Business Strategy for IT-related Chemicals Sector

September 1, 2016

Toshihisa Deguchi
IT-related Chemicals Sector, Representative Director & Senior Managing Executive Officer
Contents

- Overview of Our IT-related Chemicals Business
- Business Environment for the IT-related Chemicals
- Global Business Strategy
- Development of Flexible Display Materials
Overview of Our IT-related Chemicals Business

Business Environment for IT-related Chemicals

Global Business Strategy

Development of Flexible Display Materials
Business Overview of IT-related Chemicals

Flat Panel Display Materials
- Color filters
- Polarizing films
- Light diffusion plates
- Color resists
- Light guide plates
- Sapphire

Materials
- Photo spacers
- Overcoat agents
- Cleaning chemicals
- Processing chemicals for LCD panels (etchant, stripper)
- Photoresists (upstream process)
- Thick i-line resists (downstream process)

Processing chemicals for semiconductors (sulfuric acid, hydrogen peroxide solution, and others)

Semiconductor Materials
- GaN substrates
- GaAs epiwafers
- GaN epiwafers

Components
- GaAs epiwafers

Others
- Aluminum targets

Create New Value
Flat Panel Display Materials

Sumitomo Chemical Products Used in LCD Panels

Structure of Liquid Crystal Displays

- Polarizing film
- Glass substrate
- Color filter layer
  - Color filter
  - Color resist
  - ITO electrode
- Liquid crystal layer
- TFT layer
  - Photoresists, Aluminum targets, Processing chemicals for LCD panels (Etchant, Stripper)
  - ITO electrode
- LED light source
  - Sapphire substrates
- Light diffusion plates
- Light guide plates

(Note): Indicates Sumitomo Chemical product
Flat Panel Display Materials

Sumitomo Chemical’s Products Used in OLED Panels

OLED display structure

Create New Value

OLED display structure

- Sealing glass
- ITO
- Hole injection layer
- Emissive layer
- Cathode
- Glass

Sumitomo Chemical’s OLED-related materials

<table>
<thead>
<tr>
<th>OLED display structure</th>
<th>SC’s materials (already on market)</th>
<th>SC’s materials (under development)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover glass</td>
<td>Polarizer</td>
<td>Window film</td>
</tr>
<tr>
<td>Polarizer</td>
<td>ITO (xy)</td>
<td>Liquid crystal coated polarizer</td>
</tr>
<tr>
<td>Sealing glass</td>
<td>Touchscreen panel (TSP)</td>
<td>Flexible TSP</td>
</tr>
<tr>
<td>OLED</td>
<td>Polarizer</td>
<td>PLED light-emitting materials</td>
</tr>
<tr>
<td>Glass</td>
<td>Touchscreen panel (TSP)</td>
<td>Barrier film</td>
</tr>
</tbody>
</table>
Semiconductor Materials

Sumitomo Chemical Products Used in Semiconductor Chip Manufacturing

- Chip pre-assembly
  - Single-crystal wafer
  - Pattern lithography
  - Etching
  - Oxidation, diffusion, CVD, ion implantation
  - CMP
  - Metal layer
  - Interlayer dielectric
  - Wafer cleaning
- Packaging/assembly

( Sumitomo Chemical Products )

- Photoresists (i-line/KrF・ArF)
- Processing chemicals for semiconductors
- Argon gas
- Aluminum targets
- Thick i-line resist
# Compound Semiconductor Materials

## Sumitomo Chemical compound semiconductor materials

<table>
<thead>
<tr>
<th>Products</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing products</strong></td>
<td></td>
</tr>
<tr>
<td>GaAs epiwafers</td>
<td>Smartphone switches and amps, LEDs</td>
</tr>
<tr>
<td>GaN substrates</td>
<td>Blue semiconductor lasers, high-luminance LEDs and power devices</td>
</tr>
<tr>
<td>GaN-on-SiC epiwafers</td>
<td>High-output high-frequency devices (for radars and communication base stations)</td>
</tr>
<tr>
<td><strong>Next-generation products</strong></td>
<td></td>
</tr>
<tr>
<td>GaN-on-Si epiwafers</td>
<td>Power devices (household electrical appliances and IT equipment)</td>
</tr>
<tr>
<td>GaN-on-GaN epiwafers</td>
<td>Power devices (trains, cars, and electricity transmission and distribution)</td>
</tr>
</tbody>
</table>
Consolidated Sales

Create New Value

Before change in business portfolio

After change

(Billions of yen)

