



Business Strategy for IT-related Chemicals Sector

September 1, 2016

 **SUMITOMO CHEMICAL**

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

- 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

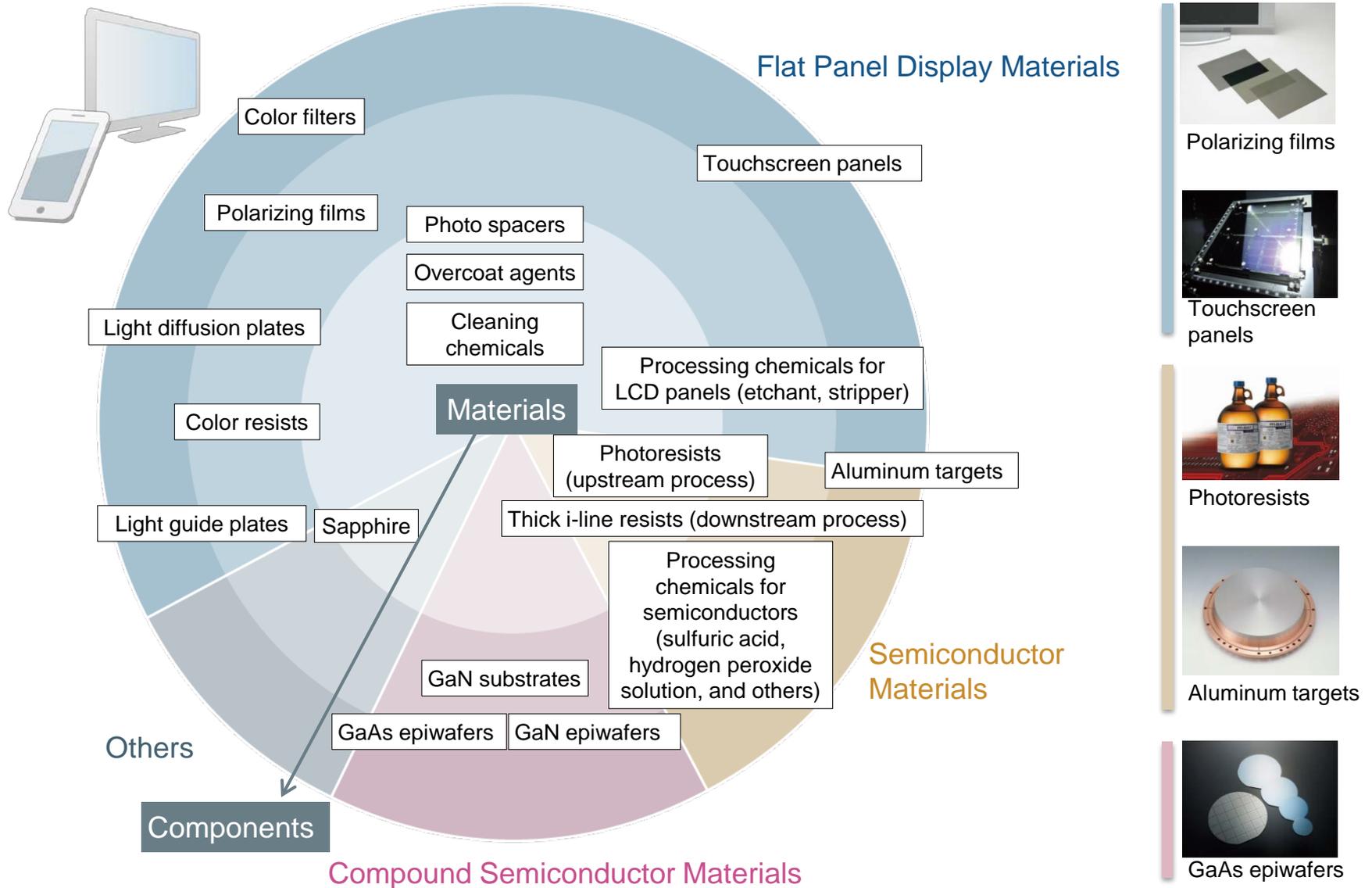
Business Environment for IT-related Chemicals

