IR SEMINAR 2021

ULVAC's Approach to the Chinese Electronic Device Market

ULVAC (Shanghai) Trading Co., Ltd.
Director, Vice General Manager
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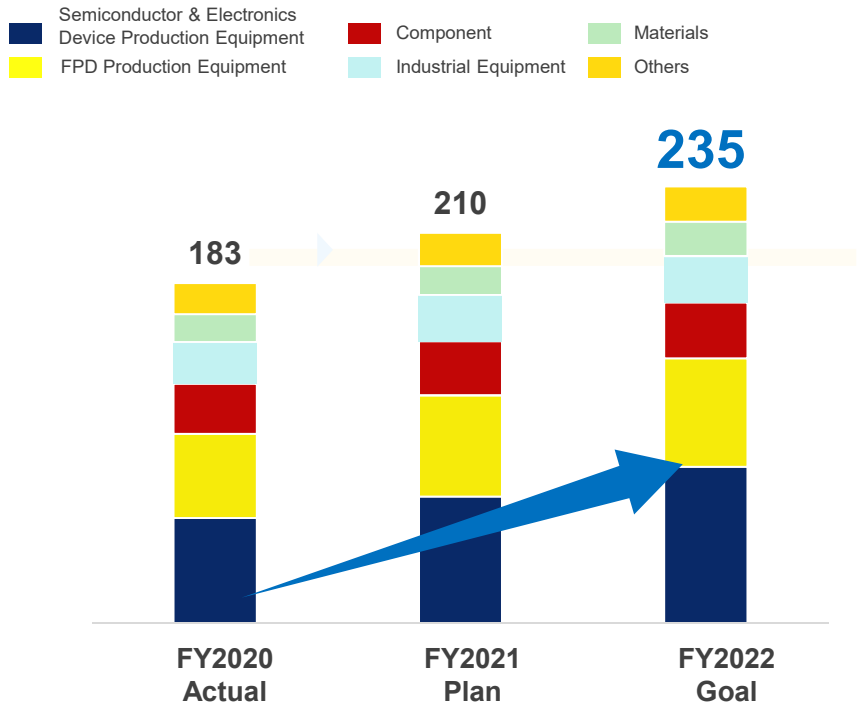
Leading the World
In Vacuum Technology

Dec.15,2021

Growth Mainly Driven by Semiconductors and Electronics (Pillar of the Mid-Term Management Plan)

Net Sales

(Unit: ¥1 billion)



Electronics Device

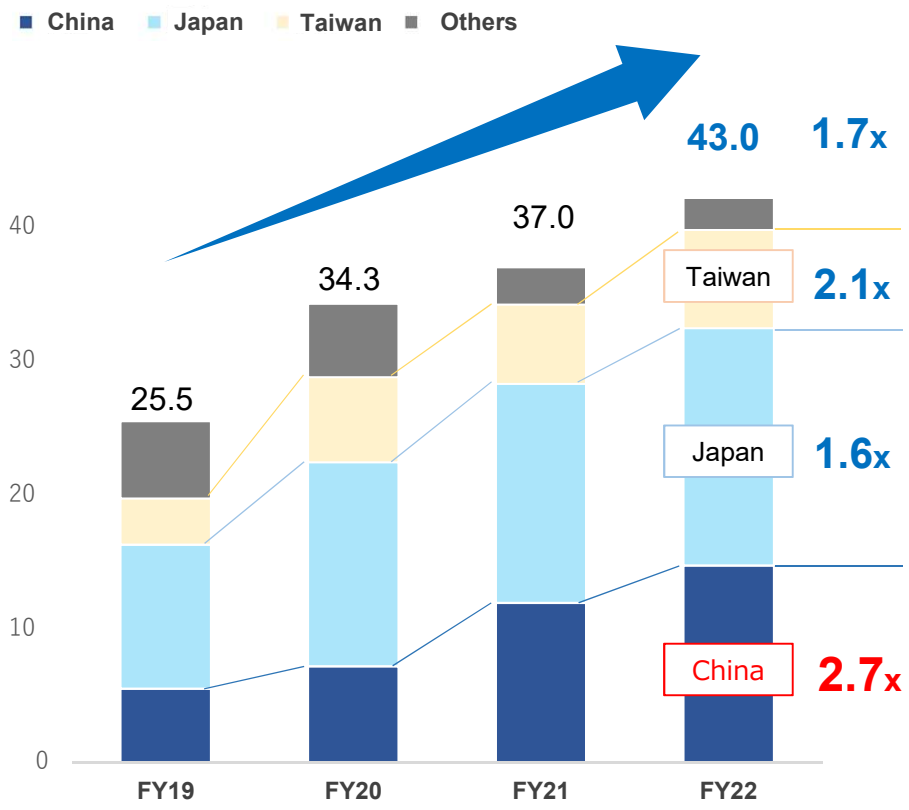
Power/Optical/Communication Devices・Packaging・Sensor

- Smaller size and lower cost
- Lower energy consumption
- High speed and low latency
- Multifunctionalization

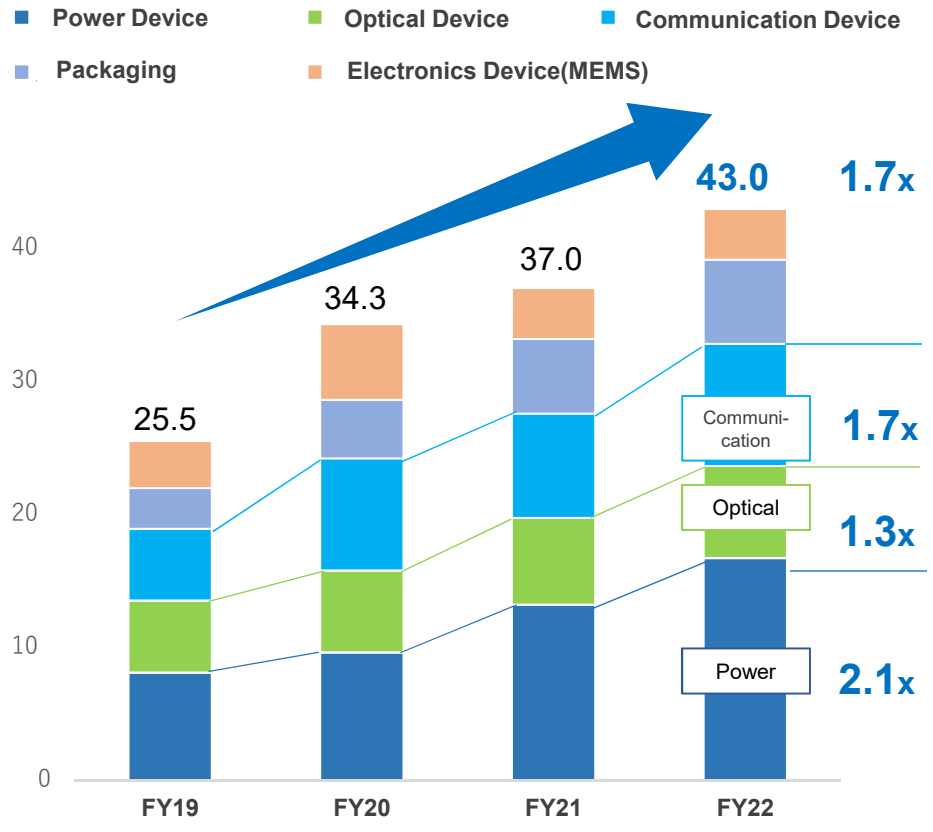
Expansion of China's Electronic Device Market

