

# Overview of Radiation Curing Market and Technologies in Japan

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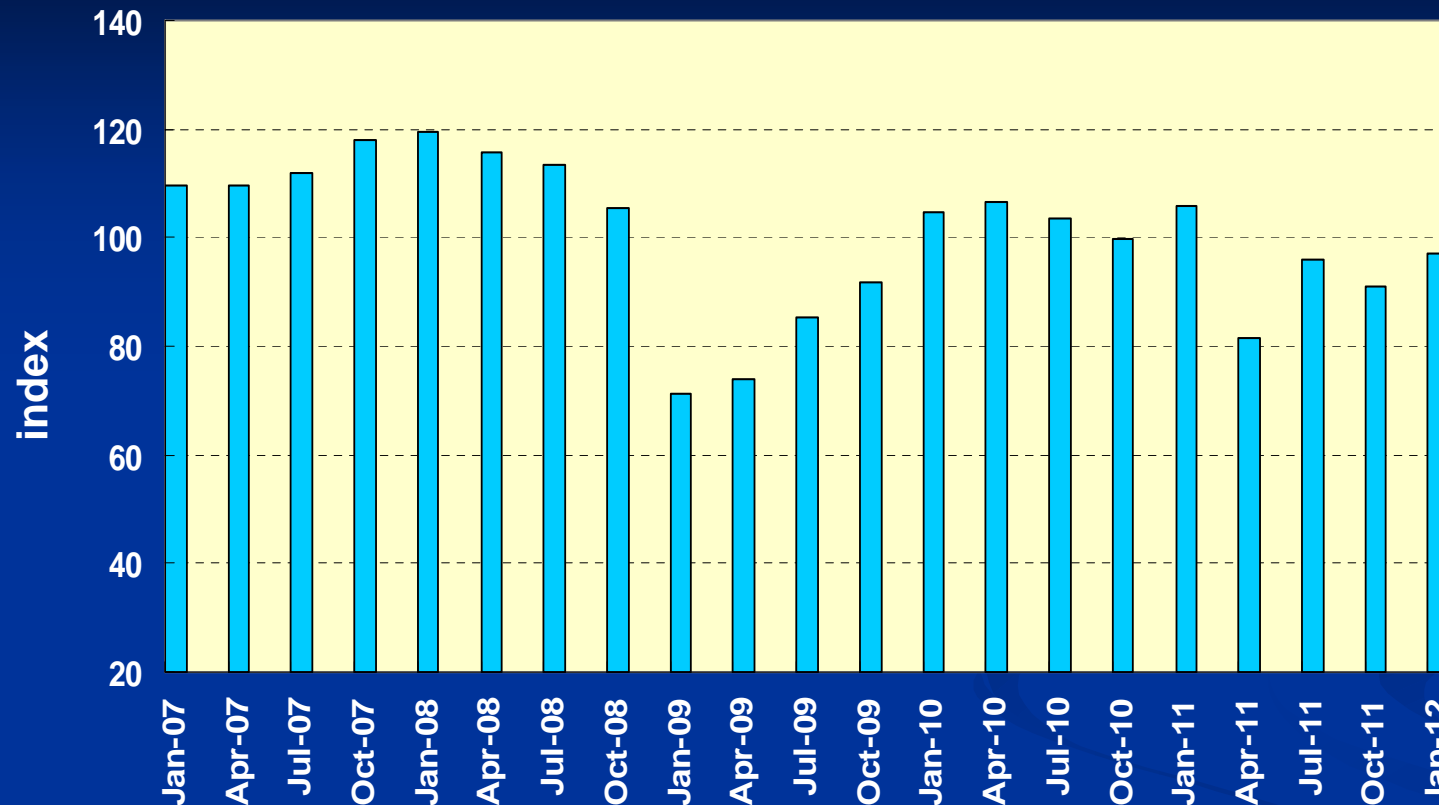
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# Contents