Global Business Strategy

Development of Flexible Display Materials

Business Overview of IT-related Chemicals

Create New Value

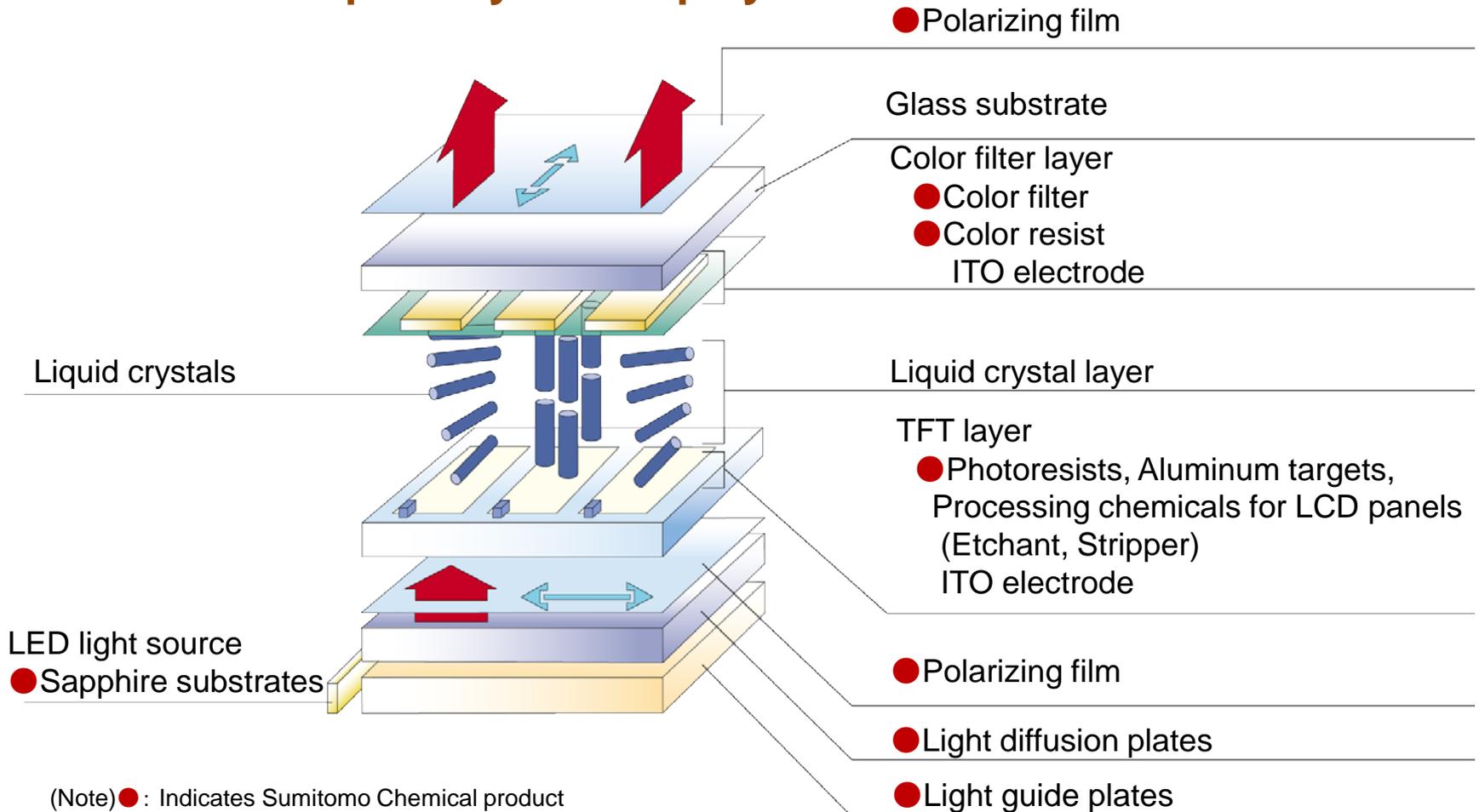


Flat Panel Display Materials

Create New Value

Sumitomo Chemical Products Used in LCD Panels

Structure of Liquid Crystal Displays

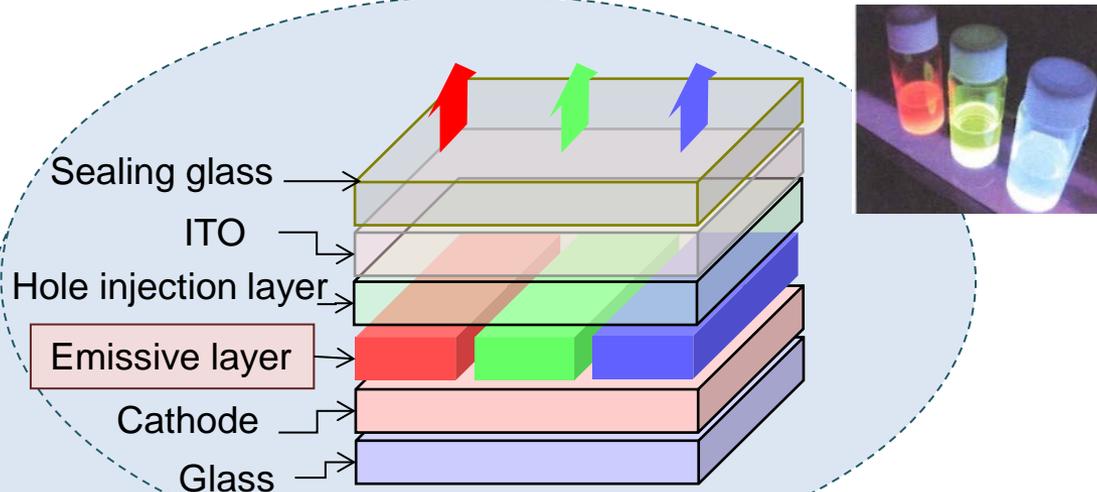


Flat Panel Display Materials

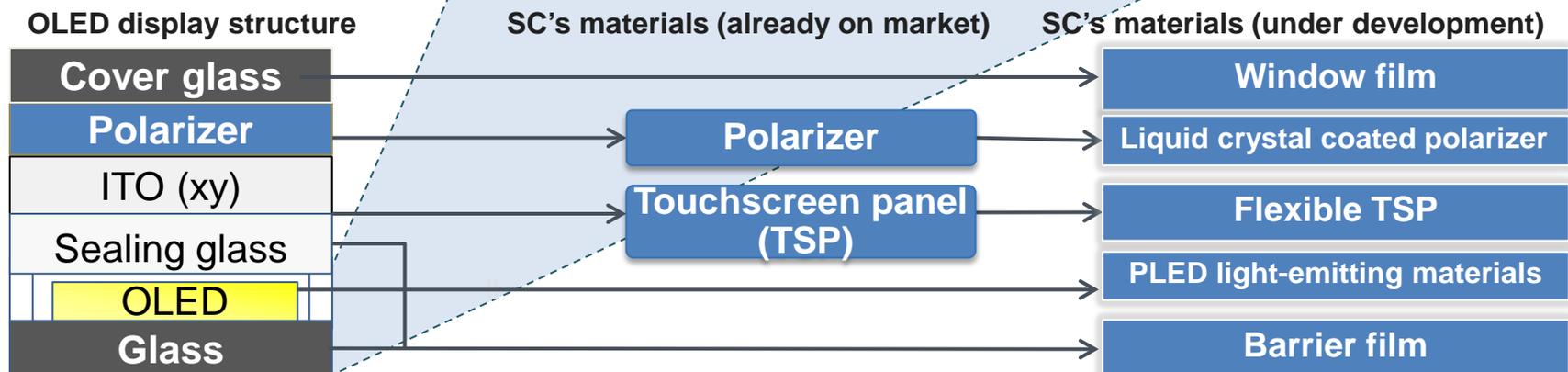
Create New Value

Sumitomo Chemicals Products Used in OLED Panels

OLED display structure



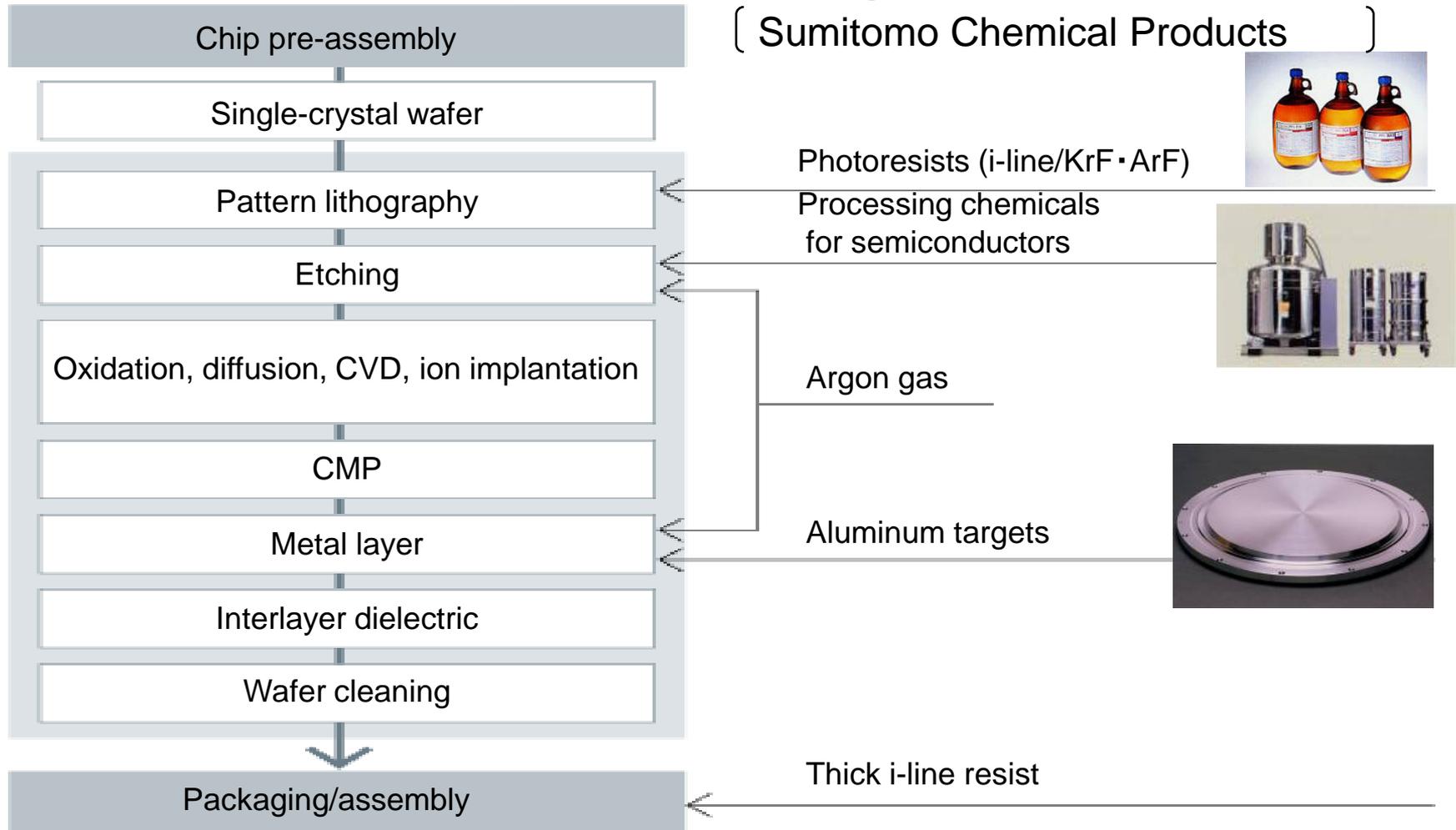
Sumitomo Chemical's OLED-related materials



Semiconductor Materials

Create New Value

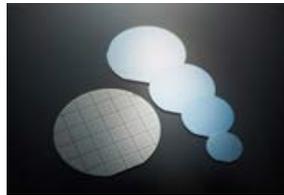
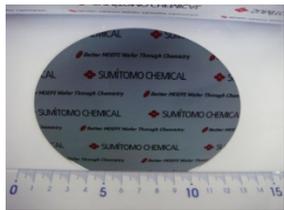
Sumitomo Chemical Products Used in Semiconductor Chip Manufacturing



Compound Semiconductor Materials

Create New Value

Sumitomo Chemical compound semiconductor materials

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

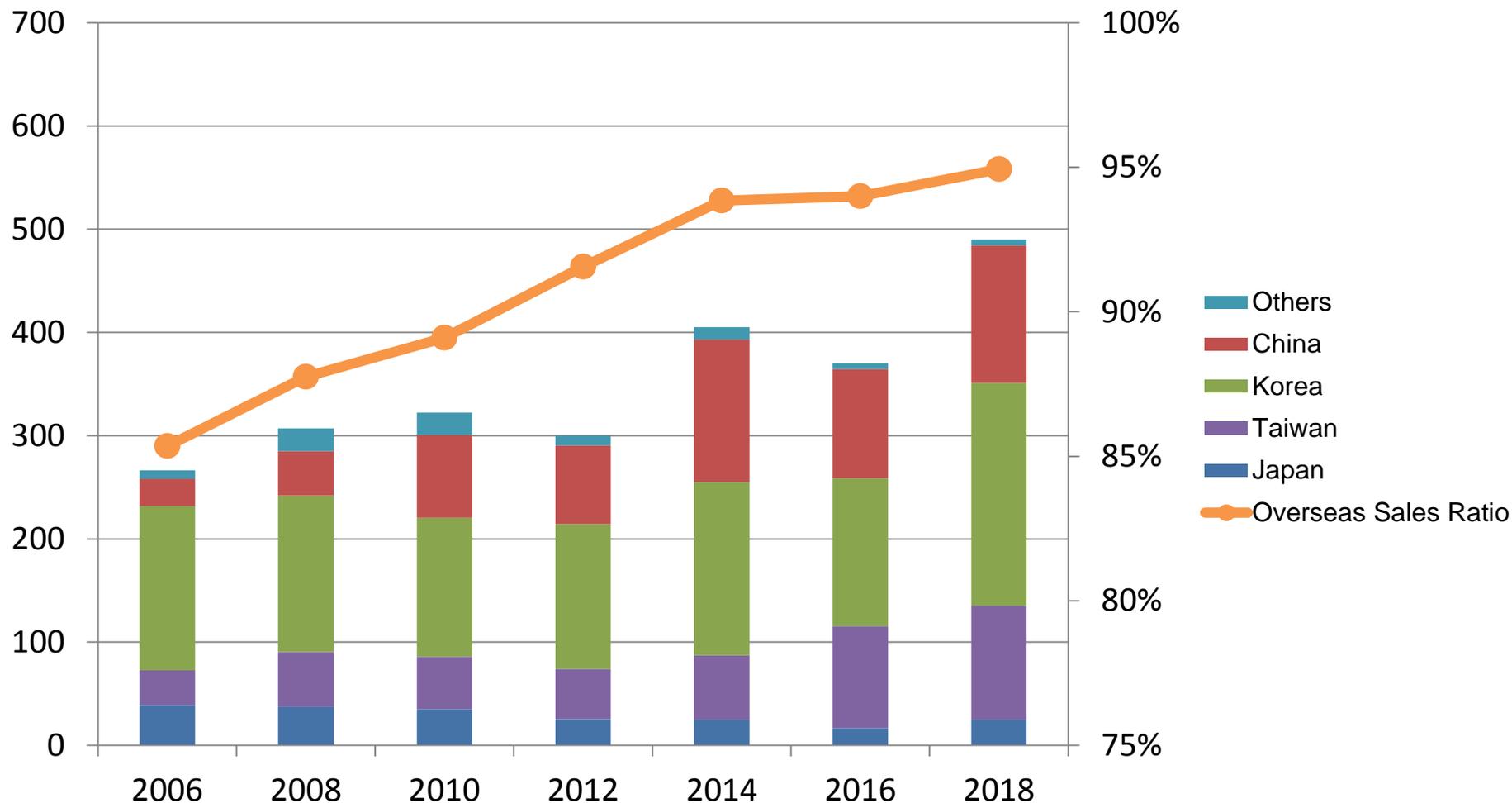
Consolidated Sales

Create New Value

Before change in business portfolio

After change

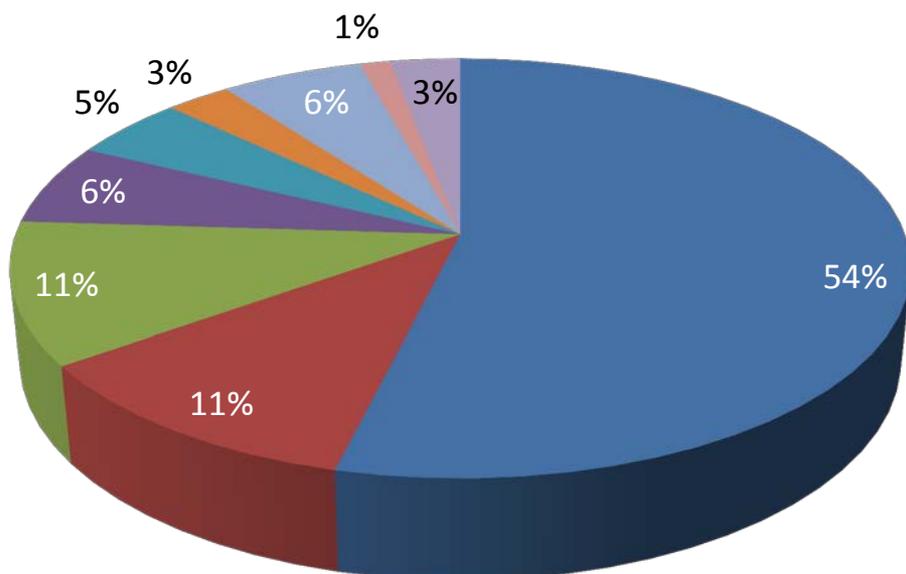
(Billions of yen)