- Expansion of electronic device-related investment in line with new energy shift and digital infrastructure investment
- Plan to grow 2.7 times compared to FY19 in China, partly due to the government's policy of domestic production
- Active investment in power devices, optical devices, communication devices, batteries, etc. (Battery belongs to FPD Department)

Order Plan（by area） (Unit: ¥1 billion)



Order Plan（by segment） (Unit: ¥1 billion)



Growing Demand for Electronic Devices and Domestic Production Policy

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Growing Demand for Electronic Devices

- New energy shift
- Digital Infrastructure Construction

Large Electronic device market depending on imports

- World's factory (1.4 billion consumers)
- Electronic devices are mostly imported

Domestic Production Policy

- Stabilizing the supply chain (Avoid Procurement risk)
- Improvement of trade balance

Local government support, vigorous entrepreneurship

- Various preferential and supportive measures to attract businesses
- New entrants surging

Increase in Demand for Electronic Devices (New energy shift, Digital Infrastructure Construction)

New Energy Shift (Carbon Neutral)

- **Renewable Energy Shift**
  Renewable energy expected to be majority in 2025
- **Increase in new energy vehicles**
  1.36M units in 2020⇒8.75M units in 2025 (expectation)
- **Global LiB production volume**
  65 billion RMB(46% produced by Chinese companies） in 2020
  ⇒120 billion RMB during 2025 to 2027

Digital Infrastructure Construction

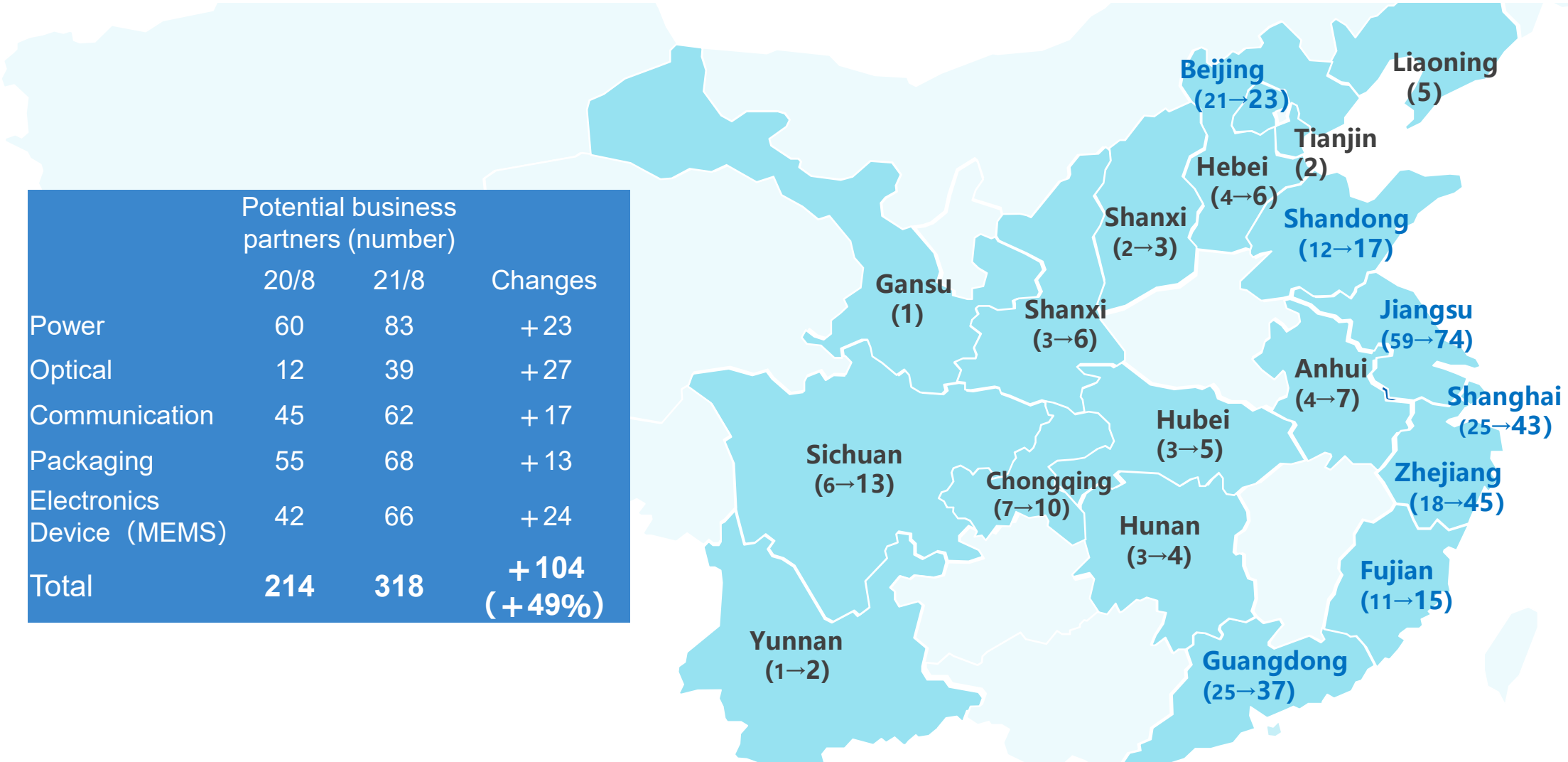
- **5G base station**
  1.3M bases in 2019 ⇒ 5.8M bases in 2026
- **Data Center Construction**
  The amount introduced in a single year in 2025: 3 times more than 2020
- **Power Device Market**
  4.8 billion RMB in 2020
  ⇒31.6 billion RMB in 2025
- **High-frequency device market (5G, etc.)**
  In 2025：3.1 billion RMB(3 times)