Overseas Sales Ratio

Consolidated Sales

(Billions of yen)


Others
China
Korea
Taiwan
Japan

Overseas Sales Ratio

0 100 200 300 400 500 600 700

75%
80%
85%
90%
95%
100%
Sales by Product Portfolio

**FY 2015**

- Polarizing films: 54%
- Touchscreen panels: 11%
- Processing chemicals: 11%
- Color resist: 6%
- Photoresists: 5%
- Compound semiconductors: 3%
- Color filters: 3%
- Aluminum targets: 2%
- New products: 1%
- Others: 1%

**FY 2018**

- Polarizing films: 49%
- Touchscreen panels: 13%
- Processing chemicals: 13%
- Color resist: 8%
- Photoresists: 6%
- Compound semiconductors: 3%
- Color filters: 13%
- Aluminum targets: 13%
- New products: 2%
- Others: 1%
Our Market Needs-Driven Global Supply Chain

Overseas Operations

[Map showing overseas operations with markers for production plants, sales offices, and R&D labs, with cities like Japan, Korea, China (Beijing), China (Hefei), China (Shanghai), China (Wuxi), Taiwan, Singapore, Belgium, America, China (Shenzhen), China (Xi’an), and China (Chongqing).]

1. Japan
2. Korea
3. China (Beijing)
4. China (Hefei)
5. China (Shanghai)
6. China (Wuxi)
7. Taiwan
8. Singapore
9. Belgium
10. America
11. China (Shenzhen)
12. China (Xi’an)
13. China (Chongqing)
Our Business in Korea

Our business facilities

Customers’ business facilities

◆ Pyongtaek
  - Dongwoo Fine-Chem Co., Ltd. (Head office/Plant/Research laboratory)
    - Polarizing films
    - Touchscreen panels
    - Color filters
    - Processing chemicals for LCD panels and semiconductors
    - Color resists

◆ Iksan
  - Dongwoo Fine-Chem Co., Ltd. (Plant/Research laboratory)
    - Processing chemicals for LCD panels, semiconductors
      (- High-purity alumina)

◆ Daegu
  - SSLM Co., Ltd. (Head office/Plant)
    - Sapphire substrates
      (- Separators)

Sales: 225 billion yen (FY2015)
Number of employees: 3,132 (end of FY2015)
Our Business in Taiwan

Our business facilities

Customers’ business facilities

Innolux Corporation

◆ Hsinchu
  - Sumika Technology Co., Ltd.
    (Plant)
    - Color filters

◆ Tainan
  - Sumika Technology Co., Ltd.
    (Head office/Plant/Research laboratory)
    - Polarizing films
    - Aluminum targets
    - Color resists
    - Ink jet printing light-guide plate (LGP)

Sales: 100 billion yen (FY2015)
Number of employees: 2,467 (end of FY2015)
Our Business in China

Sales: 105 billion of yen (FY2015)
Number of employees: 1,904 (end of FY2015)

Sumika Electronic Materials Group
- Our business facilities
- Customers’ business facilities

Create New Value

- Beijing
  - Polarizing films

- Shanghai
  - Polarizing films, aluminum targets

- Xi’an
  - Processing chemicals for semiconductors

- Chongqing
  - Processing chemicals for LCD panels

- Wuxi
  - Polarizing films, Light guide plates

- Shenzhen
  - Polarizing films

- BOE
- Samsung Electronics
- Tianma
- Sumika Electronic Materials Group

BOE

Our business facilities

Customers’ business facilities
Current Status of Our Global Business

Sales by country (FY2015)

- **Japan**: 18%
- **Korea**: 41%
- **China**: 19%
- **Taiwan**: 18%
- **Others**: 4%

Number of employees by country (as of end of FY2015)

- **Japan**: 23%
- **Taiwan**: 25%
- **China**: 19%
- **Korea**: 32%
- **Others**: 1%
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Flat Panel Display Materials Market

**LCDs for the TV market**

Demand and production capacity for LCD panels for TVs by country

(Million units)

