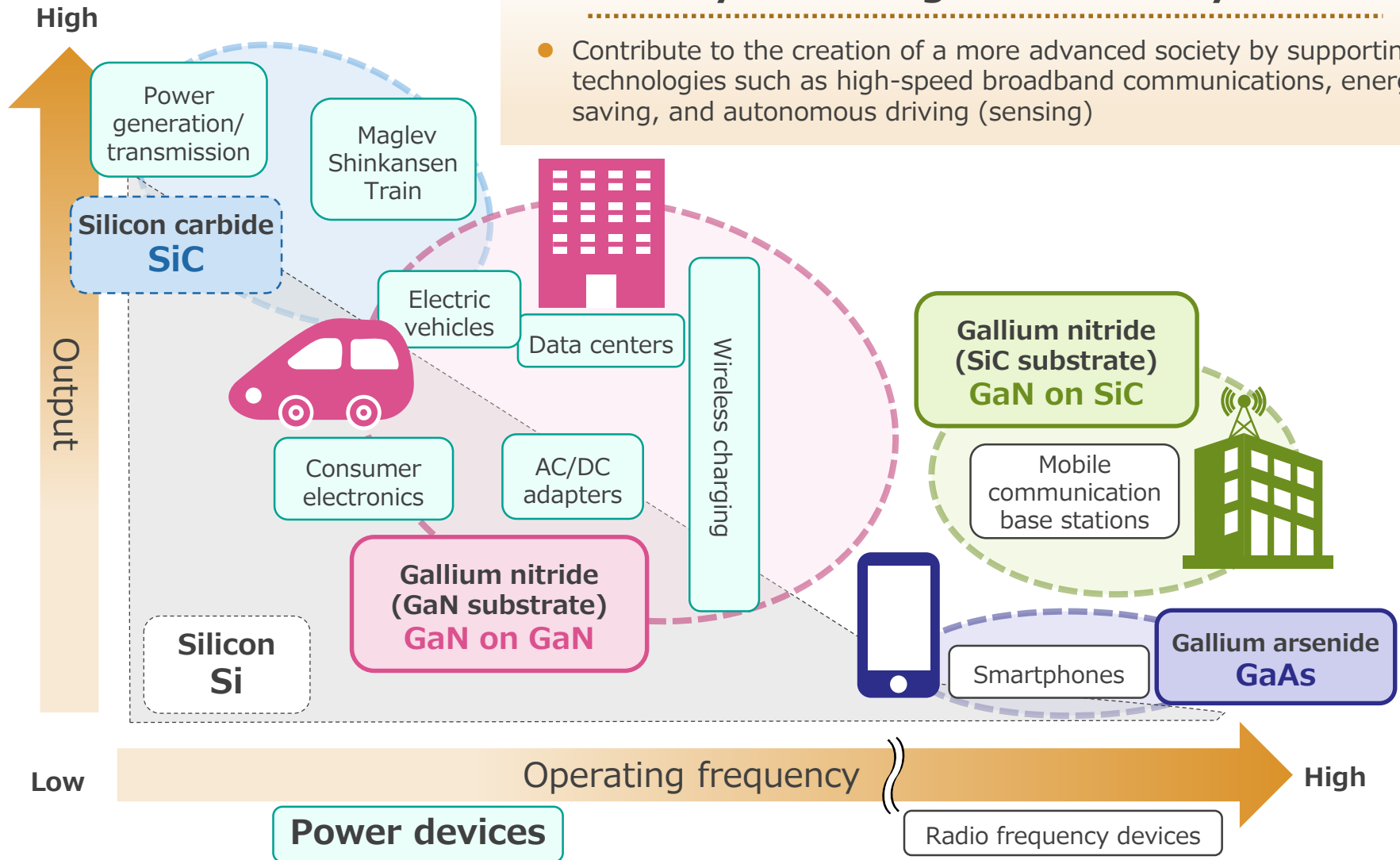
- Contribute to the continuous evolution of microfabrication technology with super high-quality chemicals



# Business Overview: Compound Semiconductor Materials

## Key technologies for Society 5.0

- Contribute to the creation of a more advanced society by supporting technologies such as high-speed broadband communications, energy saving, and autonomous driving (sensing)





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# Business Strategy for FY2019-FY2021: Further Improvement of Our Business Portfolio

	Major Issues	Action Plan
Display-related Materials	Maximize profit by restructuring & focusing on high value-added products	<ul style="list-style-type: none"> <li>➤ Polarizing films for LCD - Optimization of global supply chain</li> <li>➤ Products for smartphones - Secure a share of the high-end market by utilizing core materials developed in-house</li> <li>➤ Touchscreen panels - Diversify product portfolio</li> </ul> <p> <span style="color: blue;">»» Restructuring</span>  <span style="color: red;">»» Focusing on high value-added products</span>  <span style="color: red;">»» Focusing on high value-added products</span> </p>
Semiconductor Materials	Secure growing demand by utilizing advance investment	<ul style="list-style-type: none"> <li>➤ Enhance systems of production, development and evaluation for photoresists</li> <li>➤ Invest in processing chemicals in China</li> </ul>
	Diversify product portfolio	<ul style="list-style-type: none"> <li>➤ New processing chemicals or compound semiconductors for power devices etc.</li> </ul>
Next-generation Businesses	New products by increasing the sophistication of core in-house technology	<ul style="list-style-type: none"> <li>➤ Products for image sensors and next-generation displays etc.</li> </ul>
	Approaches to adjacent markets based on open innovation methods	<ul style="list-style-type: none"> <li>➤ Products developed by utilizing technologies from touchscreen panels and compound semiconductors etc.</li> </ul>