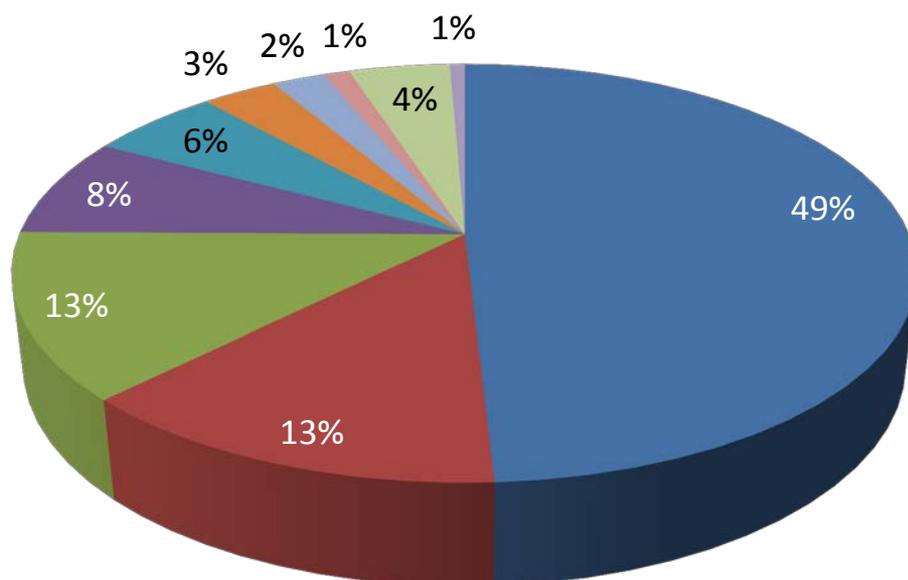
Sales by Product Portfolio

Create New Value

FY 2015



FY 2018

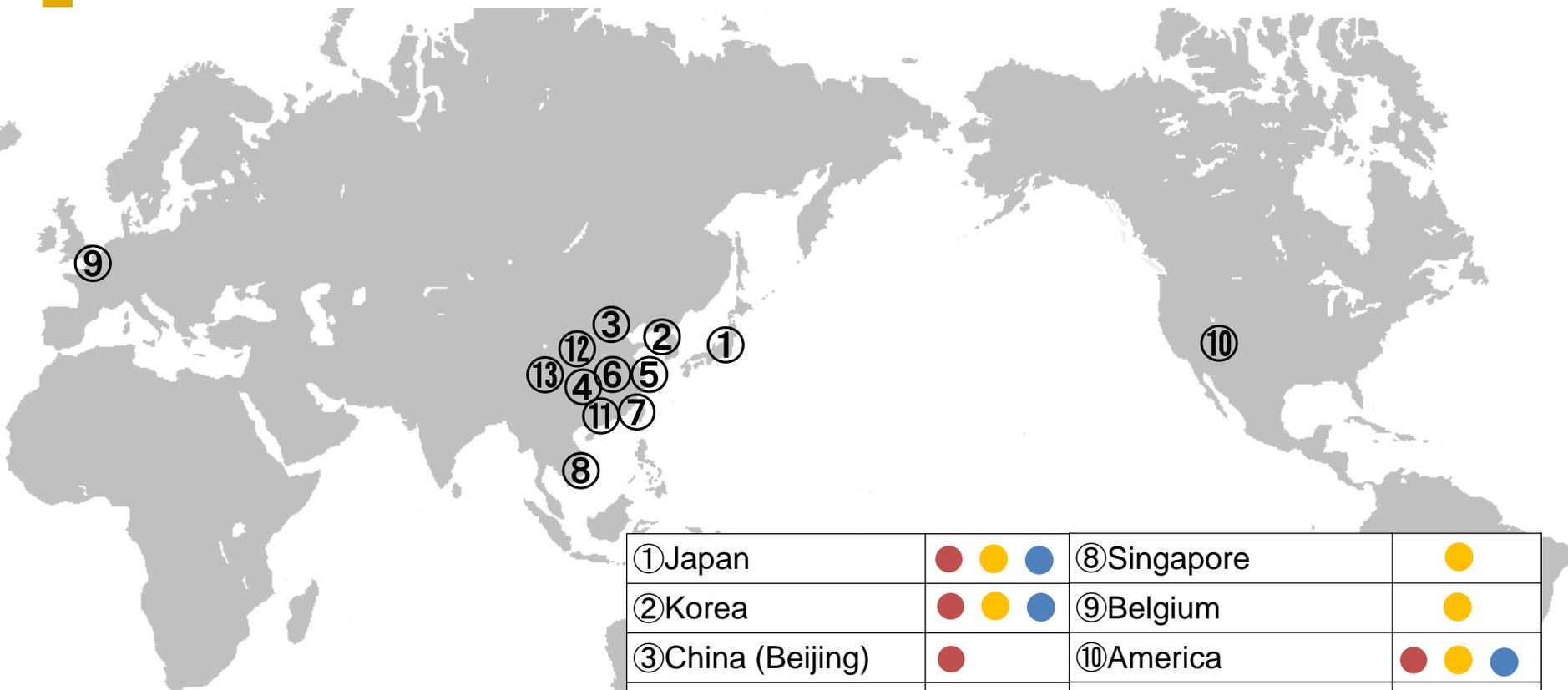


- Polarizing films
- Touchscreen panels
- Processing chemicals
- Color resists
- Photoresists
- Compound semiconductors
- Color filters
- Aluminum targets
- New products
- Others

Our Market Needs-Driven Global Supply Chain

Create New Value

Overseas Operations



- **Production plants**
- **Sales offices**
- **R&D labs**

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

Our Business in Korea

Create New Value

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

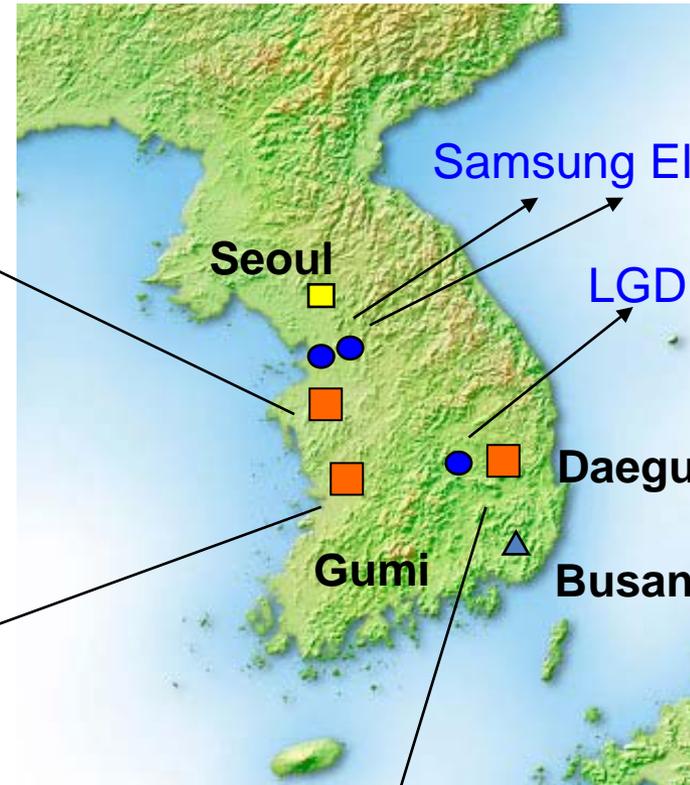
◆ Iksan

• Dongwoo Fine-Chem Co., Ltd.
(Plant/Research laboratory)

- Processing chemicals for LCD panels, semiconductors
- (- High-purity alumina)

Sales: 225 billion yen (FY2015)

Number of employees: 3,132 (end of FY2015)



◆ Daegu

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

Our Business in Taiwan

Create New Value

- Our business facilities
- Customers' business facilities

Innolux Corporation

AU Optronics

◆ Hsinchu

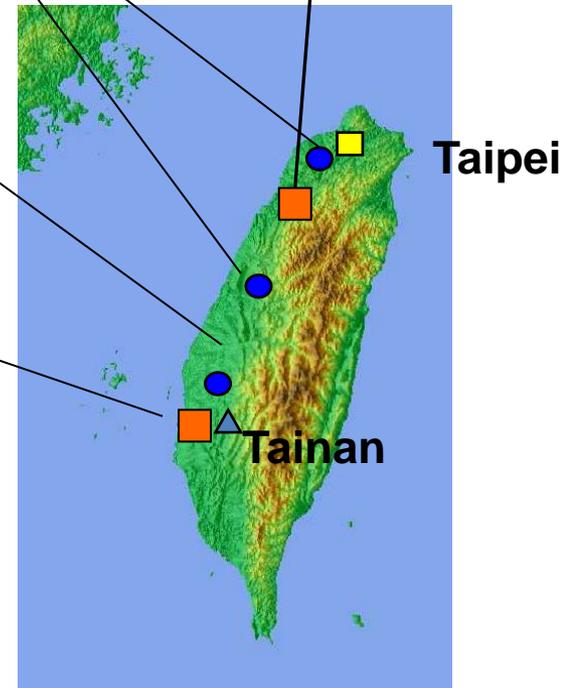
- Sumika Technology Co., Ltd. (Plant)
- Color filters

◆ 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

Create New Value

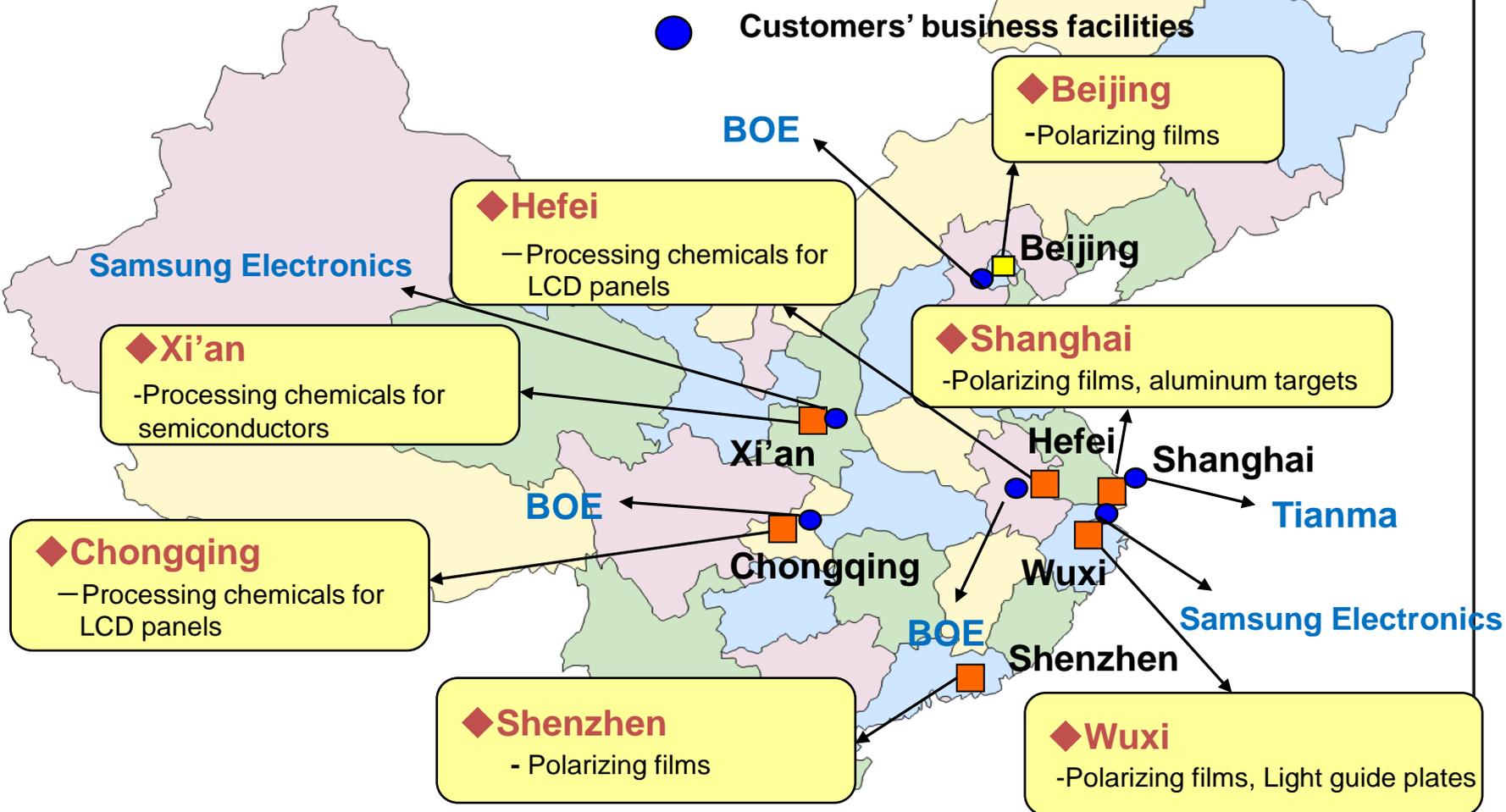
Sales: 105 billion of yen (FY2015)

Number of employees: 1,904 (end of FY2015)