Source：the document made by Mr. Noriyoshi Kuromasa, Shanghai Bureau Chief, Sangyo Times

Active electronics investment in China

- The domestic production policy and the local government support stimulate investment in the electronics sector, especially in coastal areas.
- Business negotiations increased in a wide range of fields such as power device, optical-device, communication devices and packaging

	Potential business partners (number)		
	20/8	21/8	Changes
Power	60	83	+23
Optical	12	39	+27
Communication	45	62	+17
Packaging	55	68	+13
Electronics Device（MEMS）	42	66	+24
Total	**214**	**318**	**+104 (+49%)**



Ulvac's lineup of equipment for various electronic device fields and applications

ULVAC

	Final Usage	Device
Power Device	EV Automotive Devices Inverter Motors Industrial robots Power Saving Devices	IGBT SiC Diodes MOSFET
Optical Device	AR/VR Automotive instrument panels 3D Sensor	µOLED Anti-reflection film Band Pass Filter
Communication Device	Smartphones Wireless base stations	SAW and BAW Filters RF Devices
Packaging	PC Smartphones Data Servers IoT devices	FanOut WFP・PLP Info-package
Electronics Device (MEMS)	Fingerprint recognition LiDAR	Piezo-MEMS

ULVAC's Equipment

Sputtering Equipment

Evaporation Equipment

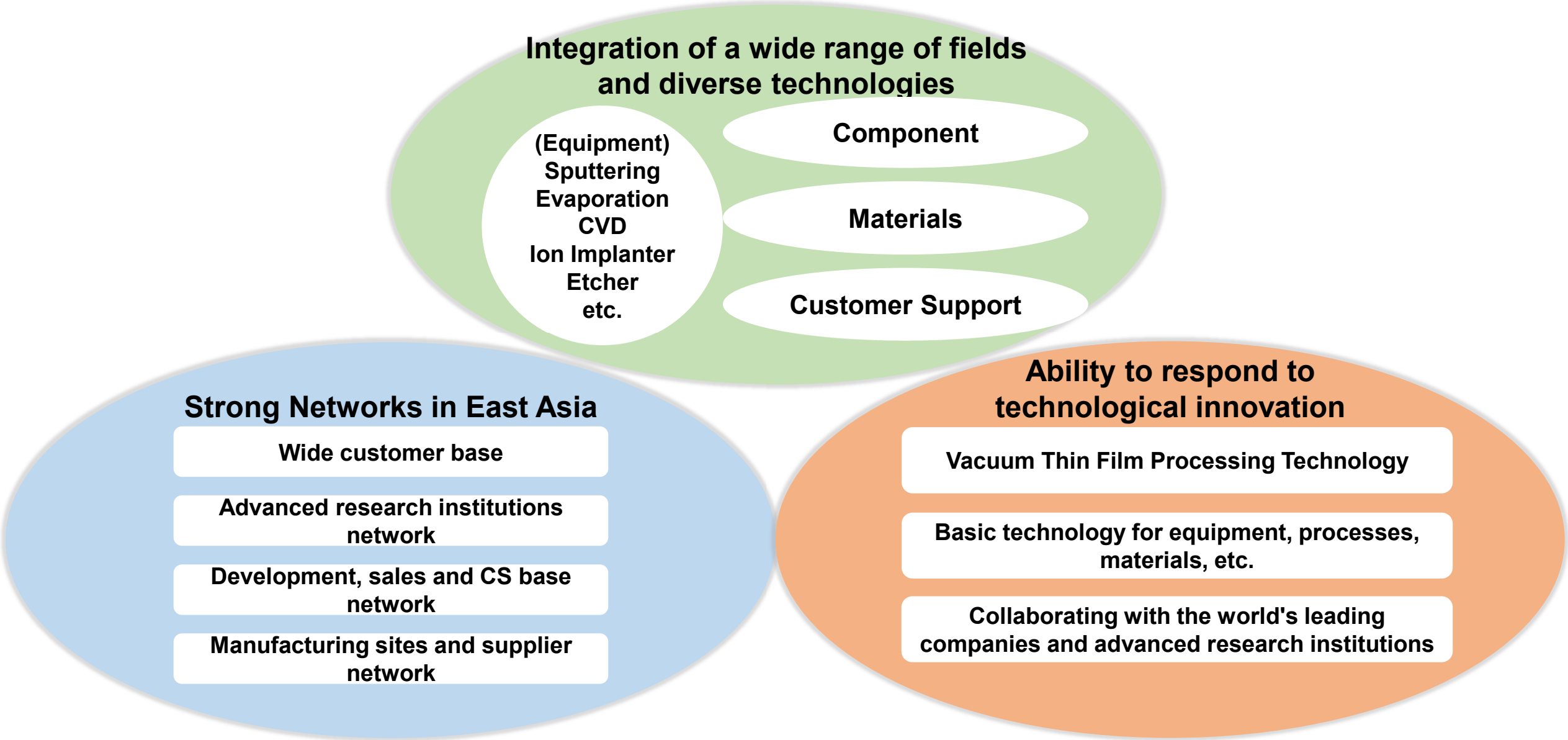
Ion Implanter

CVD Equipment

Etcher Equipment

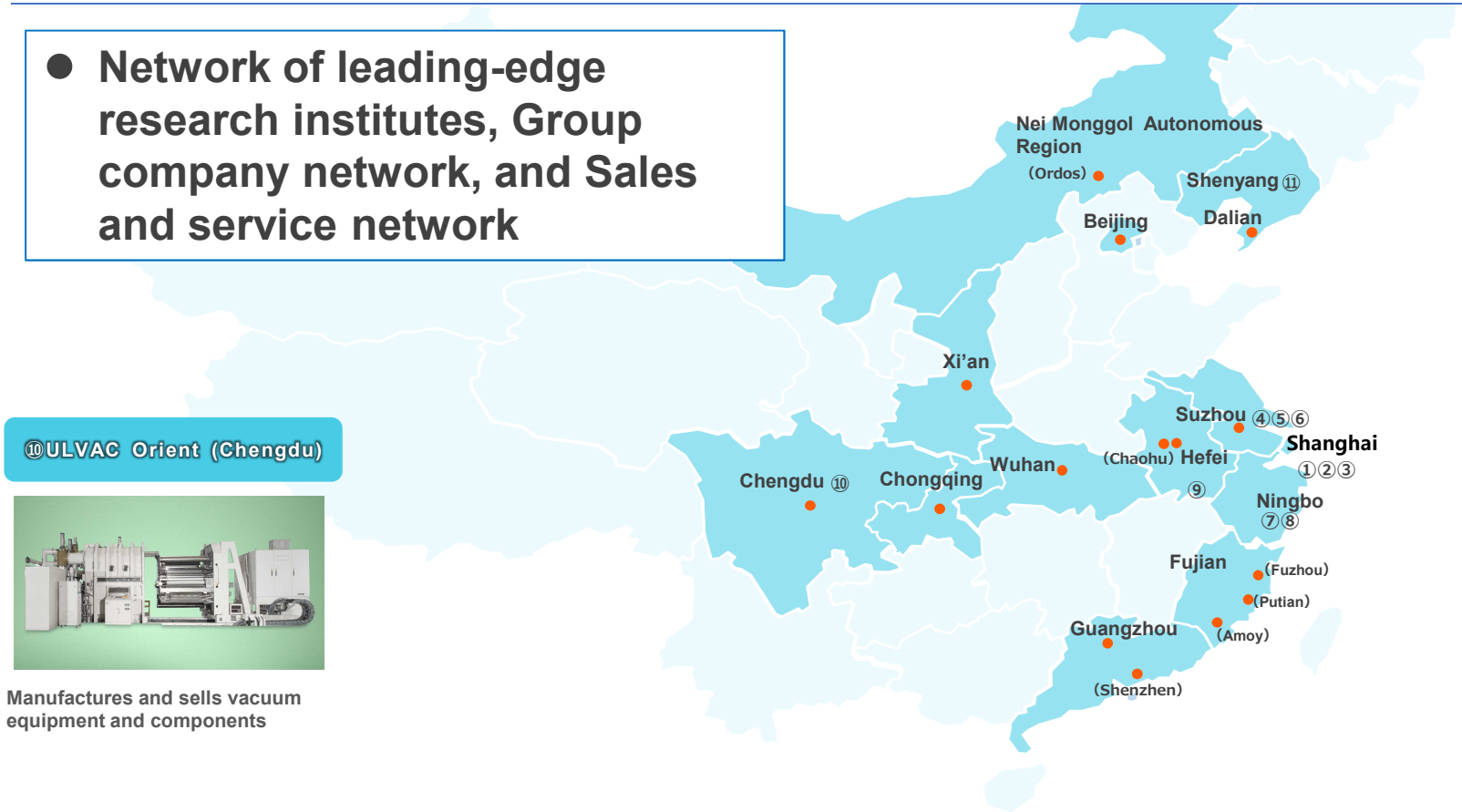
Ashing Equipment

ULVAC's Advantages



Extensive Network in China

- **Network of leading-edge research institutes, Group company network, and Sales and service network**