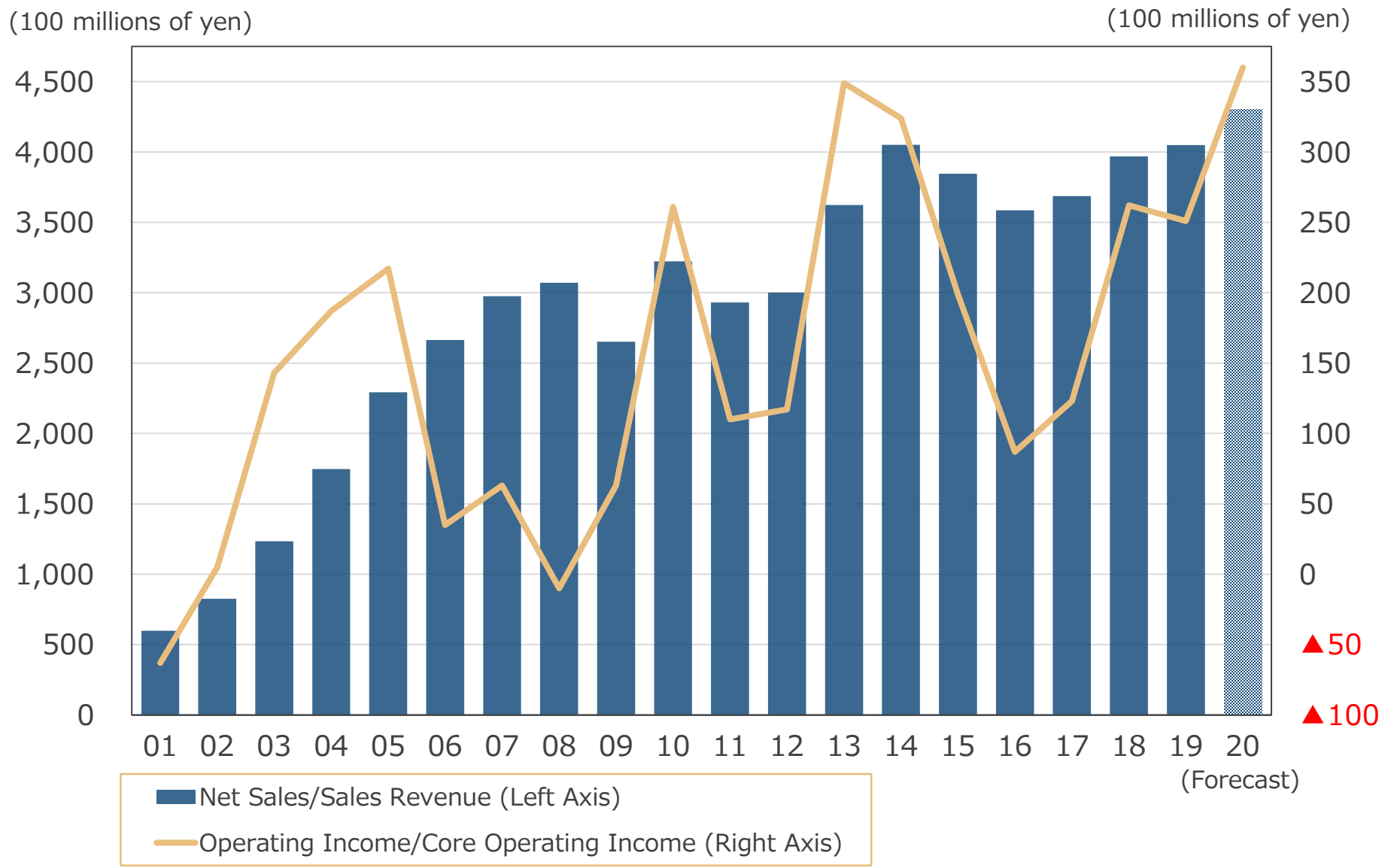
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# Financial Statements



# IV

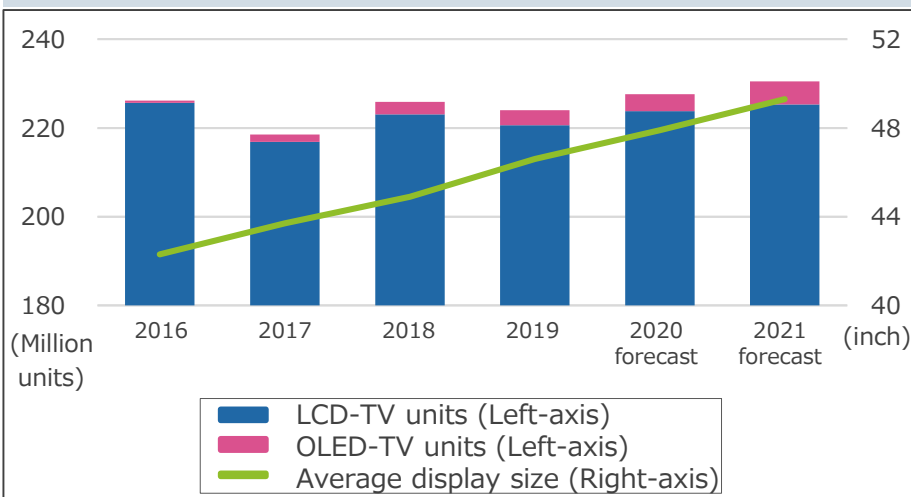
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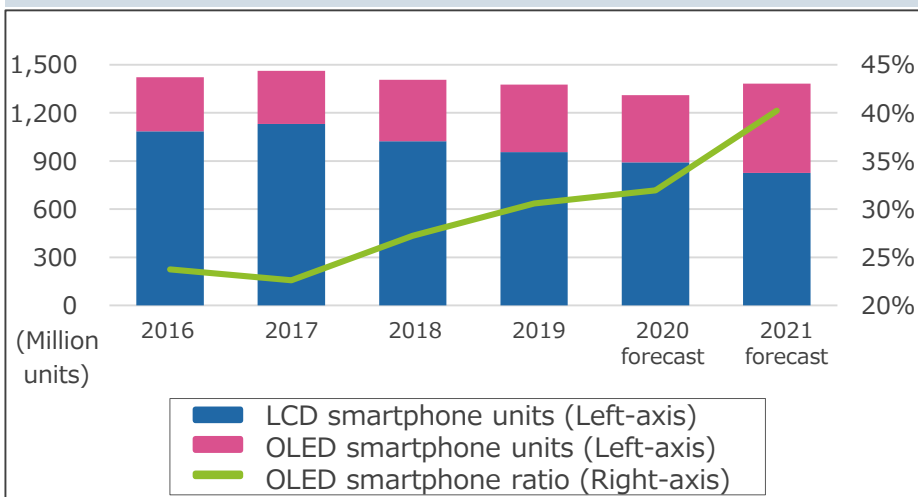
## Market Environment: Display-related Materials

Market assumptions for FY2019-FY2021	New factors	Current situation	Impact on our business (est.)		
			2019	2020	2021
<ul style="list-style-type: none"> <li>TV Displays: Number of TV sets remains almost the same, TV display size continues to get larger (Growth rate: YoY+4%)</li> </ul>	Market Reorganization	<ul style="list-style-type: none"> <li>Market shift to China accelerates (Korean panel manufacturers withdraw or downsize LCD-TV business)</li> </ul>	Slight	COVID-19 special demand	Moderate
<ul style="list-style-type: none"> <li>Mobile Displays: Number of smartphones remains almost the same, units with OLED display increase (27% in 2018 -&gt; 48% in 2021)</li> </ul>	COVID-19	<ul style="list-style-type: none"> <li>Market stagnates (especially in high-end)</li> <li>Increase in OLED units slows down (40% in 2021)</li> </ul>	—	Moderate	Slight