Sumika Electronic Materials Group

■ Our business facilities

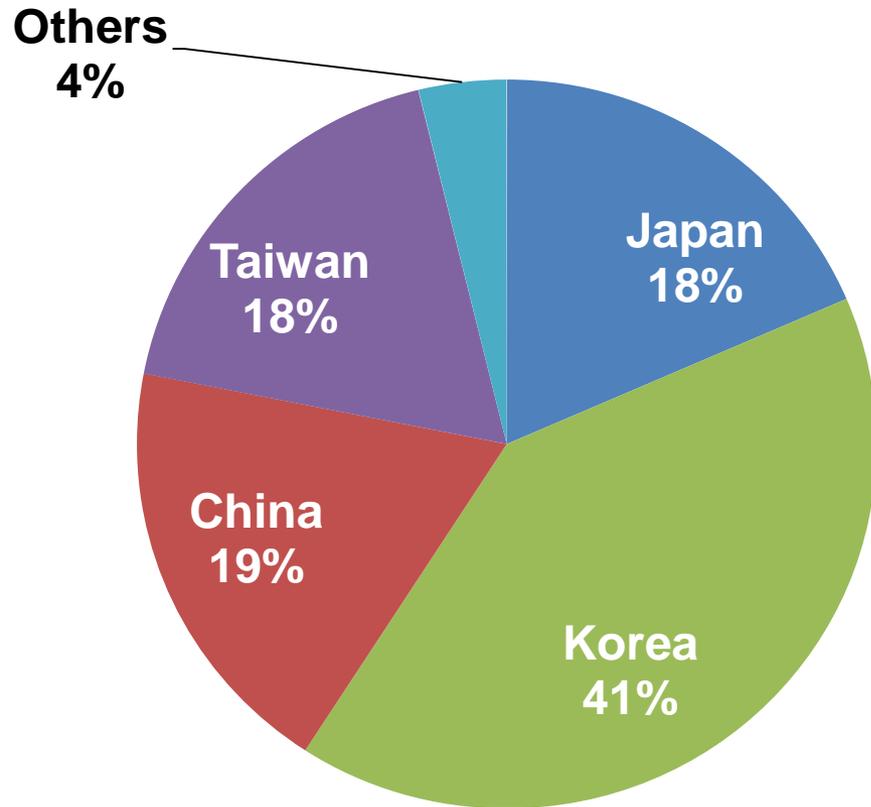
● Customers' business facilities



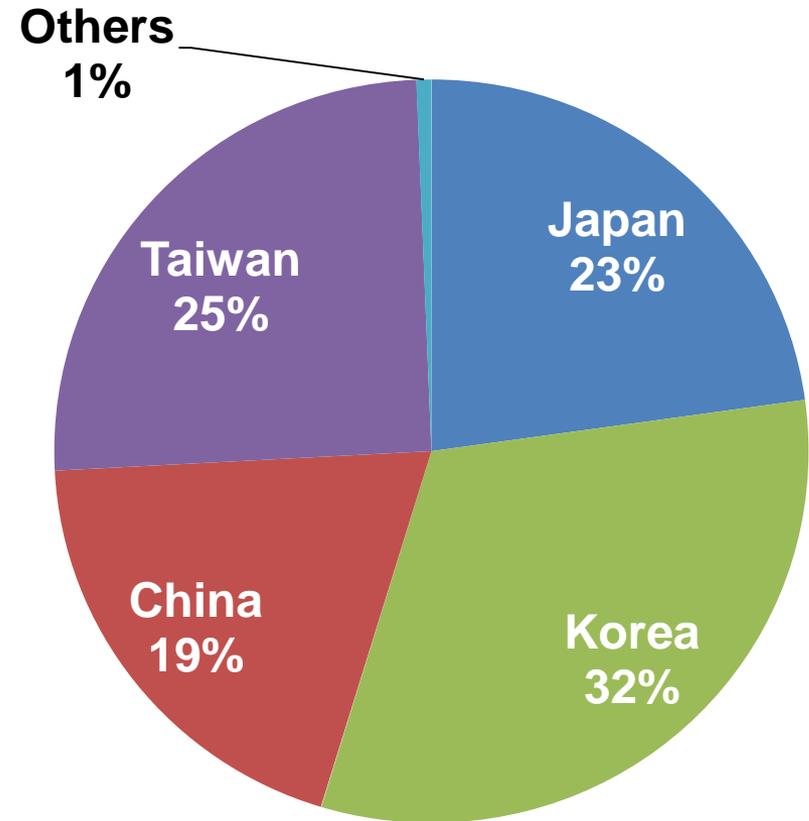
Current Status of Our Global Business

Create New Value

Sales by country (FY2015)



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



Overview of Our IT-related Chemicals Business

Business Environment for IT-related Chemicals

Global Business Strategy

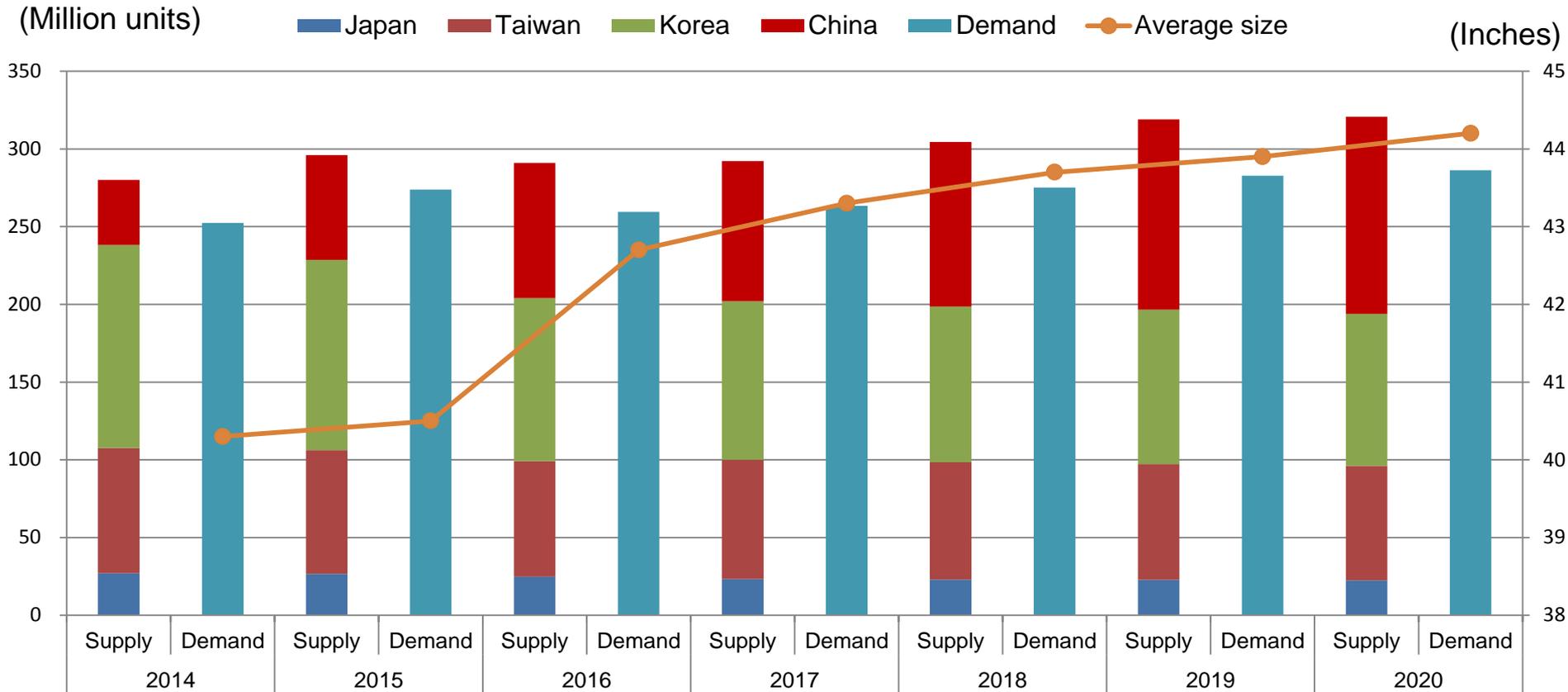
Development of Flexible Display Materials

Flat Panel Display Materials Market

Create New Value

LCDs for the TV market

Demand and production capacity for LCD panels for TVs by country



(Source: IHS Technology (DisplaySearch))

Flat Panel Display Materials Market

Create New Value

LCDs for the TV market

Chinese panel makers' investment plans from 2017

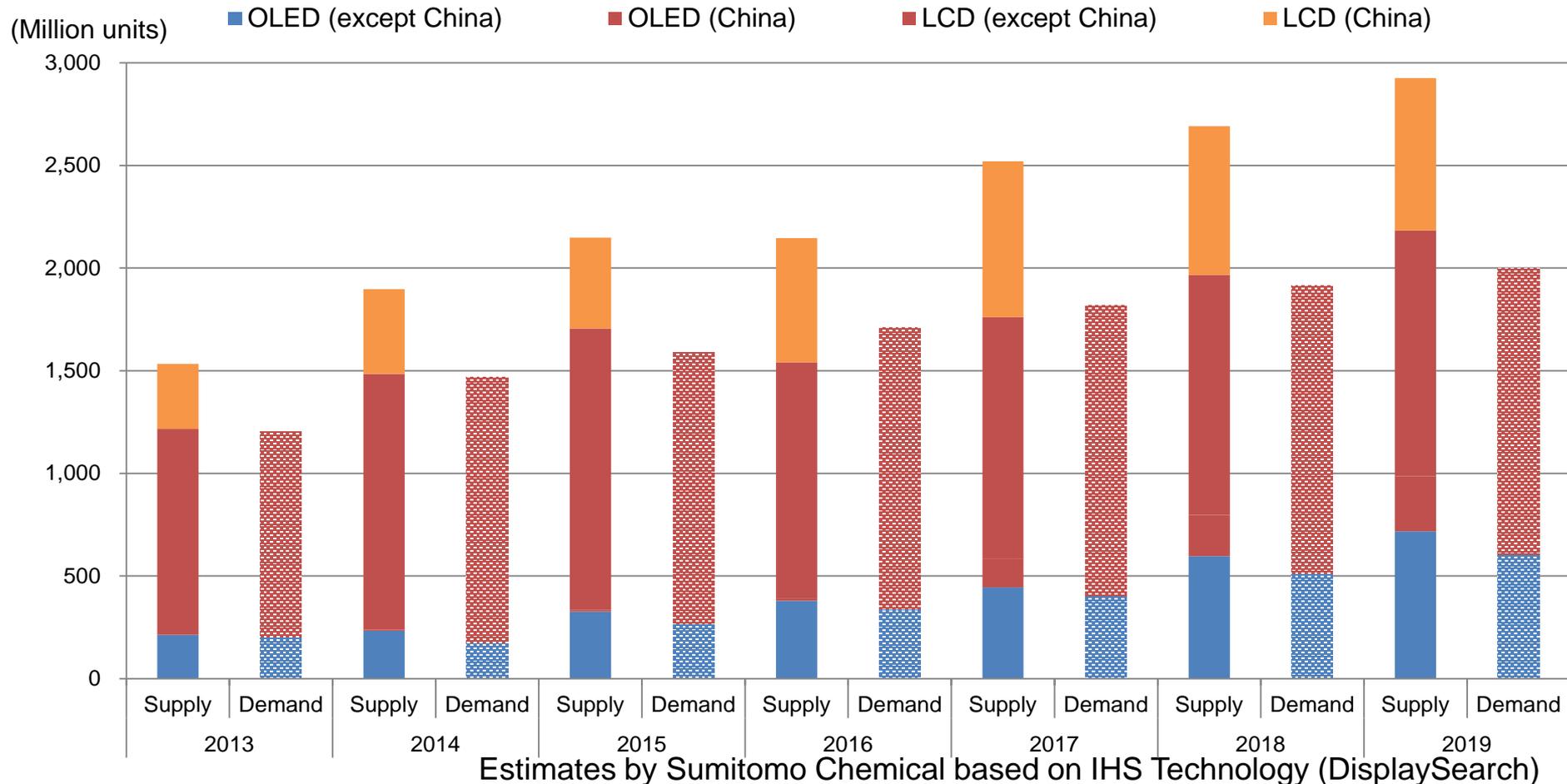
Start of Operation	Company	Line	Location	Generation	Capacity (thousands/month)
Q3 2017	BOE	B10	Fuzhou	8.5	120
	HKC	—	Chongqing	8.6	70
Q2 2018	BOE	B9	Hefei	10.5	90
2018	BOE	B11	Mianyang	8.5	120
	CEC IRICO	—	Xianyang	8.6	60
Q2 2019	CSOT	T6	Guangzhou	10.5	90