- Japan
- Taiwan
- Korea
- China
- Demand
- Average size

(Source: IHS Technology (DisplaySearch))
Flat Panel Display Materials Market

**Chinese panel makers’ investment plans from 2017**

<table>
<thead>
<tr>
<th>Start of Operation</th>
<th>Company</th>
<th>Line</th>
<th>Location</th>
<th>Generation</th>
<th>Capacity (thousands/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q3 2017</td>
<td>BOE</td>
<td>B10</td>
<td>Fuzhou</td>
<td>8.5</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>HKC</td>
<td>—</td>
<td>Chongqing</td>
<td>8.6</td>
<td>70</td>
</tr>
<tr>
<td>Q2 2018</td>
<td>BOE</td>
<td>B9</td>
<td>Hefei</td>
<td>10.5</td>
<td>90</td>
</tr>
<tr>
<td>2018</td>
<td>BOE</td>
<td>B11</td>
<td>Mianyang</td>
<td>8.5</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>CEC IRICO</td>
<td>—</td>
<td>Xianyang</td>
<td>8.6</td>
<td>60</td>
</tr>
<tr>
<td>Q2 2019</td>
<td>CSOT</td>
<td>T6</td>
<td>Guangzhou</td>
<td>10.5</td>
<td>90</td>
</tr>
</tbody>
</table>
Displays for the mobile devices market

Demand and production capacity for displays for mobile devices

(Million units)

- OLED (except China)
- OLED (China)
- LCD (except China)
- LCD (China)

Estimates by Sumitomo Chemical based on IHS Technology (DisplaySearch)
### Flat Panel Display Materials Market

#### Displays for the mobile devices market

Investment plans for production facilities for smartphone LCD/OLED displays

<table>
<thead>
<tr>
<th>Start of Operation</th>
<th>Company</th>
<th>Country</th>
<th>Technology</th>
<th>Generation</th>
<th>Capacity (thousands/month)</th>
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<tbody>
<tr>
<td>Q3 2016</td>
<td>JDI</td>
<td>Japan</td>
<td>LTPS/LTPO</td>
<td>6</td>
<td>50</td>
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<tr>
<td></td>
<td>INX</td>
<td>Taiwan</td>
<td>LTPS</td>
<td>6</td>
<td>24</td>
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<tr>
<td>Q4 2016</td>
<td>Tianma</td>
<td>China</td>
<td>LTPS</td>
<td>6</td>
<td>30</td>
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<tr>
<td></td>
<td>SDC</td>
<td>Korea</td>
<td>OLED</td>
<td>6</td>
<td>30</td>
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<tr>
<td>2016</td>
<td>TCL</td>
<td>China</td>
<td>LTPS</td>
<td>6</td>
<td>60</td>
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<tr>
<td>Q1 2017</td>
<td>TCL</td>
<td>China</td>
<td>OLED</td>
<td>6</td>
<td>60</td>
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<tr>
<td></td>
<td>Tianma</td>
<td>China</td>
<td>OLED</td>
<td>6</td>
<td>60</td>
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<tr>
<td></td>
<td>FVO</td>
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<td>LTPS</td>
<td>6</td>
<td>30</td>
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<tr>
<td></td>
<td>SDC</td>
<td>Korea</td>
<td>OLED</td>
<td>6</td>
<td>30</td>
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<tr>
<td></td>
<td>LGD</td>
<td>Korea</td>
<td>OLED</td>
<td>6</td>
<td>10</td>
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<tr>
<td>Q2 2017</td>
<td>SDC</td>
<td>Korea</td>
<td>OLED</td>
<td>6</td>
<td>30</td>
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<tr>
<td></td>
<td>LGD</td>
<td>Korea</td>
<td>OLED</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Q3 2017</td>
<td>BOE</td>
<td>China</td>
<td>OLED</td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td>Q4 2017</td>
<td>Tianma</td>
<td>China</td>
<td>OLED</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>JDI</td>
<td>Japan</td>
<td>OLED</td>
<td>6</td>
<td>25</td>
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<tr>
<td></td>
<td>LGD</td>
<td>Korea</td>
<td>OLED</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>2018</td>
<td>Hon Hai</td>
<td>China</td>
<td>LTPS/OLED</td>
<td>6</td>
<td>60</td>
</tr>
</tbody>
</table>
Flat Panel Display Materials Market

Smartphone OLED displays market

(Million)

- Launch of OLED displays
- Growing OLED demand
- Launch of flexible displays

Year on Year:
- 2013: +52%
- 2014: +28%
- 2015: +19%
- 2016: +27%

(Source: IHS Technology (DisplaySearch))
Flat Panel Display Materials Market

Color resists market

(1,000t)