### TV Market (Source : Gfk)

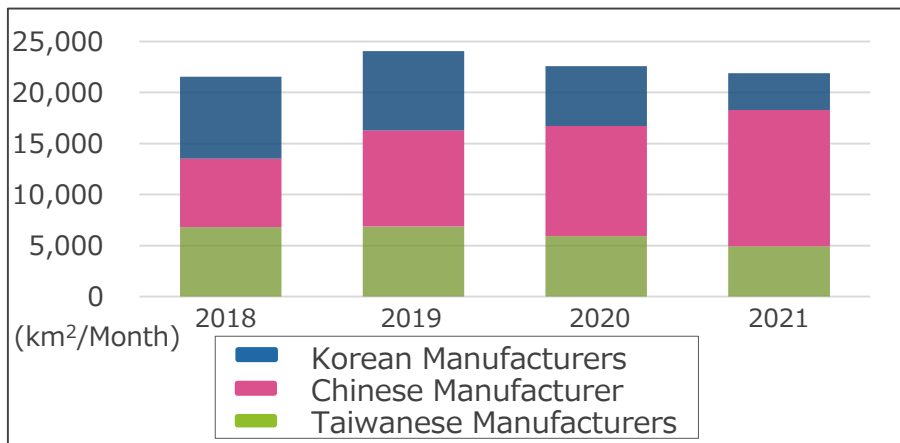


### Smartphone Market (Source: Gfk)



## Large LCD panel supply capacity

(Source: Mizuho Securities, Sumitomo Chemical)

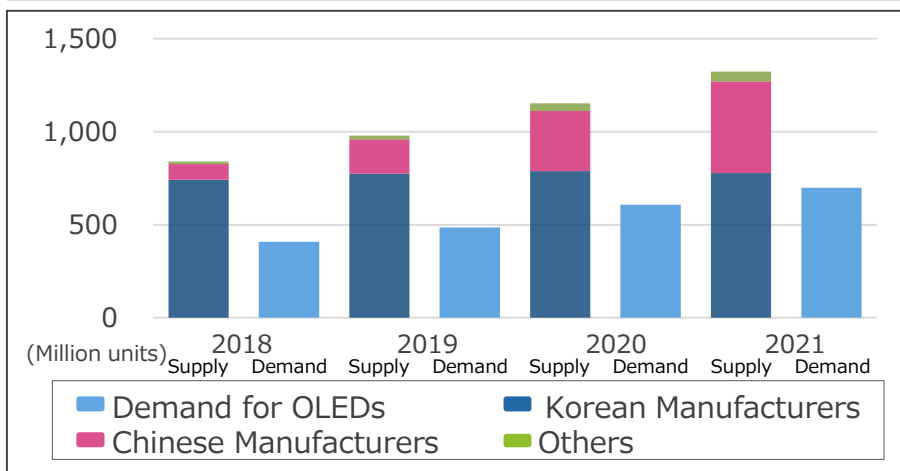


- Global supply capacity of large LCD panels is concentrating in China
- Market reorganization is going on within China (Consolidating to 2 major Chinese panel manufacturers)

Suppliers of LCD-related materials will be faced with **fiercer competition**

## Balance of supply/demand for mobile OLED panels

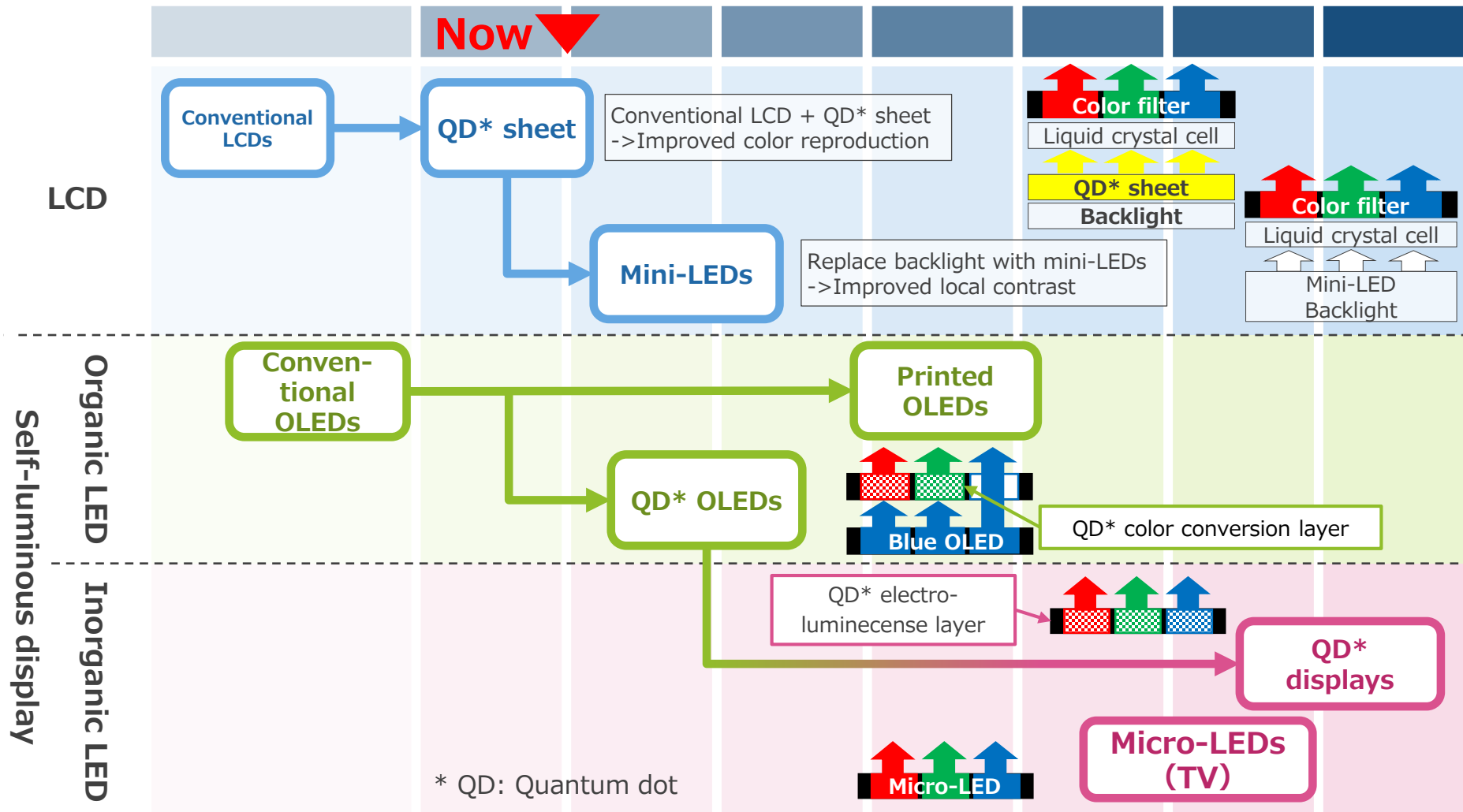
(Source: Omdia, DSCC)