Flat Panel Display Materials Market

Create New Value

Displays for the mobile devices market

Demand and production capacity for displays for mobile devices



Flat Panel Display Materials Market

Create New Value

Displays for the mobile devices market

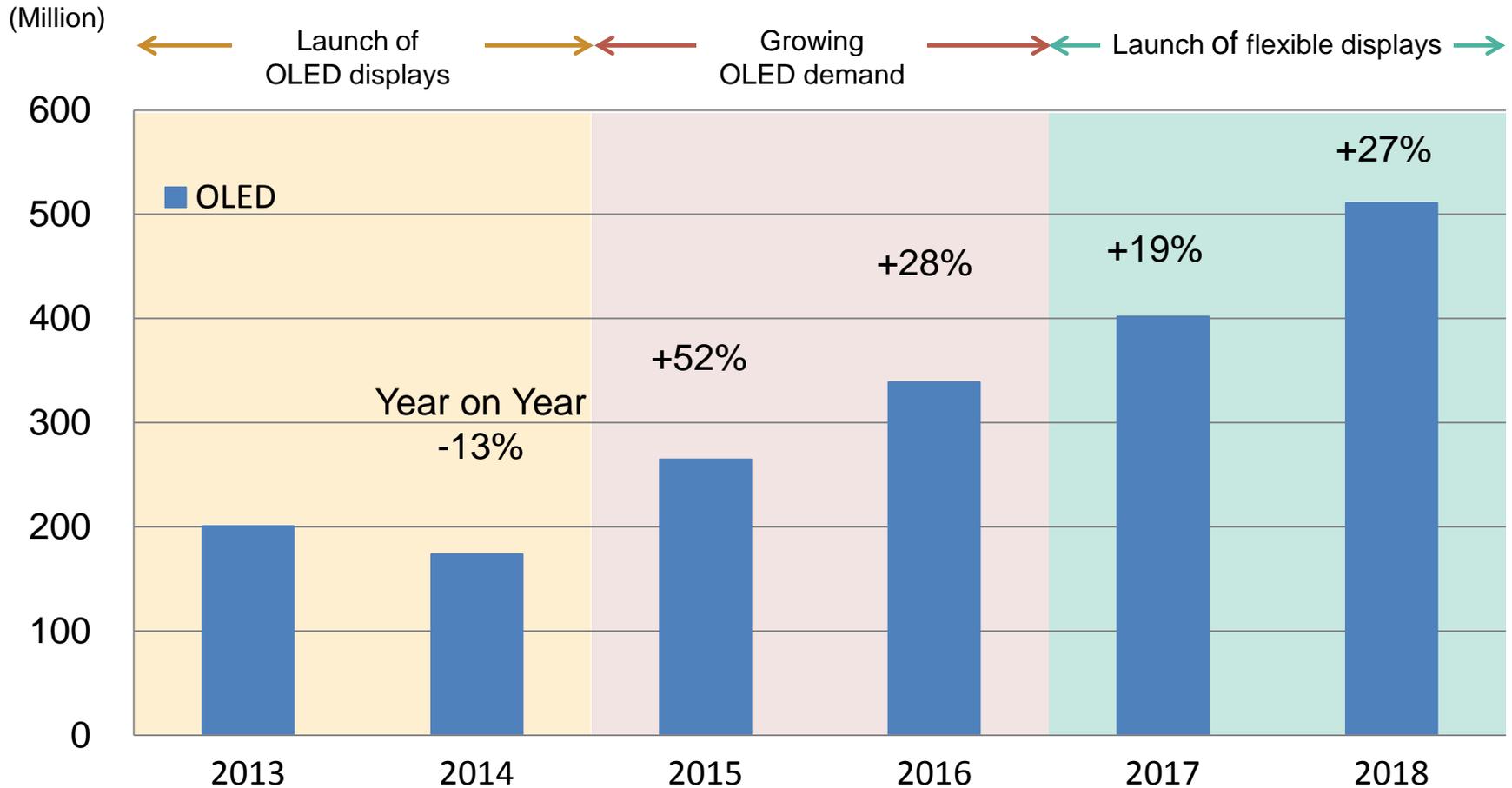
Investment plans for production facilities for smartphone LCD/OLED displays

Start of Operation	Company	Country	Technology	Generation	Capacity (thousands/month)
Q3 2016	JDI	Japan	LTPS/LTPO	6	50
	INX	Taiwan	LTPS	6	24
Q4 2016	Tianma	China	LTPS	6	30
	SDC	Korea	OLED	6	30
2016	TCL	China	LTPS	6	60
Q1 2017	TCL	China	OLED	6	60
	Tianma	China	OLED	6	30
	FVO	China	LTPS	6	30
	SDC	Korea	OLED	6	30
	LGD	Korea	OLED	6	10
Q2 2017	SDC	Korea	OLED	6	30
	LGD	Korea	OLED	6	25
Q3 2017	BOE	China	OLED	6	45
Q4 2017	Tianma	China	OLED	6	30
	JDI	Japan	OLED	6	25
	LGD	Korea	OLED	6	50
2018	Hon Hai	China	LTPS/ OLED	6	60

Flat Panel Display Materials Market

Create New Value

Smartphone OLED displays market

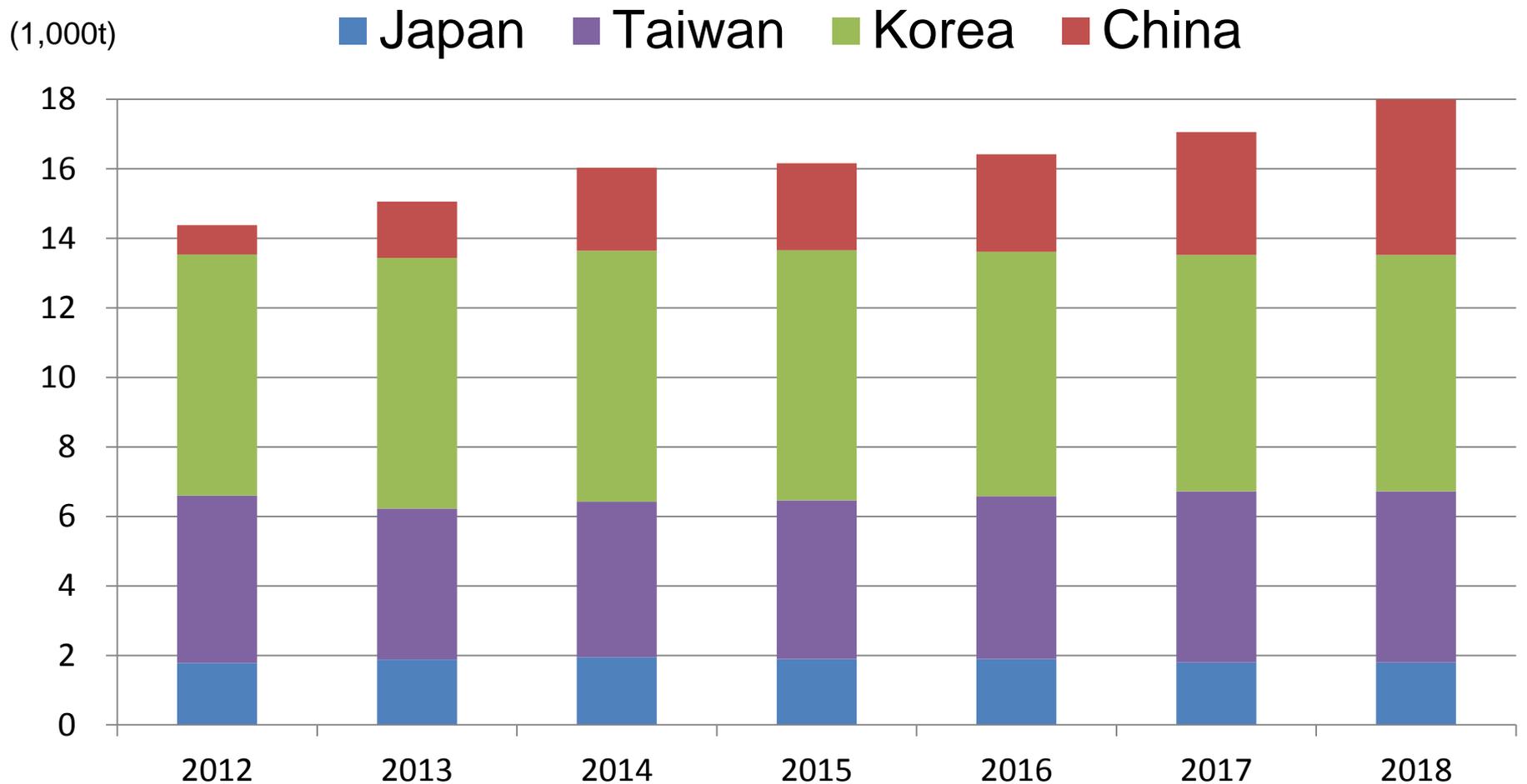


(Source: IHS Technology (DisplaySearch))

Flat Panel Display Materials Market

Create New Value

Color resists market



*Sumitomo Chemical estimations

Flat Panel Display Materials Market

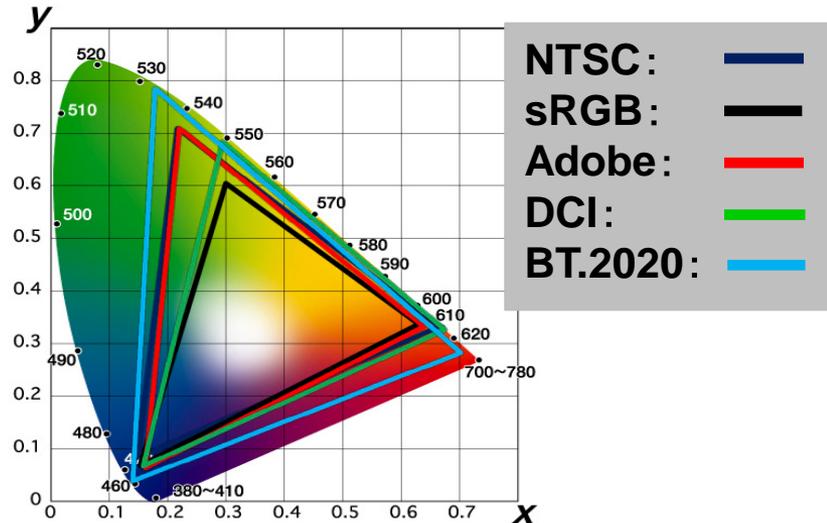
Create New Value

Required properties for liquid crystal displays and color resists

Required properties for liquid crystal displays	Technology trends			Required Properties for color resists
Higher color reproduction	① LCD Panel standards	NTSC/72% =s-RGB ⇒ DCI/adobe ⇒ UHDTV (BT2020)		Deeper colors
Greater brightness	② Backlights	(White) LEDs ⇒ 3 wavelength backlights ⇒ Laser backlights		High transmittance
Higher definition	③ Image resolution	(TV) 2K ⇒ 4K ⇒ 8K		High resolution
		(Mobile) 600ppi ⇒ 800ppi		

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.

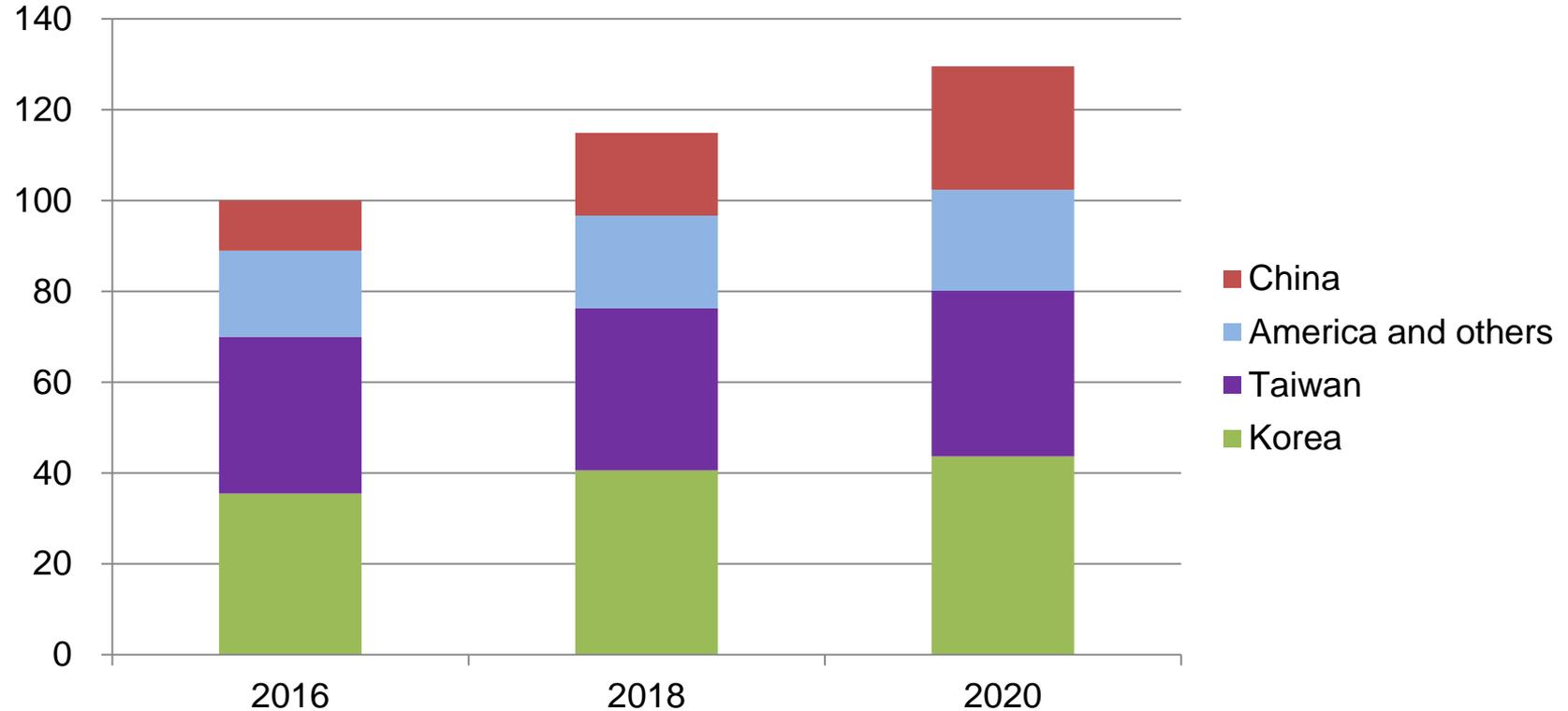


Semiconductor Materials Market

Create New Value

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

(Index)