Japan ■ Taiwan ▪ Korea □ China

2012 2013 2014 2015 2016 2017 2018

*Sumitomo Chemical estimations
## Flat Panel Display Materials Market

### Required properties for liquid crystal displays and color resists

<table>
<thead>
<tr>
<th>Required properties for liquid crystal displays</th>
<th>Technology trends</th>
<th>Required Properties for color resists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher color reproduction</td>
<td>NTSC/72% =s-RGB</td>
<td>DCI/adobe ⇒ UHDTV (BT2020)</td>
</tr>
<tr>
<td>Greater brightness</td>
<td>(White) LEDs</td>
<td>3 wavelength backlights ⇒ Laser backlights</td>
</tr>
<tr>
<td>Higher definition</td>
<td>(TV) 2K 4K 8K</td>
<td>(Mobile) 600ppi 800ppi</td>
</tr>
</tbody>
</table>

### Requirement for color resists

1. High resolution resin that can provide high definition displays.
2. Color material that has both a high transmittance and deeper colors, even with a thin layer.
Semiconductor Materials Market

Main semiconductor manufacturing capacity forecast by region (12 inch plant)

Trends in miniaturization of circuits

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAM</td>
<td>20nm</td>
<td>1Xnm</td>
<td>1Ynm</td>
<td>1Znm</td>
</tr>
<tr>
<td>LSI</td>
<td>14-16nm</td>
<td>10nm</td>
<td>7nm</td>
<td></td>
</tr>
</tbody>
</table>

*Sumitomo Chemical estimations*
Compound Semiconductor Market

Power devices market (GaN-on-Si)

Shipment Volume

Shipment Amount

(Millions of USD)

(Thousand)

(Source: Yole Développement)
Compound Semiconductor Market

GaN substrates market

(Thousand)

- Shipment Volume
- Shipment Amount

(Millions of USD)

Source: Fuji Chimera Research Institute, Inc.


0 50 100 150 200 250 300 350 400 450 500 550 600 650 700

Business Strategy for the IT-related Chemicals Sector
Contents

- Overview of Our IT-related Chemicals Business
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Medium to Long-term Vision for IT-related Chemicals Sector

**Medium to long-term goal**
Deliver new value that responds to the changes in the ICT industry by leveraging our material development capabilities in collaborative development with customers.

**Action plan**
- Secure sustainability of the polarizer business
- Expand the touch sensor business
- Expand the semiconductor materials business
- Develop a new core business in addition to the polarizer and touchscreen businesses

**FY2018 Target**
- Net sales: ¥490.0 billion
- Operating income: ¥34.0 billion

**Operating income variance analysis (FY2015 v/s FY2018)**
- Margins
- Streamlining
- Fixed costs
- Volumes and others

*FY 2015 Operating income*
Flat Panel Display Materials

Polarizing films for TV

Market Environment
- Commoditization of technology
- Maturation of the market
- Chinese LCD makers rushing to build new facilities

Pressure to lower prices
Slight increase in panel demand

Basic Strategy
- Global balance optimization
- Promoting thorough cost rationalization

Maximize use of existing resources
Increased sales of products using in-house produced materials

Polarizing film supply capacity transition
- Built new production lines
- Accelerated the speed of production lines
- Global balance optimization

(Index)
200
180
160
140
120
100
80
60
40
20
0
2009 2012 2015 2018
Flat Panel Display Materials

Polarizing films for TV

Each production line focuses on producing products it can produce most efficiently
Realize global balance optimization

Dongwoo Fine-Chem Co., Ltd. in Korea

Sumitomo Chemical Co., Ltd

Sumika Technology Co., Ltd. in Taiwan

Sumika Electronic Materials Co., Ltd in China

Production capacity by country
Japan 10%
Taiwan 30%
Korea 60%
Flat Panel Display Materials

Polarizing films for mobile devices

**Market Environment**
- LCD panel oversupply
- Market maturation
- Rise of Chinese brands
- Growth of OLED panels

- Increased competition, reduced prices
- OLED market expansion gathers steam

**Basic Strategy**
- Utilize our broad technology lineup

**Entry into promising markets**
- Automotive applications
- OLED-related materials

**Prices of Polarizing Films for Mobile Devices**
- Ultrathin stretched polarizing film
- High durability polarizing film
- Reverse wavelength dispersion film
- Special processing
- Coated-type polarizer
Flat Panel Display Materials

**Color resists**

**Market Environment**
- Increased demand for high brightness/definition/color reproducibility
- Growth of the Chinese panel market

**Basic Strategy**

- Differentiation through customization for different customers utilizing our superior dye development capabilities
- Enhance customer support in growth regions