- Active investment by Chinese panel manufacturers
- Slower growth of the end market of OLED smartphones than expected

Demand for **differentiation to provide additional value** becomes stronger due to the expanding supply/demand gap

# Market Environment: Display-related Materials



► The increasing sophistication of LCDs and the development of next generation self-luminous displays are progressing in parallel

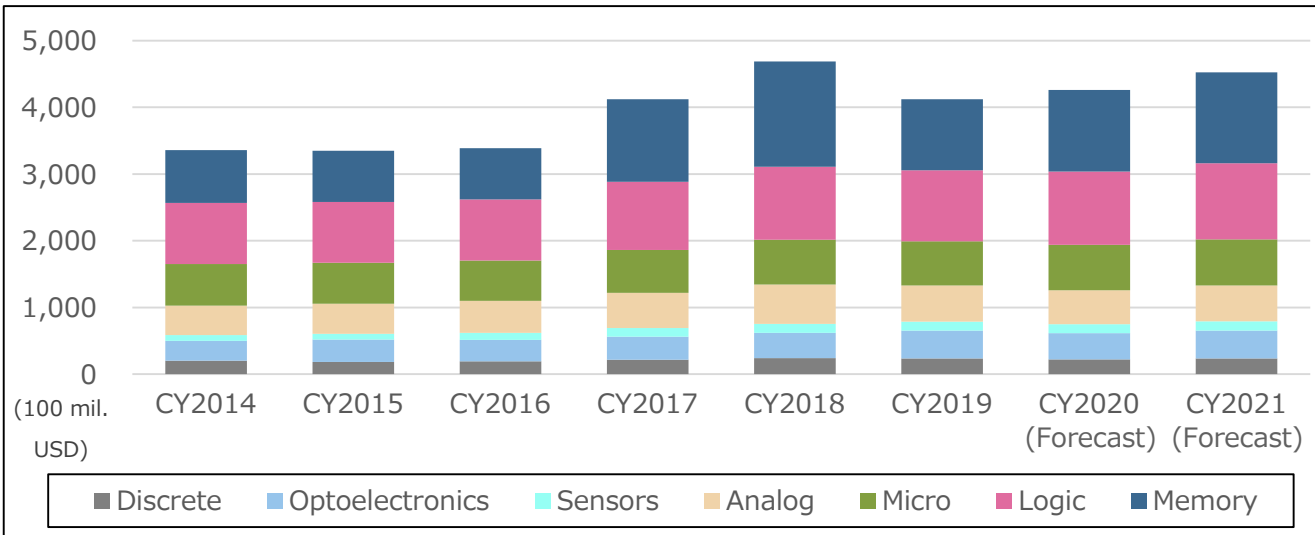


# IV-4 Market Environment: Semiconductor Materials

Market assumptions for FY2019-FY2021	New factors	Current situation	Impact on our business (est.)		
			2019	2020	2021
<ul style="list-style-type: none"> <li>Steady market growth accompanying digital transformation (Growth rate: +4%/year)</li> </ul>	COVID-19	<ul style="list-style-type: none"> <li>Demand stays firm on the whole, although some categories are affected by COVID-19</li> </ul>	–	Slight	Slight
	US-China trade war	<ul style="list-style-type: none"> <li>Demand for cutting-edge products is very strong, and supply/demand balance is tight</li> </ul>	Slight	Slight	Slight

## Semiconductor Market

(Source: WSTS)



Compound Average Growth Rate (CAGR)