Trends in miniaturization of circuits



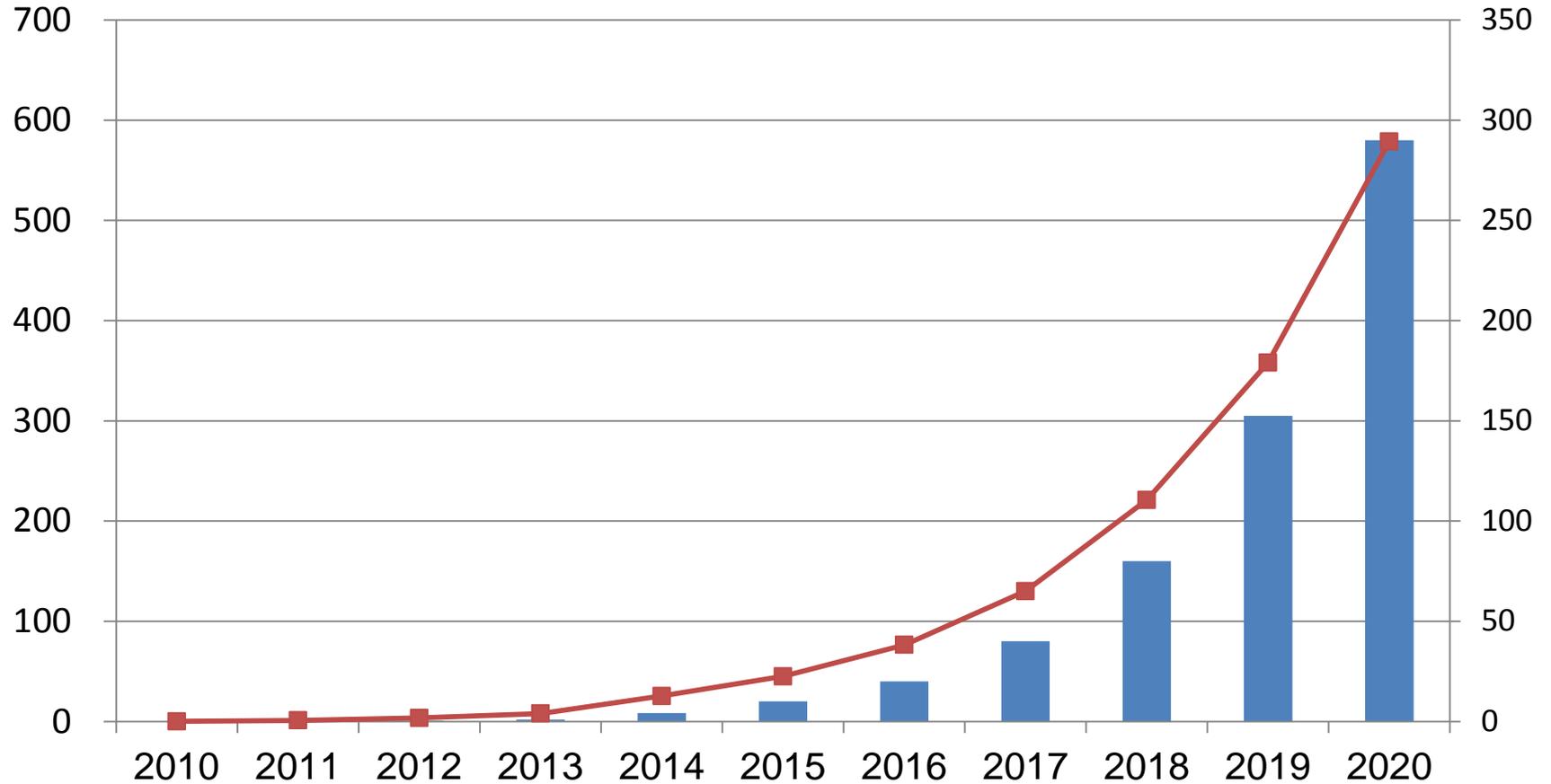
*Sumitomo Chemical estimations

Compound Semiconductor Market

Create New Value

Power devices market (GaN-on-Si)

(Thousand) ■ Shipment Volume ■ Shipment Amount (Millions of USD)



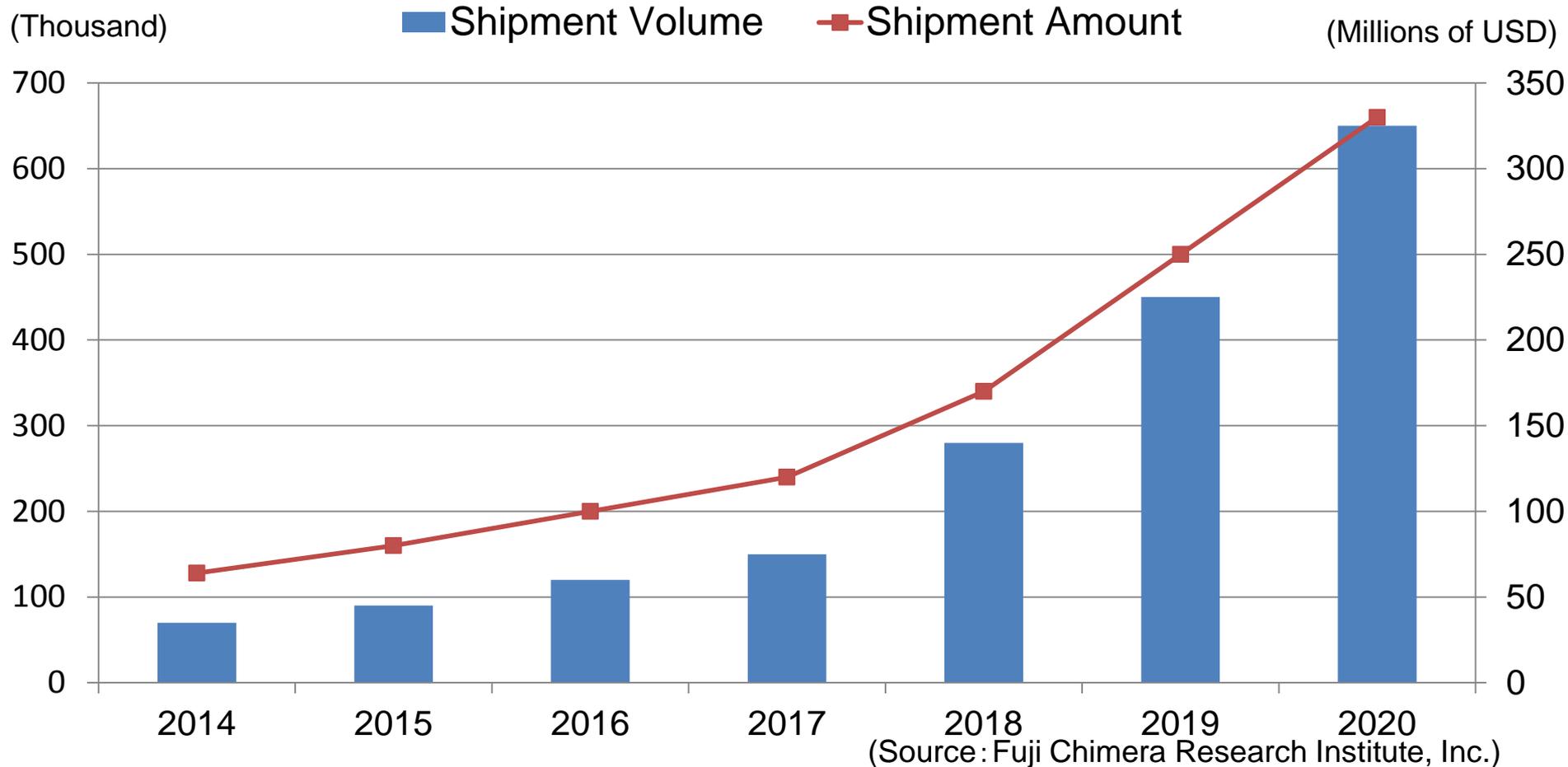
(in terms of 6-inch product)

(Source: Yole Développement)

Compound Semiconductor Market

Create New Value

GaN substrates market



Overview of Our IT-related Chemicals Business

Business Environment for IT-related Chemicals

Global Business Strategy

Development of Flexible Display Materials

Medium to Long-term Vision for IT-related Chemicals Sector

Create New Value

Medium to long-term goal

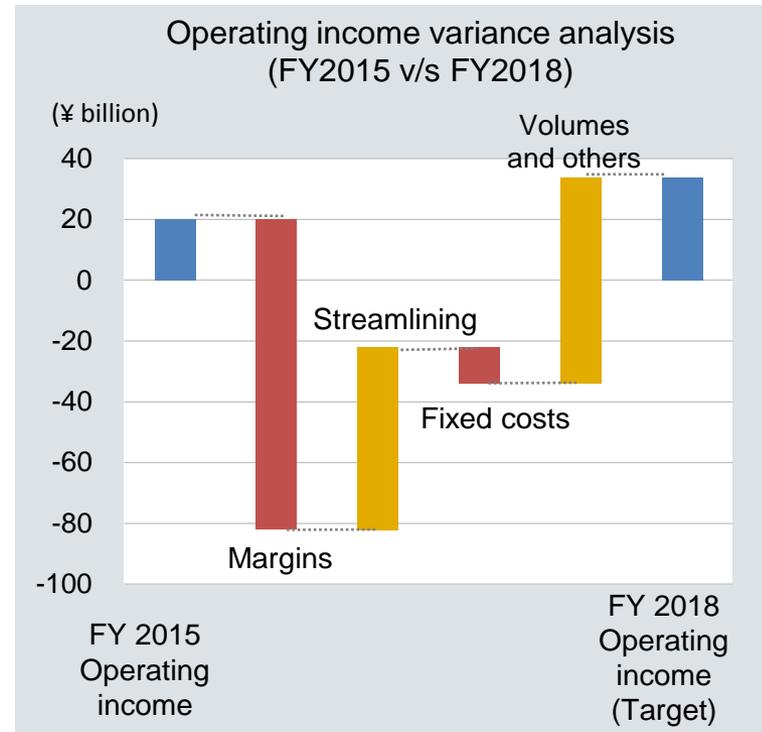
Deliver new value that responds to the changes in the ICT industry by leveraging our material development capabilities in collaborative development with customers