⑪ULVAC (Shenyang) CO.,LTD.

Manufactures, sells, and provides customer support for vacuum equipment

③ULVAC Automation Technology (Shanghai)

Develops, designs, manufactures, and sells electrical control panel and automatic control solution

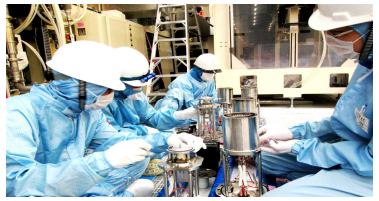
⑩ULVAC Orient (Chengdu)

Manufactures and sells vacuum equipment and components

①ULVAC (CHINA) HOLDING

Undertakes administrative and coordinating tasks for investment and business in China

②ULVAC (Shanghai) Trading



Sells and provides customer support for products manufactured by ULVAC group companies

● Branch office or CS

⑨ULVAC Coating Technology (HEFEI)

Manufactures, processes, and sells mask blanks for flat panel displays

⑧ULVAC CRYOGENICS (NINGBO)

Manufactures, sells, and provides customer support for cryopump

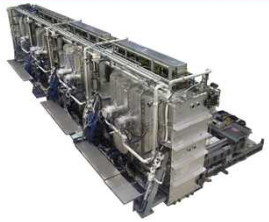
⑦ULVAC (NINGBO) CO., LTD.

Manufactures and sells vacuum pumps

⑥ULVAC Research Center SUZHOU Co., Ltd.

Provides technologies for R&D into vacuum equipment

⑤ULVAC (SUZHOU) CO., LTD.



Manufactures and sells vacuum equipment and components

④ULVAC Materials (Suzhou)

Develops, manufactures, sells, and provides customer support for sputtering targets

Ulvac's lineup of equipment for various electronic device fields and applications

ULVAC

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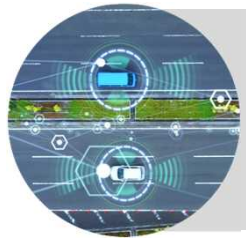
 **Electronics Device (MEMS)**	Fingerprint recognition LiDAR  	Piezo-MEMS