**Accumulated technology from our dyes business**

**Track record of responding to customer needs in Taiwan and Korea**

**Our Shipments and Market Share**

<table>
<thead>
<tr>
<th>Year</th>
<th>Shipments</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>2015</td>
<td>200</td>
<td>10</td>
</tr>
<tr>
<td>2018</td>
<td>350</td>
<td>45</td>
</tr>
</tbody>
</table>

**Accelerating the development of dye color resists**

**Global research targeted at the Chinese market, setting up a technical service structure**
Flat Panel Display Materials

Touchscreen panels (glass substrate and film substrate types)

Market Environment
- Expanding market for OLED displays (increased demand for on-cell touchscreen panels)

Basic Strategy
- Maintain top market share for on-cell type touchscreen panels
- Fully satisfy broad customer needs

Development capability of high-resolution products through differentiated technology
Development capability and cost competitiveness through in-house manufacturing of raw materials

Production Capacity
- Increase customers for both glass substrate and film substrate types
- Differentiation
  - Develop thinner glass-type touchscreen panels
  - In-house processing of ITO layers

- (Index)
Flat Panel Display Materials

Touchscreen panels (glass and film types)

Glass-type touchscreen panels
(Making sensors on sealing glass)

- Cover glass
- Polarizing film
- Glass-type touchscreen panels
- Sealing glass
- OLED
- Glass

• Increase production capacity in the second half of 2016

Film-type touchscreen panels
(Making sensors on film substrate)

- Cover glass
- Polarizing film
- Film-type touchscreen panels
- Film substrate
- Sealing layer
- OLED
- Glass

• Launched in February 2015, currently in mass production
• Contributing to curved OLED displays

Maintain top market share for on-cell type touchscreen panels

The first step toward achieving flexible displays
Semiconductor Materials

Create New Value

Photoresists

**Market Environment**
- High integration/miniatrization/3D
- Growth in the advanced logic and memory fields
- Evolution of packaging and assembly technology

**Immersion ArF resist market continues to expand**

**Basic Strategy**
- Maintain and improve high market share in immersion ArF resists
- Expand our product portfolio
- Meet the growing demand not only in Korea, Taiwan and the US, but also in China

**New business opportunity in post-processing**

**Development and aggressive marketing of final generation Immersion ArF resists**

**Our market share in immersion ArF resists**
(Currently 32% ⇒ FY2018 30%)

**Expansion of our post-process thick i-line resist business**

**Sales Volume of Immersion ArF Resists**

- 2015
- 2016
- 2017
- 2018

Sales Volume (Index)

0 50 100 150 200 250

2015 2016 2017 2018

Total manufacturing from basic materials based on organic synthetic technology

Quality management down to the nanoscale level
Compound Semiconductors Materials

Compound semiconductors

Market Environment
- Mobile market: Expanded information volume, increased communication speed → high output
- Power conversion devices: Miniaturization, energy saving → high endurance, low loss

Basic Strategy
- GaAs epiwafers
  Increase cost competitiveness
- GaN substrates
  Strengthening our supply chain with the goal of becoming a leading supplier
- GaN epiwafers
  (GaN-on-Si, GaN-on-SiC, GaN-on-GaN)
  Establish a leading position in markets where growth is expected

Unified operations with SCIOCS Co., Ltd,
Improve efficiencies through the pursuit of synergies

Laser diode applications: Maintaining high market share
LED applications: Early stable production of 4 inch products

GaN-on-Si: Early commercialization
GaN-on-SiC: Global customer development
GaN-on-GaN: Development with a medium-to-long term perspective

Accumulated epiwafer growth technology in our GaAs business
Expanded product lineup from our purchase of SCIOCS Co., Ltd.
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Development of Flexible Display Materials

Roadmap for the development of flexible display materials

OLED Display Trends

- Rigid
  - 2013

- Bendable
  - 2015
  - OLED panels using glass-type touchscreen panel

- Foldable
  - 2017
  - Flexible OLED panel
  - OLED panels using film-type touchscreen panel

- Rollable
  - 2019

Sumitomo Chemical products

Business Strategy for the IT-related Chemicals Sector
Development of Flexible Display Materials

Roadmap for the development of flexible display materials

- Window film
- Liquid crystal-coated polarizer
- Flexible touchscreen panel
- Sumitomo Chemical barrier film
- OLED
- Barrier film

Development and mass production of each component according to the timing of customer mass production

Continue parallel development of multi-functional materials and components, offer performance improvements for integration

Sumitomo Chemical’s Competitive Advantages

- Materials development capability
  as a diversified chemical company

- Product development capability
  and processing technology
  acquired through display materials business

Contribute to evolution and diffusion of OLED technology
### Development of Flexible Display Materials