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



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

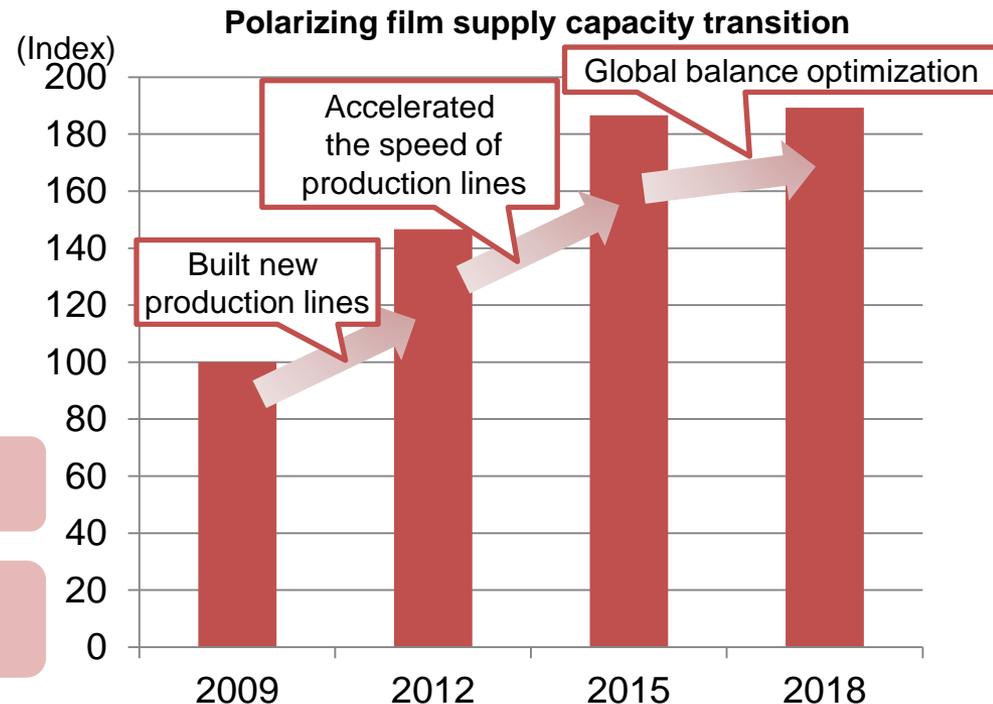
Basic Strategy

- ◆ Global balance optimization
- ◆ Promoting thorough cost rationalization



Maximize use of existing resources

Increased sales of products using in-house produced materials



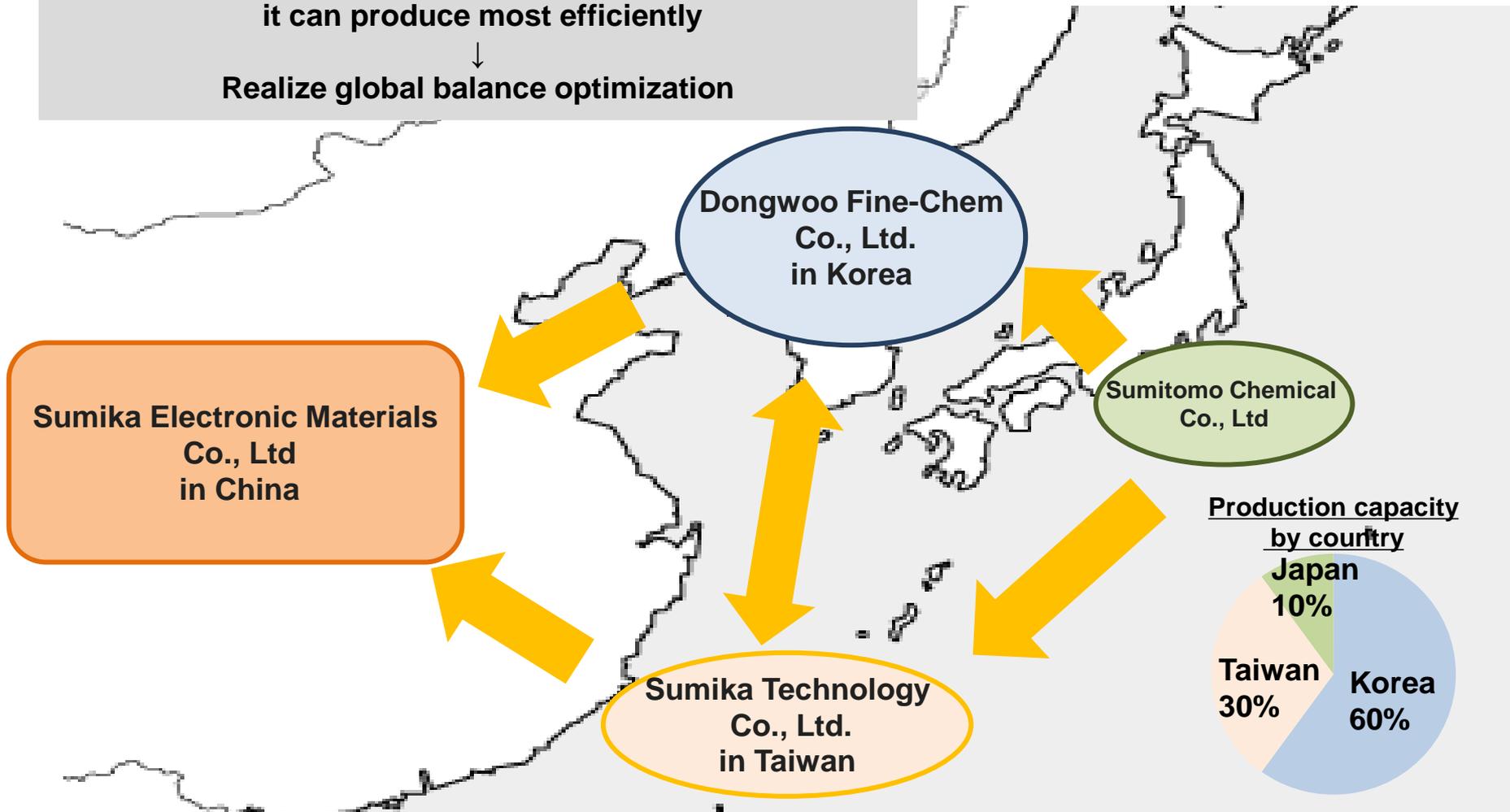
Flat Panel Display Materials

Create New Value

Polarizing films for TV

Each production line focuses on producing products it can produce most efficiently

↓
Realize global balance optimization



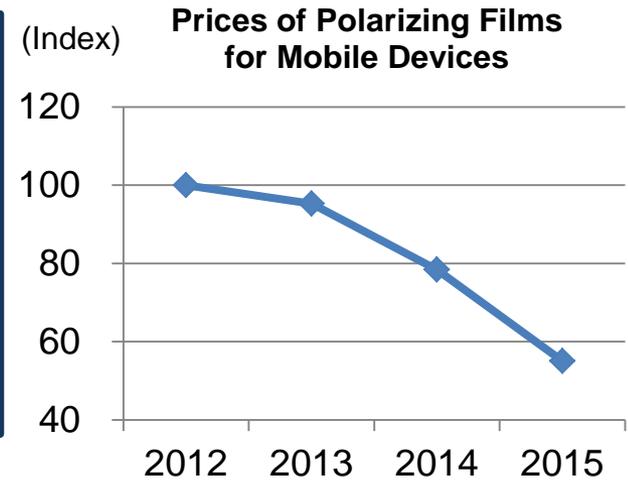
Polarizing films for mobile devices

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

Ultrathin stretched polarizing film

High durability polarizing film

Reverse wavelength dispersion film

Special processing

Coated-type polarizer

Flat Panel Display Materials

Create New Value

Color resists

Market Environment

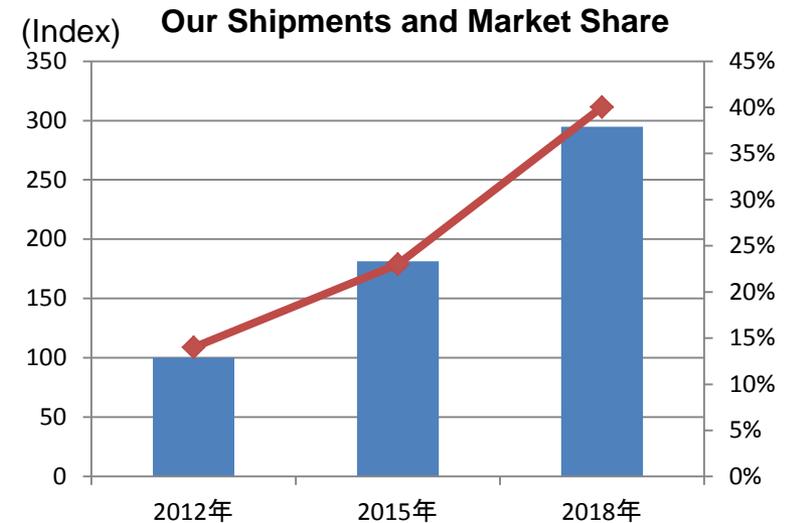
- Increased demand for high brightness/definition/color reproducibility
- Growth of the Chinese panel market

Basic Strategy

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

Track record of responding to customer needs in Taiwan and Korea

Accumulated technology from our dyes business



Accelerating the development of dye color resists

Global research targeted at the Chinese market, setting up a technical service structure

Flat Panel Display Materials

Create New Value

Touchscreen panels (glass substrate and film substrate types)

Market Environment

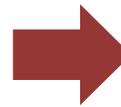
- Expanding market for OLED displays (increased demand for on-cell touch screen panels)

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

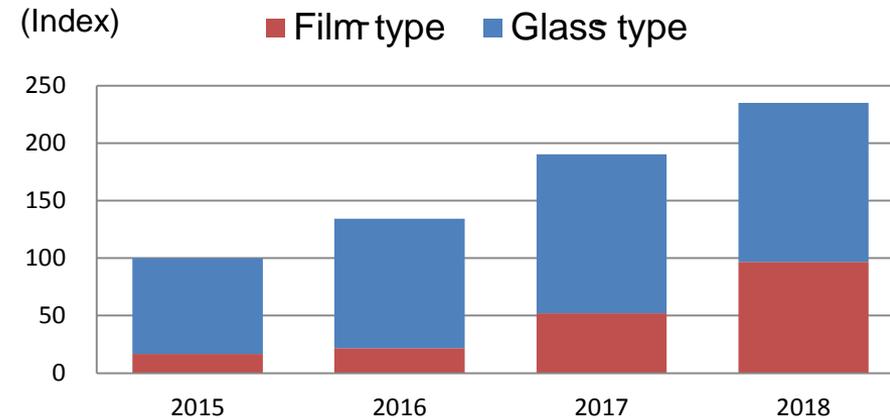


(Differentiation)

- Develop thinner glass-type touchscreen panels
- In-house processing of ITO layers

Increase customers for both glass substrate and film substrate types

Production Capacity



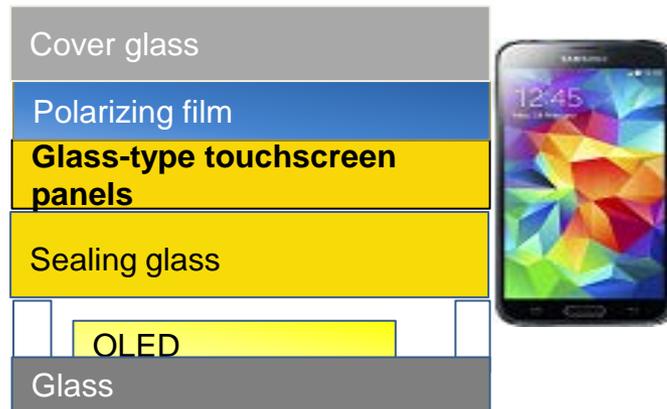
Flat Panel Display Materials

Create New Value

Touchscreen panels (glass and film types)

Glass-type touchscreen panels

(Making sensors on sealing glass)



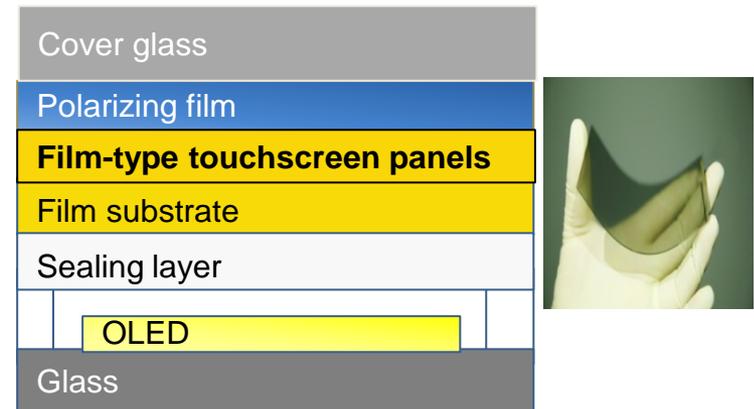
- Increase production capacity in the second half of 2016



Maintain top market share for on-cell type touchscreen panels

Film-type touchscreen panels

(Making sensors on film substrate)



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



The first step toward achieving flexible displays

Semiconductor Materials

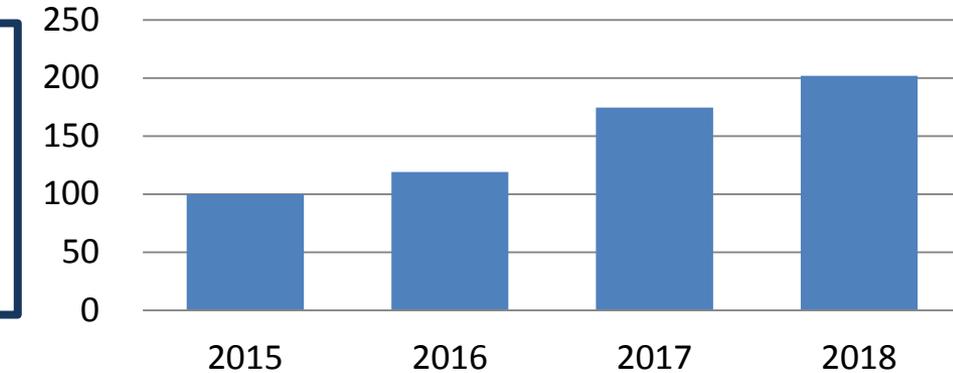
Create New Value

Photoresists

Market Environment

- High integration/miniaturization/3D
- Growth in the advanced logic and memory fields
- Evolution of packaging and assembly technology