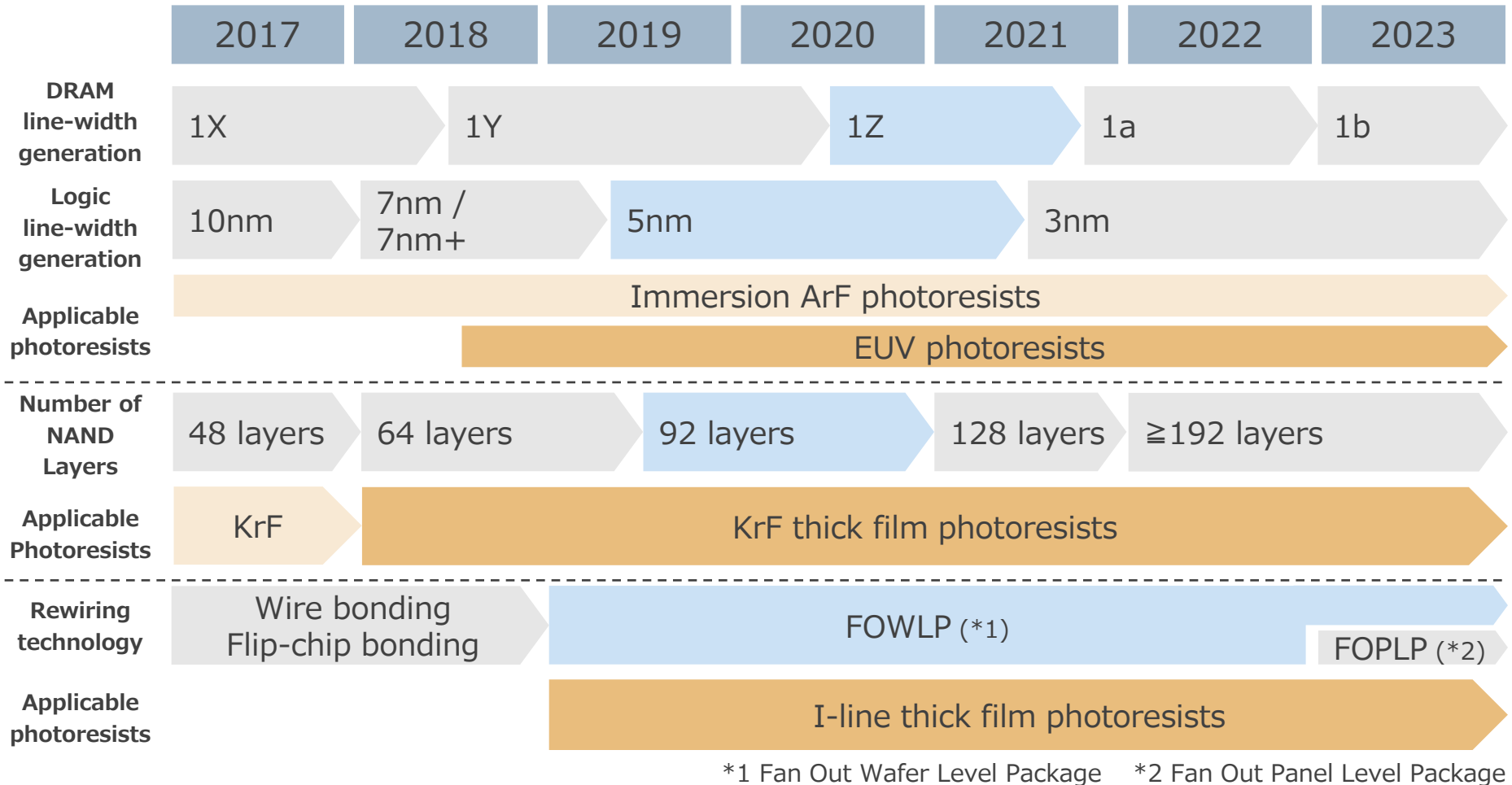
Memory 8%

Logic 3%

Total Semiconductor 4%

# IV-4

## Market Environment: Semiconductor Materials



**Line-width shrinking and multilayer structures are required to achieve semiconductor performance improvement**

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# Progress on Major Issues: Expand Product Portfolio & Develop New Businesses

## Expand existing businesses

Increased sophistication of in-house core technologies and multifunctional materials, fusion of display-related and semiconductor materials technologies



## Existing businesses

Display-related Materials


Semiconductor Materials



## Develop new businesses

Collaboration and investment in business fields where we expect synergy

# Progress on Major Issues: Display-related Materials for OLED Displays

Major Issue	Action Plan	Progress
Focusing on high value-added products	<ul style="list-style-type: none"> <li>➢ Secure a share of the high-end market by utilizing core materials developed in-house</li> </ul>	<ul style="list-style-type: none"> <li>☑ Full-fledged mass-production of polarizing film with in-house LC* coating retardation for OLED smartphones has started</li> </ul>
	<ul style="list-style-type: none"> <li>➢ Expand touchscreen panel product portfolio</li> </ul>	 See "Progress on Major Issues: New products" section
	<ul style="list-style-type: none"> <li>➢ Develop products for flexible displays</li> </ul>	

Element technology	2018	2019	2020	2021
Polarizer	Stretched PVA			
	LC* coating (In-house)			
Retardation film	LC* coating (Procurement)			
	LC* coating (In-house)			

\* LC: Liquid crystal

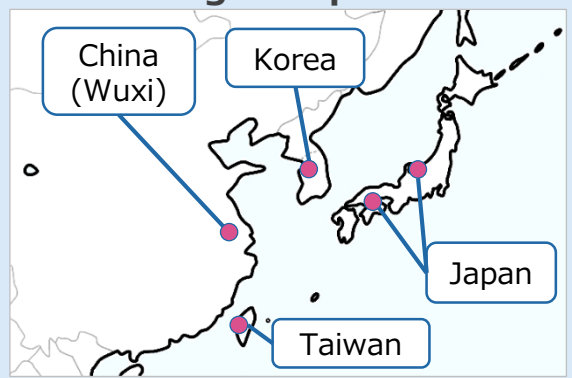
 Continue to secure high market share with a wide-lineup of polarizing film materials for OLED displays

# Progress on Major Issues: Display-related Materials for LCDs

Major Issue	Action Plan	Progress
<b>Market shift to China</b>	<ul style="list-style-type: none"> <li>➤ Design polarizing films to meet the requirement of Chinese panel manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>☑ Lower shrinkage stress &amp; improved permeability of polarizing film with acrylic protective film</li> </ul>
<b>Restructuring</b>	<ul style="list-style-type: none"> <li>➤ Optimize our global supply chain</li> </ul>	<ul style="list-style-type: none"> <li>☑ Optimization of product allocation of polarizing film for LCD-TVs has made some progress</li> </ul>
<b>Focusing on high-end LCDs</b>	<ul style="list-style-type: none"> <li>➤ Secure market share in extra-large sized TVs and PIDs* (polarizing film)</li> </ul>	<ul style="list-style-type: none"> <li>☑ "Roll to Panel" lines for extra-large sized panels have been installed in customer factories</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Achieve wide color gamut &amp; high color reproduction (color-resists)</li> </ul>	<ul style="list-style-type: none"> <li>☑ Development of new color materials for high-end LCD-TVs (8K, Mini-LED etc.) has started</li> </ul>

\* Public Information Displays

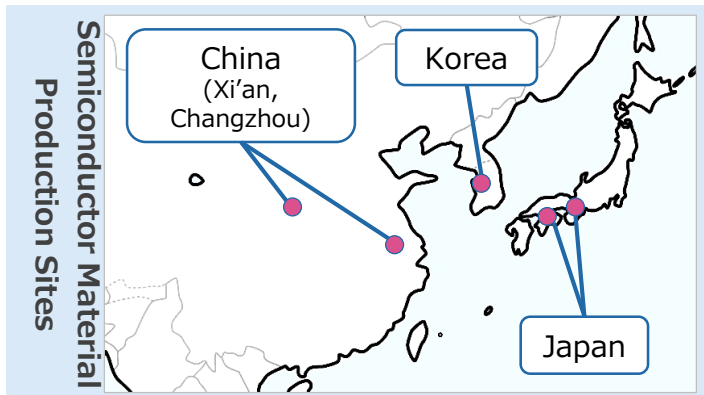
## Polarizing film production



Focus our resources effectively on promising fields (ex. next-generation displays) while keeping some profit in conventional business fields

# Progress on Major Issues: Semiconductor Materials

Major Issue	Action Plan	Progress
<p><b>Secure growing demand by utilizing advance investment</b></p>	<ul style="list-style-type: none"> <li>➤ Expand production capacity for immersion ArF photoresists</li> <li>➤ Enhance the development and evaluation system of photoresists for cutting-edge processes</li> <li>➤ Invest in a processing chemical plant in China</li> </ul>	<ul style="list-style-type: none"> <li>☑ Full-fledged operation has started from the July-September quarter of 2020</li> <li>☑ Plan to start in the April-September period of 2022</li> <li>☑ Operating stably</li> </ul>
<p><b>Diversify product portfolio</b></p>	<ul style="list-style-type: none"> <li>➤ Expand sales of EUV photoresists</li> <li>➤ Develop compound semiconductors for power devices</li> </ul>	<p>➤ See "Progress on Major Issues: New products" section</p>