ULVAC's Equipment

Sputtering Equipment

Evaporation Equipment

Ion Implanter

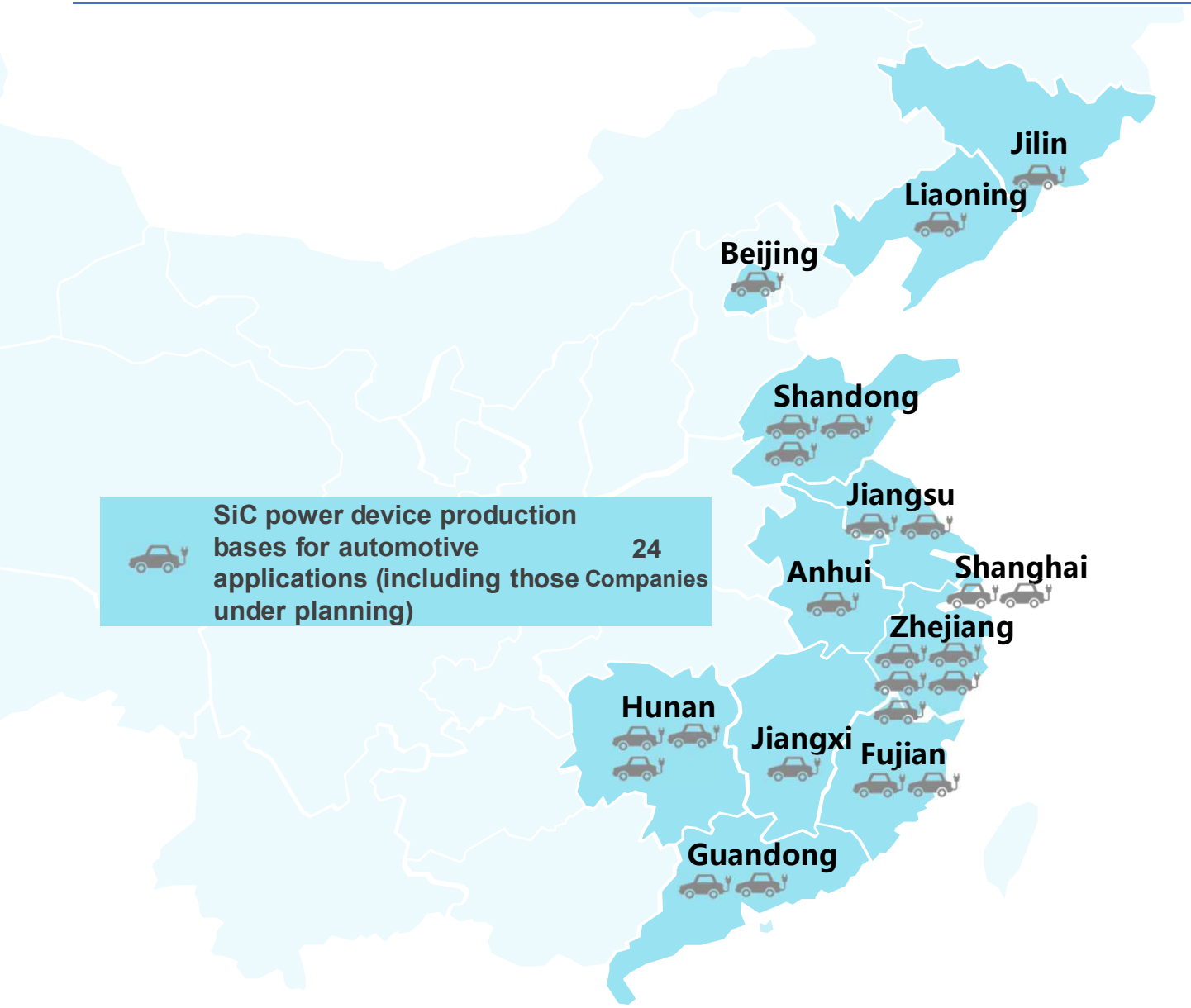
CVD Equipment

Etcher Equipment

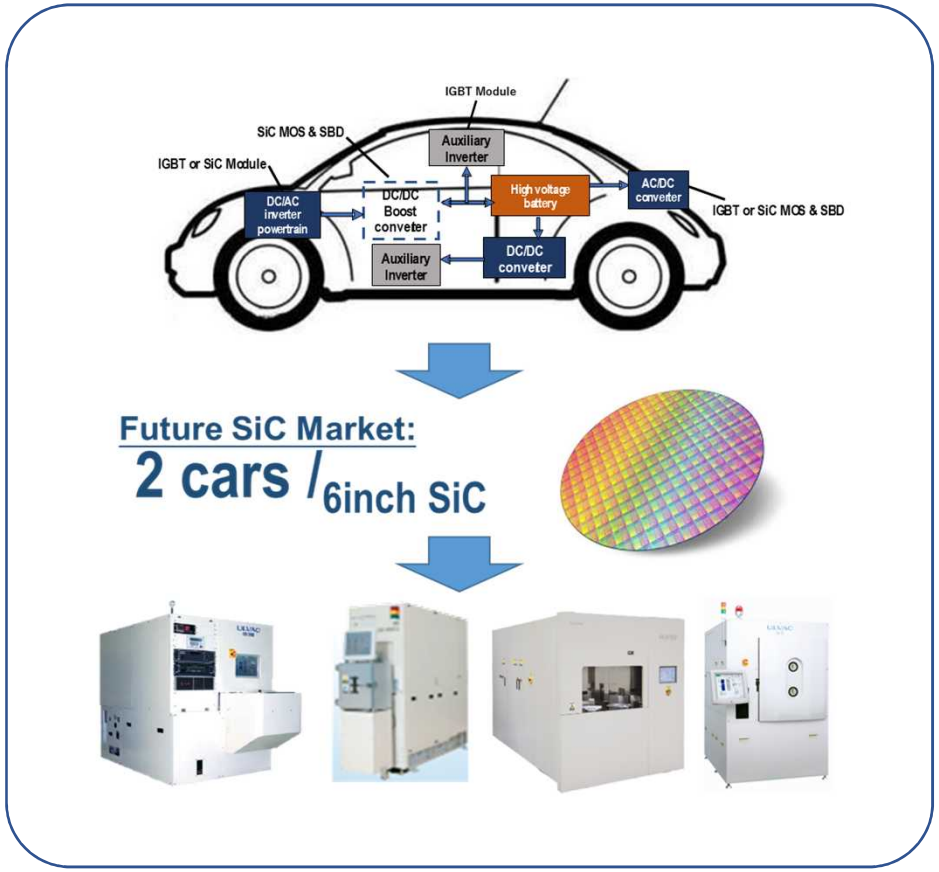
Ashing Equipment

Investment in SiC Power Semiconductors for Automotive applications increasing in China

ULVAC



SiC power device production bases for automotive applications (including those under planning) 24 Companies



Source：Made by ULVAC based on the information of 2021 Sandaiban latest investment

Power Device

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- **Increasing importance of high-power power devices due to the development of green energy and EVs**

IGBT

High voltage
Large current

Market Environment

✓ Active investment by major Japanese companies

Japanese Company	Investment Amount/Period
Company A	¥130 billion/5 years(2021-2026)
Company B	¥160 billion/4 years(2019-2023)
Company C	¥18.8 billion/3 years(2021-2023)
Company D	¥60 billion/5 years(2020-2025)

ULVAC's Equipment

Backside Metallization Sputtering System

SiC

High voltage
Large current

- ✓ Accelerating green energy investment
- ✓ Domestic Production Policy and Local Government Support
- ✓ Strengthening SiC Wafer Production in China

Sputtering System

Etching System

Ion Implantation System

Evaporation System

Si-MOSFET

Low voltage
Small current

- ✓ Inverterization of home appliances, etc.
- ✓ Domestic production policy and local government support
- ✓ Strong demand for low to mid-end devices

Batch-type High Vacuum Evaporation System

Power Device（SiC）

Background of SiC's Growth in China

- **Increasing demand for power devices as the shifts to new energy (power generation, power transmission, power storage, EV, etc.) and the development of digital infrastructure**
- **Focus on power devices, as trade frictions between the U.S. and China makes it difficult to develop leading-edge semiconductors (large appetite for domestic production)**
- **Expectations for the possibility of replacing Si-IGBTs in automotive applications**
- **Enhancement of SiC supply chain**

✓ More than 24 SiC wafer factories (2.15 million wafers in total)

✓ More than 35 SiC semiconductor construction projects

Source: The presentation material made by Mr. Noriyoshi Kurosasa, Shanghai Bureau Chief, Sangyo Times