(Index) Sales Volume of Immersion ArF Resists



Immersion ArF resist market continues to expand

New business opportunity in post-processing

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



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

Total manufacturing from basic materials based on organic synthetic technology

Quality management down to the nanoscale level

Compound Semiconductors Materials

Create New Value

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



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

GaN substrates

Strengthening our supply chain with the goal of becoming a leading supplier



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

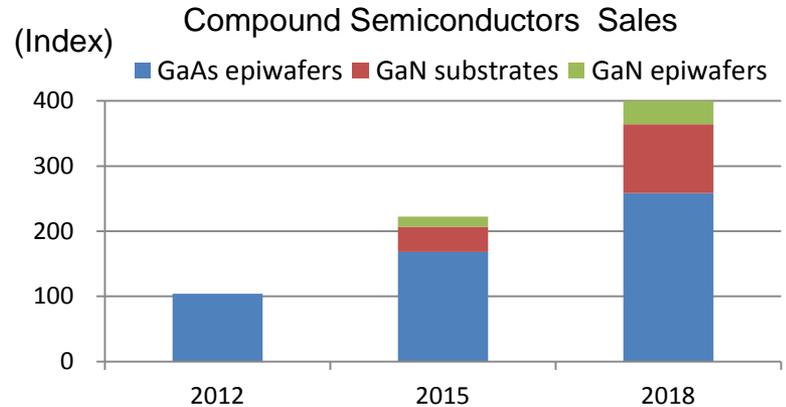
GaN epiwafers

(GaN-on-Si, GaN-on-SiC, GaN-on-GaN)

Establish a leading position in markets where growth is expected



**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.

Overview of Our IT-related Chemicals Business

Business Environment for IT-related Chemicals

Global Business Strategy

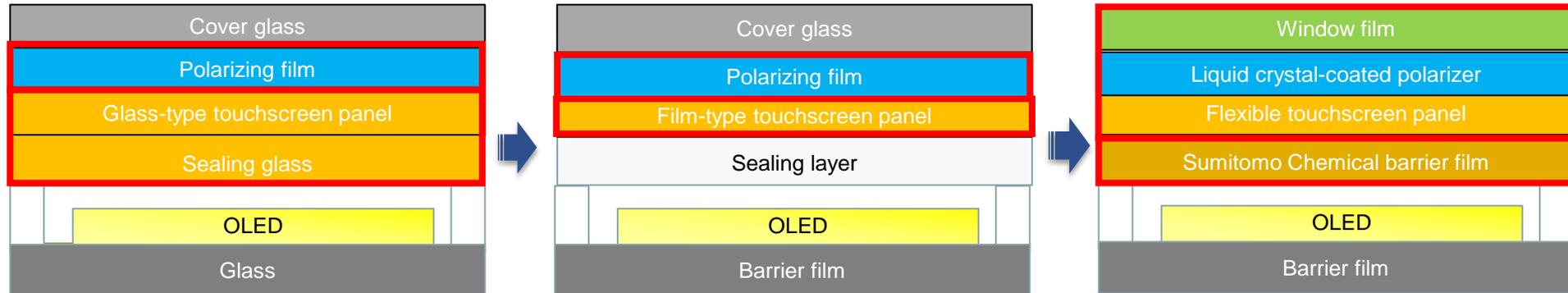
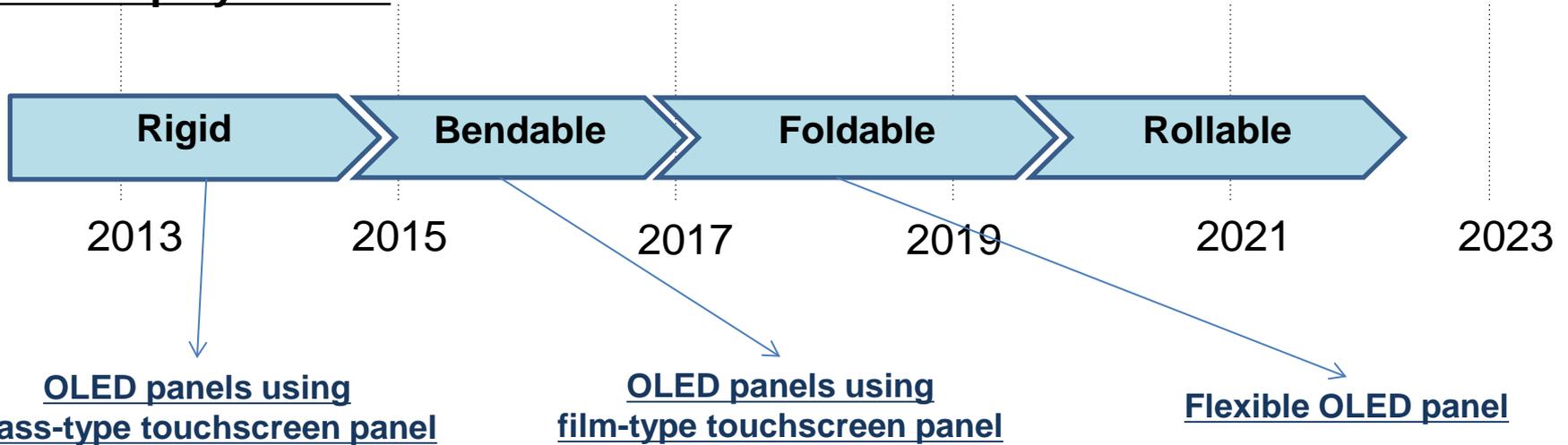
Development of Flexible Display Materials

Development of Flexible Display Materials

Create New Value

Roadmap for the development of flexible display materials

OLED Display Trends

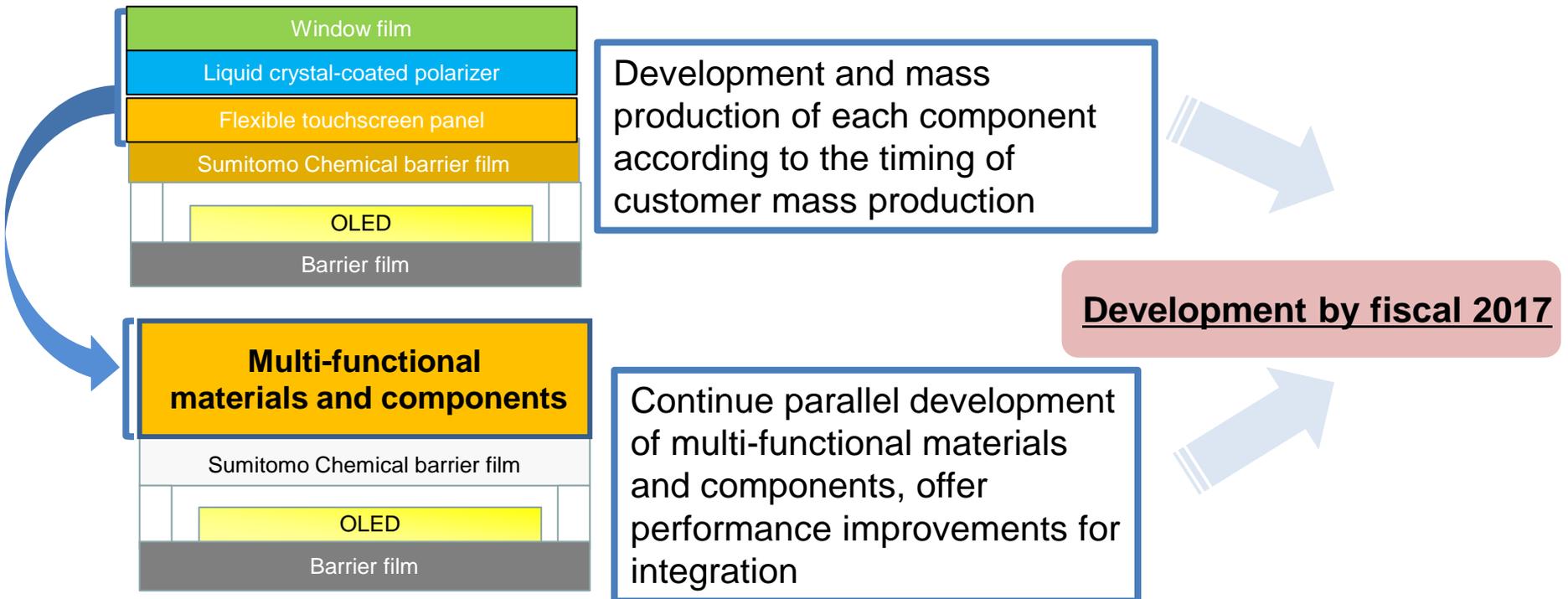


 Sumitomo Chemical products

Development of Flexible Display Materials

Create New Value

Roadmap for the development of flexible display materials



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

Create New Value

Window film



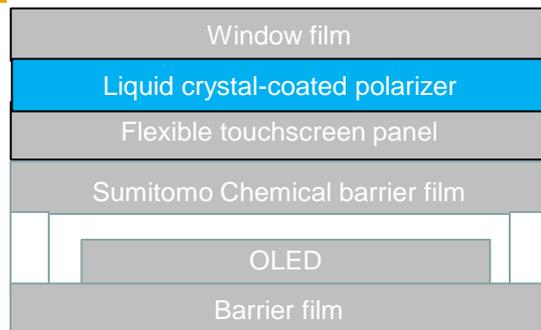
High-level balance of surface component characteristics and flexible component characteristics through polymer molecular design and process optimization

			Other Companies' Products	Our Products
Characteristics necessary for display surface components	Transparency	Transmittance	≤90%	>90%
	Color tone	YI	0-5	1-2
	Hardness	Pencil hardness	9H	9H
	Surface accuracy	Apparent reflectivity	Good	Good
Characteristics necessary for flexible components	Bendability	Bending test (3R)	>200,000 times	>200,000 times
	Low characteristic change	Water absorption	2-3%	<1%

Development of Flexible Display Materials

Create New Value

Liquid crystal-coated polarizer



Adding characteristics of low thickness, flexible components while maintaining the fundamental characteristics of anti-reflective materials

		Previous types	Liquid crystal-coated type
Characteristics necessary for anti-reflective components	Color tone	Neutral	Neutral
	Brightness	Transmittance	40-48%
	Anti-reflective performance	Reflection from cells	~0
Characteristics necessary for flexible components	Bendability	Bending test (3R)	>200,000 times
		Light leakage	 <i>Some light leakage</i>
	Thickness		<10µm
	Dimensional stability	95C 24Hr	Reduced shrinkage
			Significant shrinkage

Development of Flexible Display Materials

Create New Value

Flexible touchscreen panels



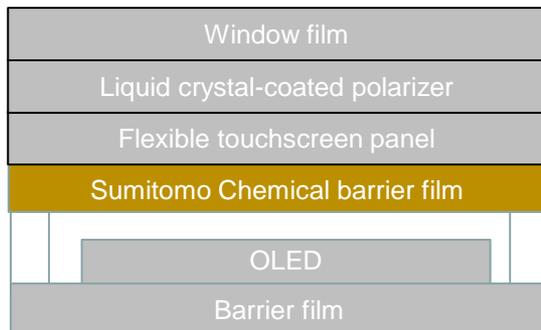
Providing the characteristics of thin, flexible components on a variety of substrates while maintaining the characteristics of an excellent touchscreen panel

			Film-type (Existing products)	Flexible
Touchscreen panel characteristics	Line resolution	L/S (μm)	10/10	10/10
	Pattern visibility		Difficult to see	Difficult to see
	Color tone		Neutral	Neutral
Characteristics necessary for flexible components	Thickness		40 μm -50 μm	<30μm
	Bendability	Curvature radius	3R	3R
		Bending test (3R)	—	>200,000 times
	Substrate selection		Narrower	Broader

Development of Flexible Display Materials

Create New Value

Barrier film



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



			Other Companies' Products	Our Products
Barrier characteristics	Water vapor resistance	WVTR(g/m ² /day)	10 ⁻⁵	10⁻³-10⁻⁵ (selectable)
Characteristics necessary for flexible components	Bendability	Curvature radius	≥20R	≤10R
	Optical characteristics	Transmittance	88-89%	90-91%
	Substrate selection		Narrower	Broader

Creative Hybrid Chemistry



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.