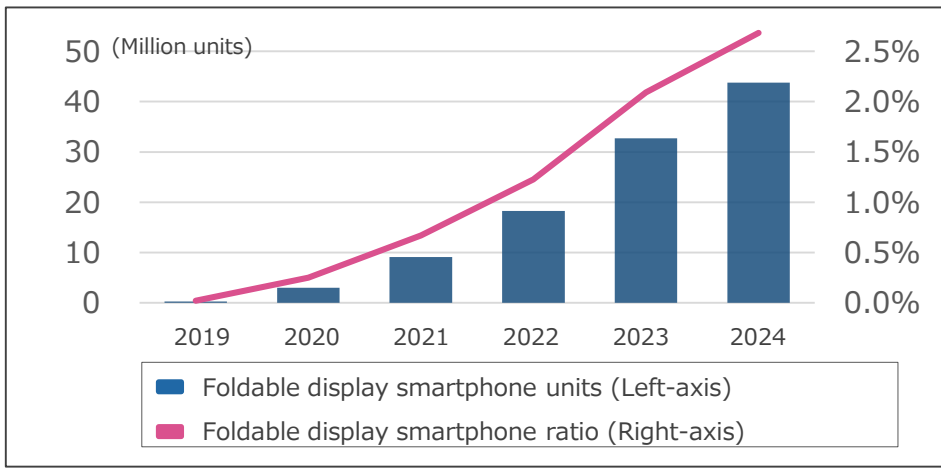


➤ **Secure market share by providing high-performance and high-quality chemicals needed for enhancing the density of semiconductors (line-width shrinkage and multilayer structures)**

# Progress on Major Issues: New Products (Foldable Display Materials)

## Market for foldable display smartphones

(Source: Omdia)



### Our position

- Have a wide-lineup of foldable display materials
- Have advantages in optimization of product properties by utilizing organic synthesis technology



<b>Action Plan</b>	<ul style="list-style-type: none"> <li>☑ Propose materials that meet the requirement of panel/device manufacturers</li> </ul>
<b>Progress</b>	<ul style="list-style-type: none"> <li>☑ All products already have been launched separately</li> <li>☑ Prepare to launch multi-functional materials in 2021</li> </ul>

## Foldable display materials

	Our products	Competitor
Display cover materials	Clear resin film	Ultra thin glass
Polarizing film	LC-coated polarizer/retardation film	Stretched/coated-PVA polarizer
Touchscreen panel (TSP)	Flexible TSP (Add-on)	On-cell TSP (Manufactured by panel mfr. in-house)

**Secure market share in foldable display materials**

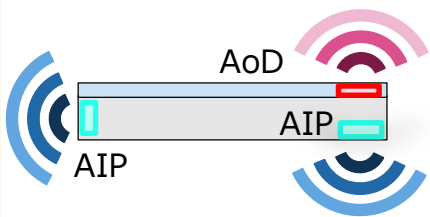
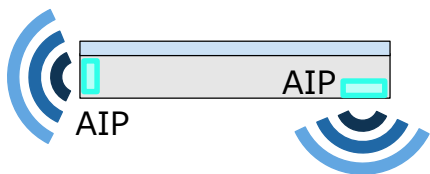
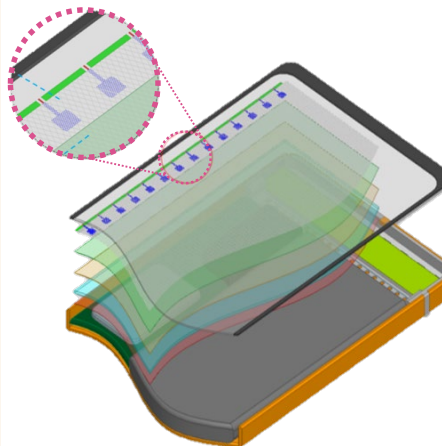
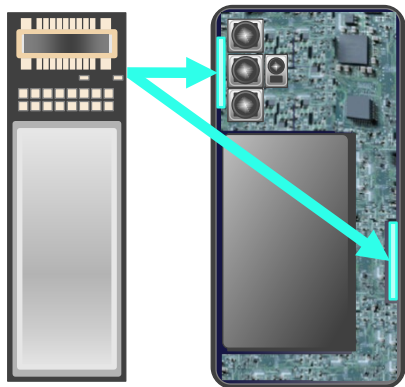


# Progress on Major Issues: New Products (5G Antenna on Display)

## Comparison with existing technology

Existing product  
(Antenna in Package)

Our product in development  
(Antenna on Display)



### Position of our technology

- For millimeter wave bands
- Making the most of touchscreen panel technologies and production lines



Action Plan

- ☑ Promote improved 5G communication performance **in combination with** existing technology
- ☑ Develop new applications for which thin, transparent and flexible properties are suitable