**Window film**

- **Characteristics necessary for display surface components**
  - Transparency
  - Color tone
  - Hardness
  - Surface accuracy

- **Characteristics necessary for flexible components**
  - Bendability
  - Low characteristic change

<table>
<thead>
<tr>
<th>Characteristics necessary for display surface components</th>
<th>Transparency</th>
<th>Transmittance</th>
<th>Color tone</th>
<th>YI</th>
<th>Hardness</th>
<th>Pencil hardness</th>
<th>Surface accuracy</th>
<th>Apparent reflectivity</th>
<th>Our Products</th>
<th>Other Companies’ Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;90%</td>
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<tr>
<td>Color tone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>Hardness</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9H</td>
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<tr>
<td>Surface accuracy</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Characteristics necessary for flexible components**

- Bendability
- Low characteristic change

**Our Products**

- >90%
- 1-2
- 9H
- Good
- >200,000 times
- <1%

- High-level balance of surface component characteristics and flexible component characteristics through polymer molecular design and process optimization.
## Development of Flexible Display Materials

### Liquid crystal-coated polarizer

<table>
<thead>
<tr>
<th>Characteristics necessary for anti-reflective components</th>
<th>Previous types</th>
<th>Liquid crystal-coated type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color tone</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>Brightness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmittance</td>
<td>42-44%</td>
<td>40-48%</td>
</tr>
<tr>
<td>Anti-reflective performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection from cells</td>
<td>~0</td>
<td>~0</td>
</tr>
<tr>
<td>Bendability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bending test (3R)</td>
<td>—</td>
<td>&gt;200,000 times</td>
</tr>
<tr>
<td>Light leakage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>&gt;20μm</td>
<td>&lt;10μm</td>
</tr>
<tr>
<td>Dimentional stability</td>
<td>95C 24Hr</td>
<td>Significant shrinkage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced shrinkage</td>
</tr>
</tbody>
</table>

Adding characteristics of low thickness, flexible components while maintaining the fundamental characteristics of anti-reflective materials.
## Development of Flexible Display Materials

### Flexible touchscreen panels

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Confirmation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window film</td>
<td></td>
</tr>
<tr>
<td>Liquid crystal-coated polarizer</td>
<td></td>
</tr>
<tr>
<td>Flexible touchscreen panel</td>
<td></td>
</tr>
<tr>
<td>Sumitomo Chemical barrier film</td>
<td></td>
</tr>
<tr>
<td>OLED</td>
<td></td>
</tr>
<tr>
<td>Barrier film</td>
<td></td>
</tr>
</tbody>
</table>

Providing the characteristics of thin, flexible components on a variety of substrates while maintaining the characteristics of an excellent touchscreen panel

<table>
<thead>
<tr>
<th>Touchscreen panel characteristics</th>
<th>Film-type (Existing products)</th>
<th>Flexible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line resolution</td>
<td>10/10</td>
<td>10/10</td>
</tr>
<tr>
<td>Pattern visibility</td>
<td>Difficult to see</td>
<td>Difficult to see</td>
</tr>
<tr>
<td>Color tone</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>Thickness</td>
<td>40μm-50μm</td>
<td>&lt;30μm</td>
</tr>
<tr>
<td>Bendability</td>
<td>Curvature radius 3R</td>
<td>3R</td>
</tr>
<tr>
<td>Bending test (3R)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Substrate selection</td>
<td>Narrower</td>
<td>Broader</td>
</tr>
</tbody>
</table>
Development of Flexible Display Materials

Barrier film

- Window film
- Liquid crystal-coated polarizer
- Flexible touchscreen panel
- Sumitomo Chemical barrier film
- OLED
- Barrier film

Achieving both high water vapor resistance and flexibility. Broader substrate selection, which can be applied to a variety of uses.

<table>
<thead>
<tr>
<th>Characteristics necessary for flexible components</th>
<th>Water vapor resistance</th>
<th>WVTR (g/m²/day)</th>
<th>Our Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bendability</td>
<td>Curvature radius</td>
<td>≥20R</td>
<td>≤10R</td>
</tr>
<tr>
<td>Optical characteristics</td>
<td>Transmittance</td>
<td>88-89%</td>
<td>90-91%</td>
</tr>
<tr>
<td>Substrate selection</td>
<td></td>
<td></td>
<td>Broader</td>
</tr>
</tbody>
</table>
Creative Hybrid Chemistry

SUMITOMO CHEMICAL

Thank you very much.
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.