Features of Ion Implanters for SiC

✓ Ion implantation at high energy
✓ High temperature process treatment
✓ Implantation at different depths in several stages

Supporting mass production with Chinese companies for the past 10 years

More than 70% share of Chinese SiC ion implanter market

High-temp Ion Implanter for SiC
IH-860PSIC

Power Device（MOSFET）

Si－MOSFET Market in China

- China procures about 40% of Si-MOSFETs as production goods
- Dependence on imports ⇒ Strong desire to produce domestically
- Increasing demand for EVs and 5G (smartphones and base stations)⇒Robust investment

Advantages of ULVAC's Vacuum Deposition Equipment

- High productivity and low-cost equipment through local production in China
- ✓ High quality equipment manufacturing technology
- ✓ Local design
- ✓ Supply chain development and construction

Company Profile

Company Name	ULVAC (SUZHOU) CO., LTD.
Establishment	July,2003
Employees Number	135 (as of 2021/6)
Product	FPD・Electronics Device Production Equipment

Optical Device

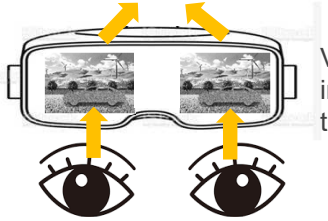
- Rapid expansion of various applications as the connected world advances

Usage・Structure

µOLED for AR/VR

Structure of AR

Actual visible image (3D)

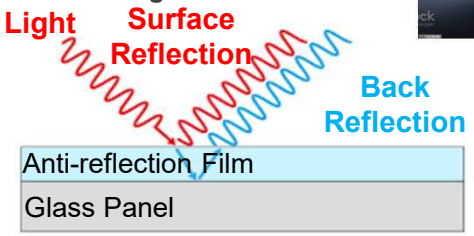


VR headsets output images (µOLED) to the left and right

Anti-Reflection Film for automotive instrument panels

Structure of Anti-reflection Film

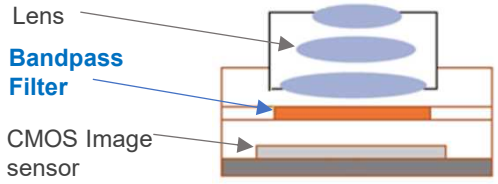
Reflection reduction by two wavelengths canceling each other out



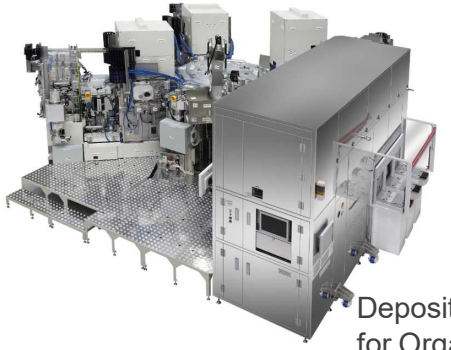
3D Sensor for biometric authentication, etc.

Structure of Bandpass Filter

Filter for infrared cameras such as smartphones: only the desired frequency band can pass



ULVAC's Equipment



Deposition System for Organic Devices

Optical Film Deposition System

Dry Etching Tool

Communication Device・MEMS

- **As 5G and IoT become widespread, communication devices and MEMS will expand with technological innovation.**

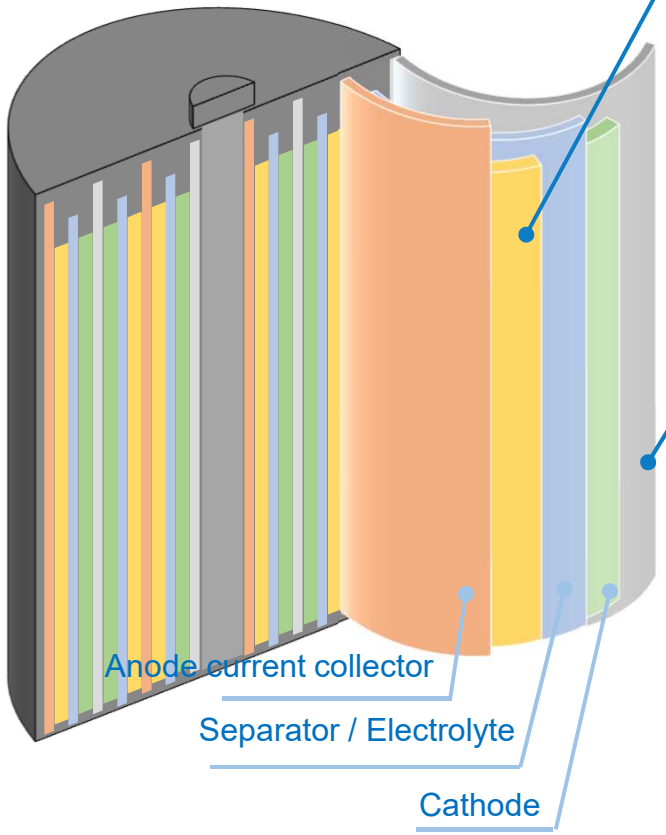
	Market Environment	ULVAC's Equipment
Higher Frequency SAW・BAW Filter	✓ Full-scale diffusion of 5G ✓ Technological innovation and new materials due to higher frequency ✓ Expansion of applications and increase in the number of installed devices	 Combined modules' deposition system of cluster type
Base Station RF Device	✓ Full-scale diffusion of 5G ✓ Improvement of base station network ✓ Increase in high-speed, high-capacity communication devices	 Dry Etching Tool
MEMS Piezo-MEMS etc.	✓ Development of 5G and IoT ⇒ Increasing number of sensors ✓ Higher performance, smaller size, lower power consumption ✓ Expansion of applications for sensors and actuators	 Cluster-type PE-CVD System

Initiatives for the Battery Market for the Future

ULVAC

Battery Trends

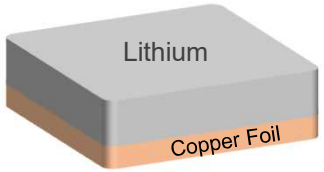
- High energy density
- Fast charging
- High safety
- Long life span



Trends in Battery Materials

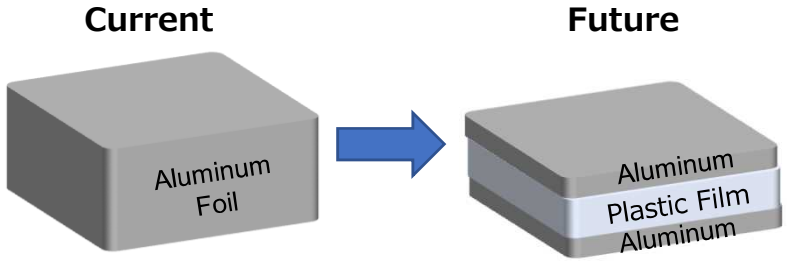
Anode

- Practical application of Li metal
- Increase in energy density
- Elimination of dead lithium and dendrites