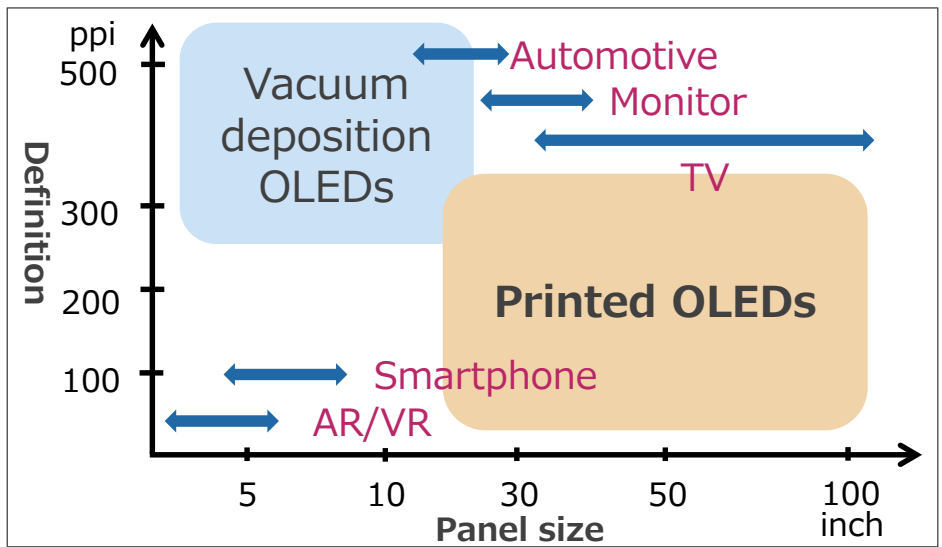
Progress

- ☑ Performance test using AoD antenna modules is on going

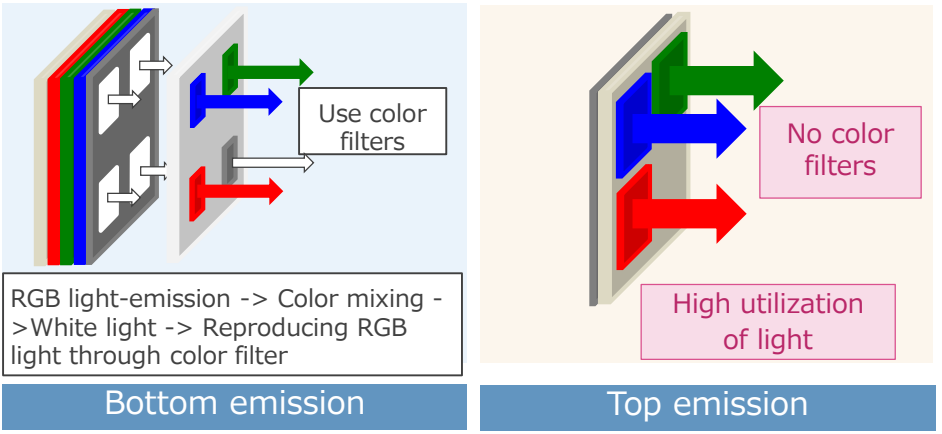
Smooth commercialization by utilizing our existing resources

# Progress on Major Issues: New Products (Polymer Light-emitting Materials)

## Target markets for printed OLEDs



## Comparison of luminescence mechanism with existing OLED-TV panels



- ### Our position
- Have light-emitting material technologies for all RGB colors
  - Already achieved mass-production of mid-sized printed OLED panels before competitors

Action Plan	☑ Improve the lifetime of blue light-emitting material
Progress	☑ Performance tests on OLED panels with new promising materials are planned to start

**Improve performance further for mass-production of TV panels**

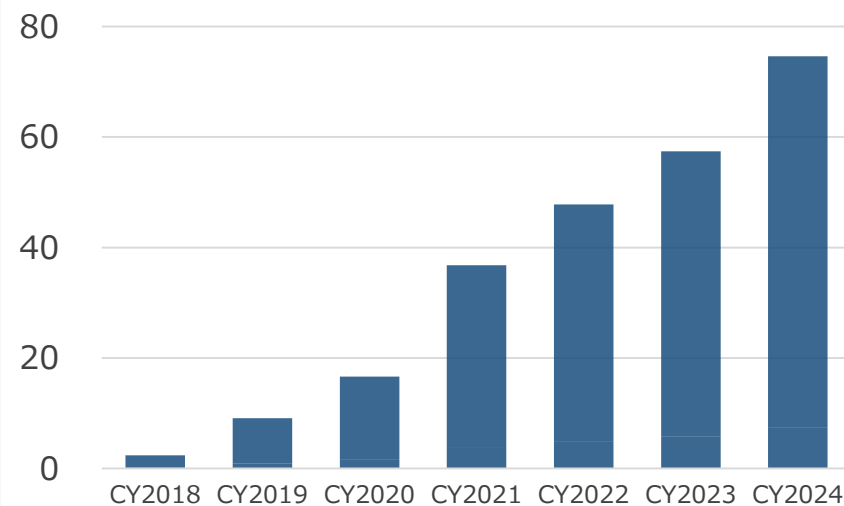
**Introduce customers to the best conditions to maximize light-emitting performance**

# Progress on Major Issues: New Products (EUV Resists)

## EUV photoresist market (quantity)

(Source: Fuji Keizai)

(k gallon/year)



## Our position

- Have the top market share (over 30%) in immersion ArF photoresists, but slightly lagging behind in EUV
- Started sales in FY2020



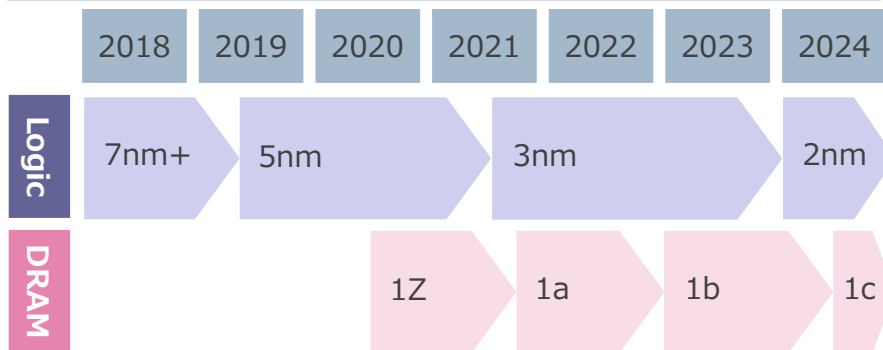
### Action Plan

- ☑ Develop a composition that can achieve higher resolution to expand sales

### Progress

- ☑ Found the optimum composition in short time by utilizing **Materials Informatics**
- ☑ Obtained good evaluations in a competition for mass production scheduled after FY2023

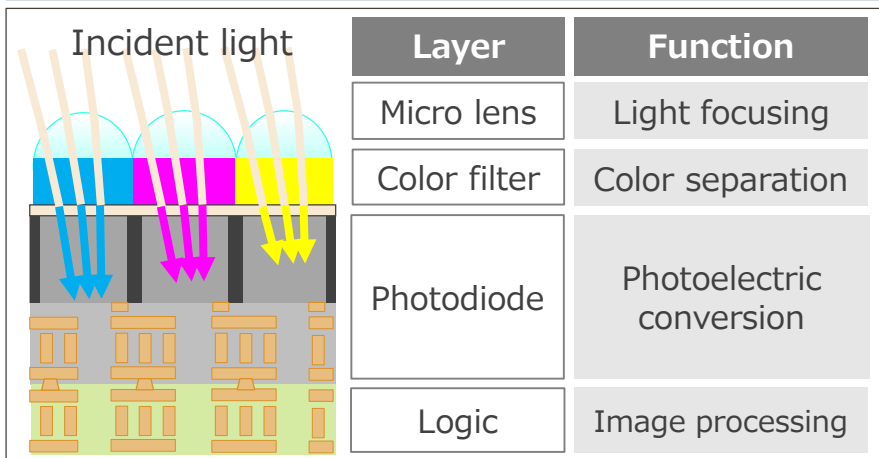
## Line-width Generation for EUV Resists