Cathode Current Collector

- Reduction of weight and volume
- Improved strength
- Short circuit prevention



Product Development

Li Evaporation Equipment

- Precise control of Li content
- High purity
- High smoothness

Al Evaporation Equipment

- Batch double-sided film deposition
- Low resistance
- High productivity

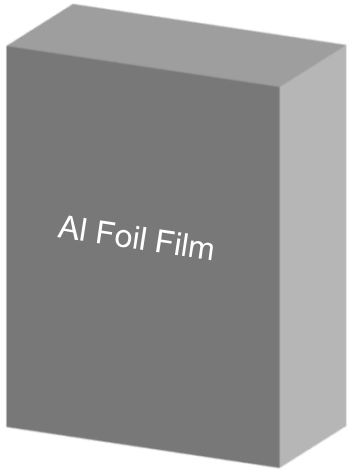
Adopting Al Foil Film for Cathode Current Collector

High Energy Density

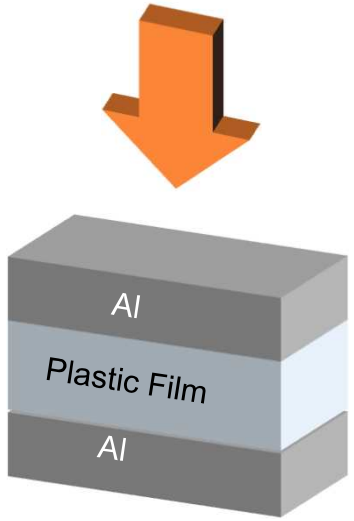
(Energy per volume Wh/ℓ)

- ✓ **The overall thickness is halved, and the volume is reduced**
  → **Increase of Energy Density**

Existing Technology



Al Foil Film

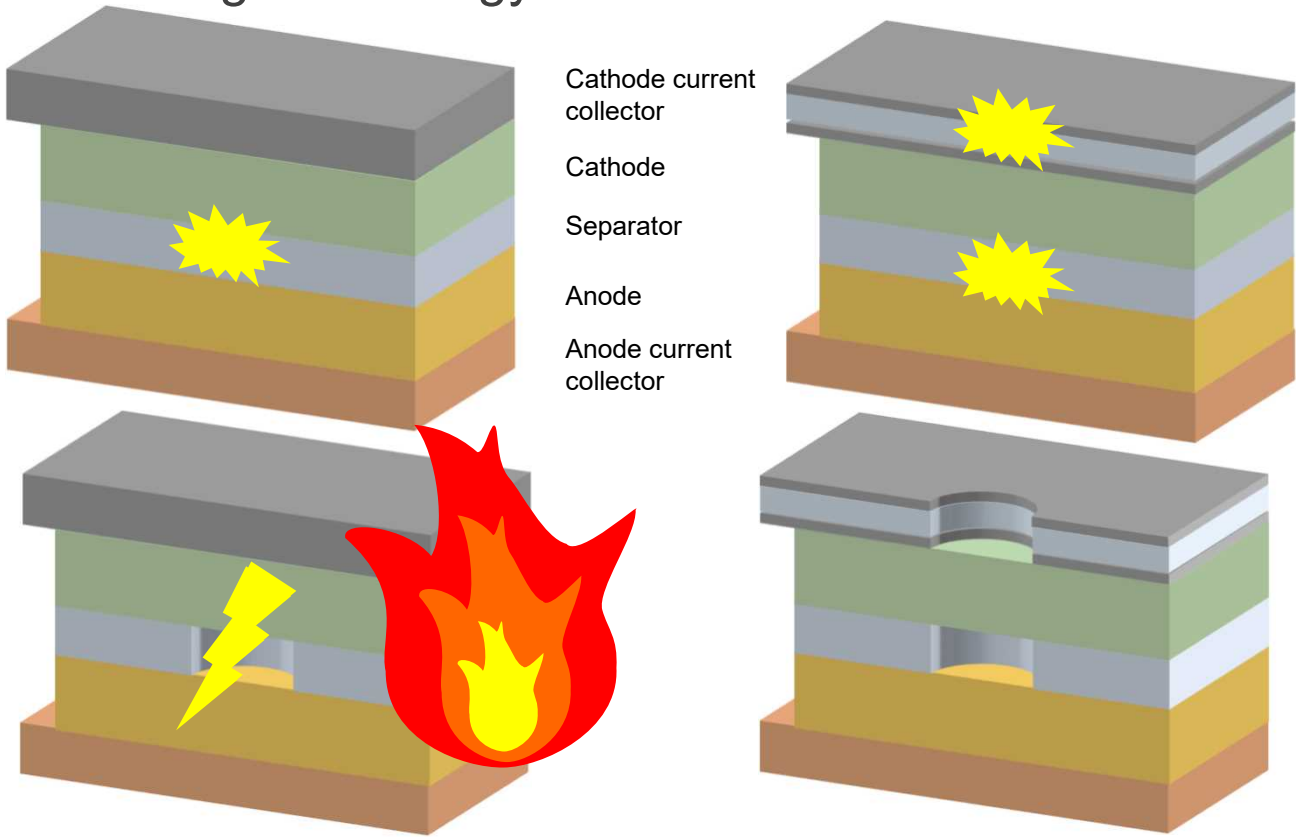


Safety

- ✓ **Prevention of short circuit by burning out current collector film**
  → **Prevention of Fire**
- ✓ **Material strength of plastic film is stronger than aluminum foil**
  → **Increase of Resistance**