**Aim for 20~30% share as soon as possible**

# Progress on Major Issues: New Products (Image Sensors)

## Structure of image sensors (CIS)



## Technical trends in CIS

### Higher definition

- Miniaturize photodiode pixels

Our products

ArF thick film photoresists

### Higher sensitivity

- Increase the amount of light focused by the lens
- Use CMY color filters instead of RGB

RGB → CMY

Our products

High refractive clear resin

CMY color resists

### Our position

- Built up technology and know-how in both display & semiconductor fields
- Have technologies applicable for high definition & high sensitivity



### Action Plan

- ☑ Secure mass-production results for new color materials
- ☑ Propose the combination of clear resin for lenses & photoresists for shaping micro lenses

### Progress

- ☑ New color materials: To launch in 2021
- ☑ Resin for lenses: Optimizing properties for launch in 2021

**Increase in sensing demand (ex. autonomous driving)**

**-> Seize the opportunity to expand share of image sensor market**

# Progress on Major Issues: New Products (Next-generation Power Semiconductors)

## Comparisons of Power Semiconductors

Type	Operating voltage	Operating frequency	Size (*1)	Characteristics
Silicon (Si)	○	○	△	<ul style="list-style-type: none"> <li>Well proven</li> <li>Cost competitiveness</li> </ul>
Silicon carbide (SiC)	◎	○	○	<ul style="list-style-type: none"> <li>High operating voltage</li> <li>Already in mass-production (*2)</li> </ul>
Gallium nitride (GaN on GaN)	○	◎	◎	<ul style="list-style-type: none"> <li>At the R&amp;D stage</li> </ul>

\*1 Power unit size for the same output

\*2 For some electric vehicles and high-speed trains

## Development of the GaN on GaN Power Semiconductors Market

Characteristics (compared with Si/SiC)	Example uses (expected)
<ul style="list-style-type: none"> <li>Low loss -&gt; Energy saving</li> </ul>	<ul style="list-style-type: none"> <li>Power sources for data centers</li> </ul>
<ul style="list-style-type: none"> <li>Small-sized -&gt; Light weight</li> </ul>	<ul style="list-style-type: none"> <li>Electric vehicles</li> </ul>
	<ul style="list-style-type: none"> <li>Wireless power supplies</li> </ul>

**➡ Need to reduce costs and develop applications that require the characteristics of GaN on GaN power semiconductors**

### Our position

- Have manufacturing technologies for both GaN substrates and GaN epi-wafers



### Action Plan

- ☑ Reduce cost of GaN substrate (produce large-diameter substrates, improve productivity)
- ☑ Develop applications by collaborating with other players

### Progress

- ☑ Made progress in development of elemental technology for manufacturing GaN substrates suitable for power semiconductors

**➡ Create a market for GaN on GaN power devices and enjoy first-mover advantage**

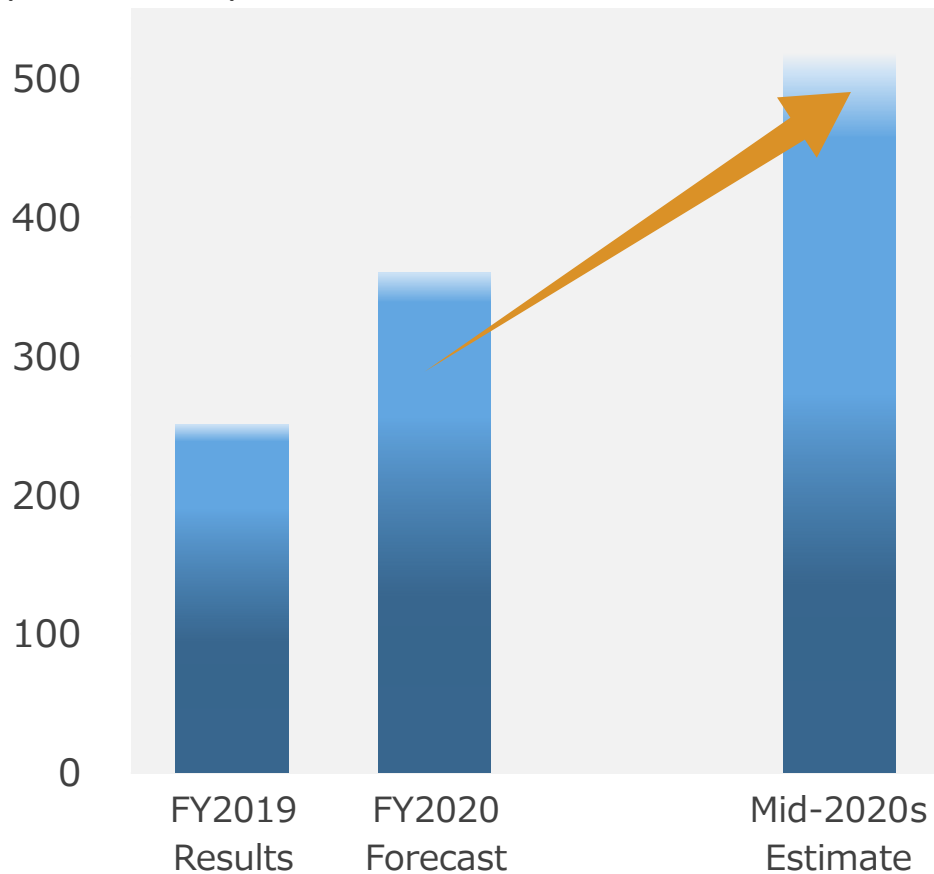
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# IV-6 Long-term Targets

(100 Million JPY)



- Display-related materials
- Semiconductor materials
- Others (including new products)

## Further improvement of our business portfolio

Focusing on high value-added products & Developing/launching new businesses

- Materials for OLED/ next-generation displays
- Materials at the boundary area between semiconductors & displays
- Materials for cutting-edge semiconductor processes
- High-performance & energy-saving compound power semiconductors etc.

Carry out action plans in response to LCD market changes

**Aim for a core operating income of around ¥50 billion in the mid-2020s**

### Cautionary Statement

Statements made in this document with respect to Sumitomo Chemical's current plans, estimates, strategies and beliefs that are not historical facts are forward-looking statements about the future performance of Sumitomo Chemical. These statements are based on management's assumptions and beliefs in light of the information currently available to it, and involve risks and uncertainties.

The important factors that could cause actual results to differ materially from those discussed in the forward-looking statements include, but are not limited to, general economic conditions in Sumitomo Chemical's markets; demand for, and competitive pricing pressure on, Sumitomo Chemical's products in the marketplace; Sumitomo Chemical's ability to continue to win acceptance for its products in these highly competitive markets; and movements of currency exchange rates.