Existing Technology

Al Foil Film

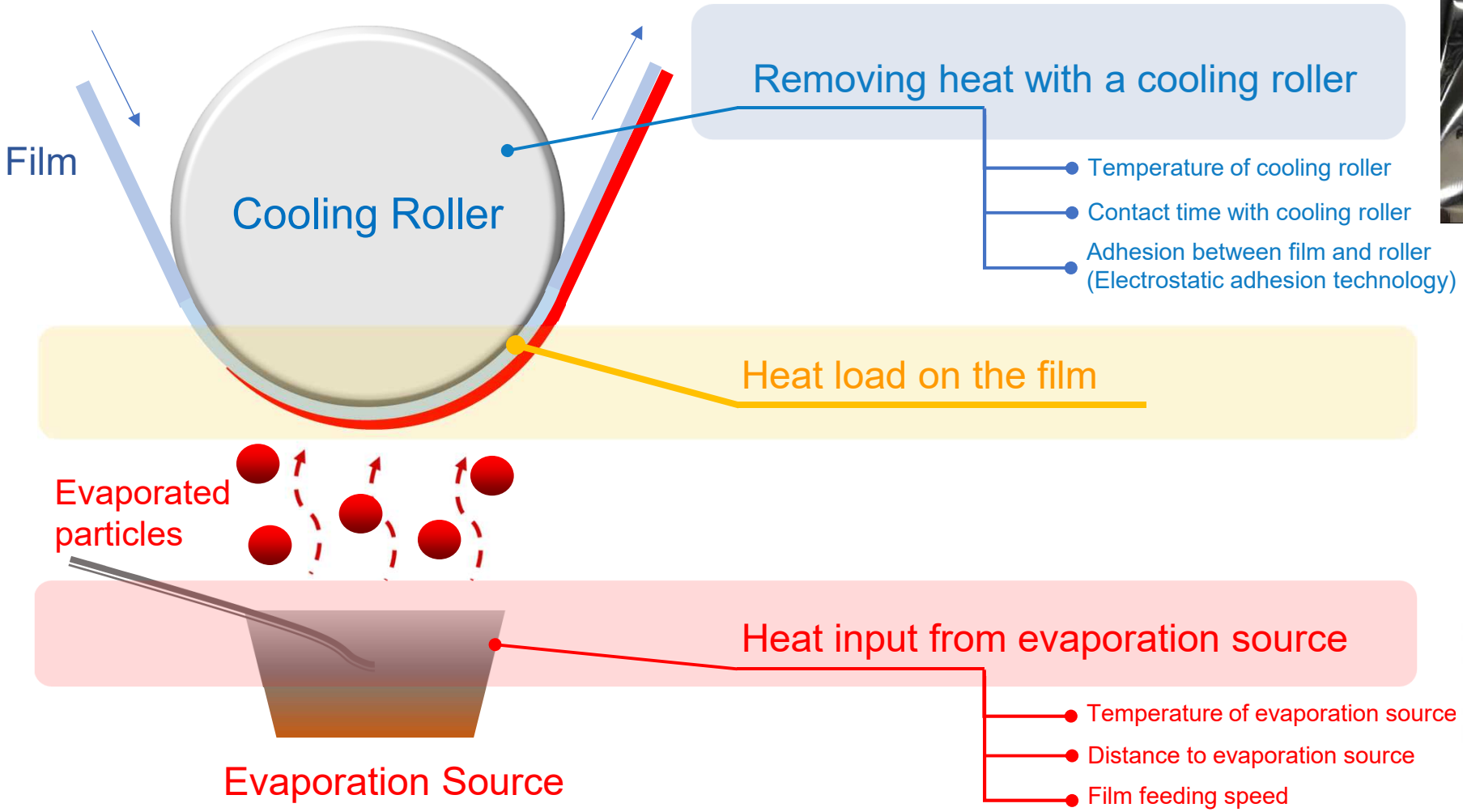


Advantages of Our Roll to Roll Equipment

ULVAC

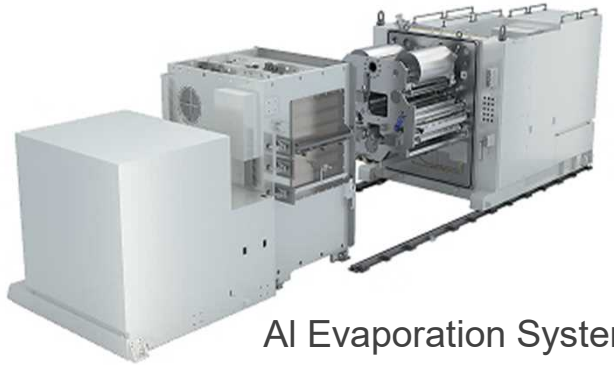
✓ **Film formation while removing heat with a cooling roller**

→ **Prevention of thermal deformation, wrinkles, and tears in the film**



Wrinkles and rips!

No damage to the film



Al Evaporation System

ULVAC’ s Advantages in Chinese Market

Market Environment

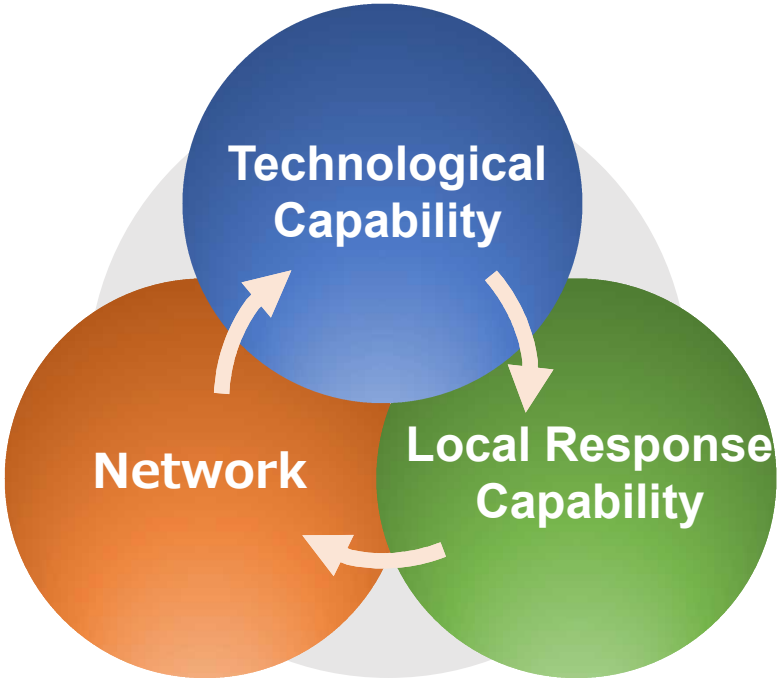
1 New Entry and Active Investment

- Domestic production policy and increasing demand
- Wide range of electronic device fields
- High-end to low-end
- Focus on speed

2 Needs of the Chinese Market

- Equipment with successful results
- Early start-up and mass production
- Approaches to cutting-edge technologies

ULVAC’s Advantages



Technological Capability

- Equipment lineup for a variety of applications
- Extensive experience and high reliability in Japan
- Providing high performance, compact size, and energy-saving solutions

Local Response Capability

- Technological sales capabilities strengthened by dispatched engineers from Japan
- Localization of mass production models / Price competitiveness
- Sales /service base network and support system

Network

- Network of major leading-edge research institutes
- Cooperation with group companies (Japan, Korea, Taiwan)

Here to Seize the Moment

ULVAC Vacuum Technology Contributes to Many Industries and Applications

ULVAC