- Japan Economic vs. Radiation Curing Market Trend Indications
- Recent Advanced Technologies
- Future Growth Applications

# Japan Economic Overview

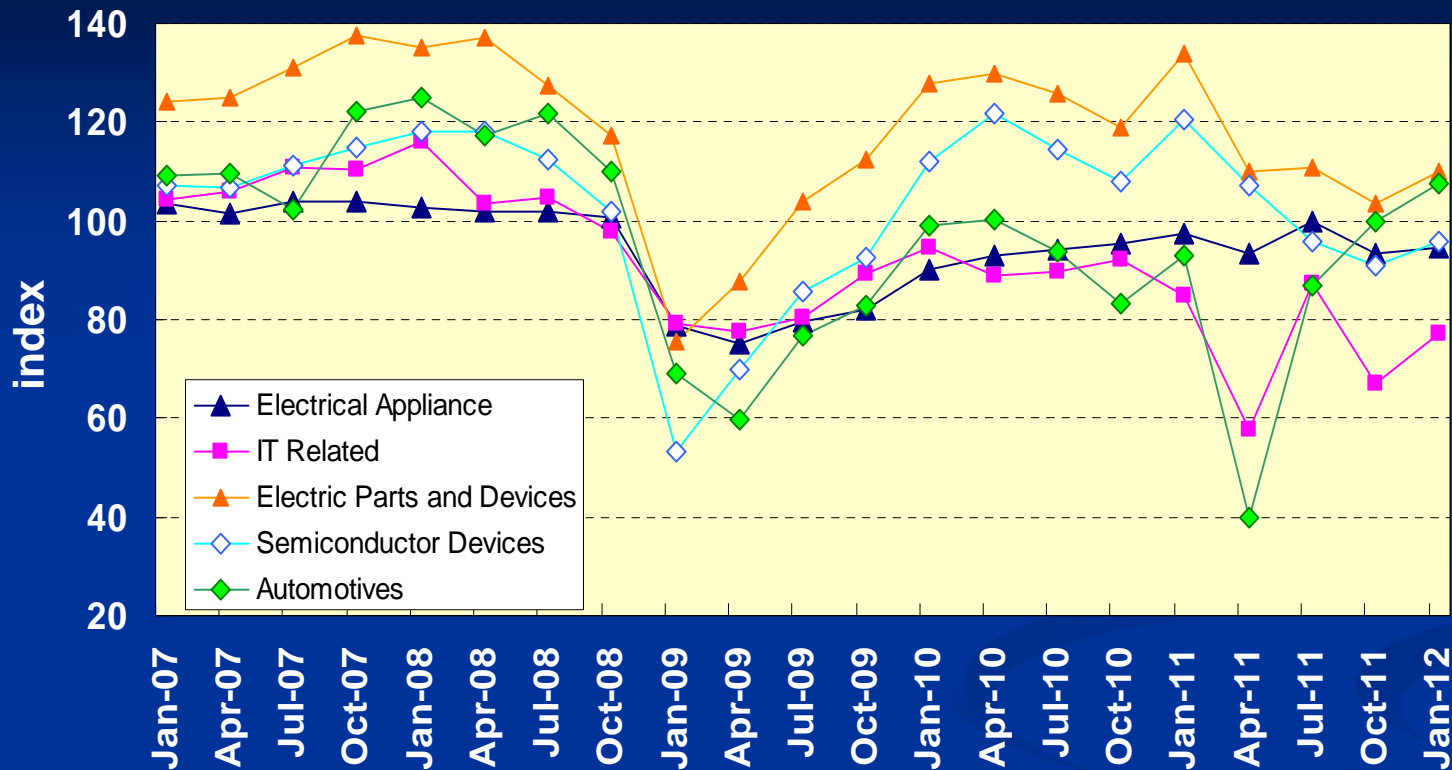
Production Index  
by METI



Overall Japan Production Index still 16 to 20% down from the peak in late 2007 to early 2008 by the triple disaster and negative global economic situation.

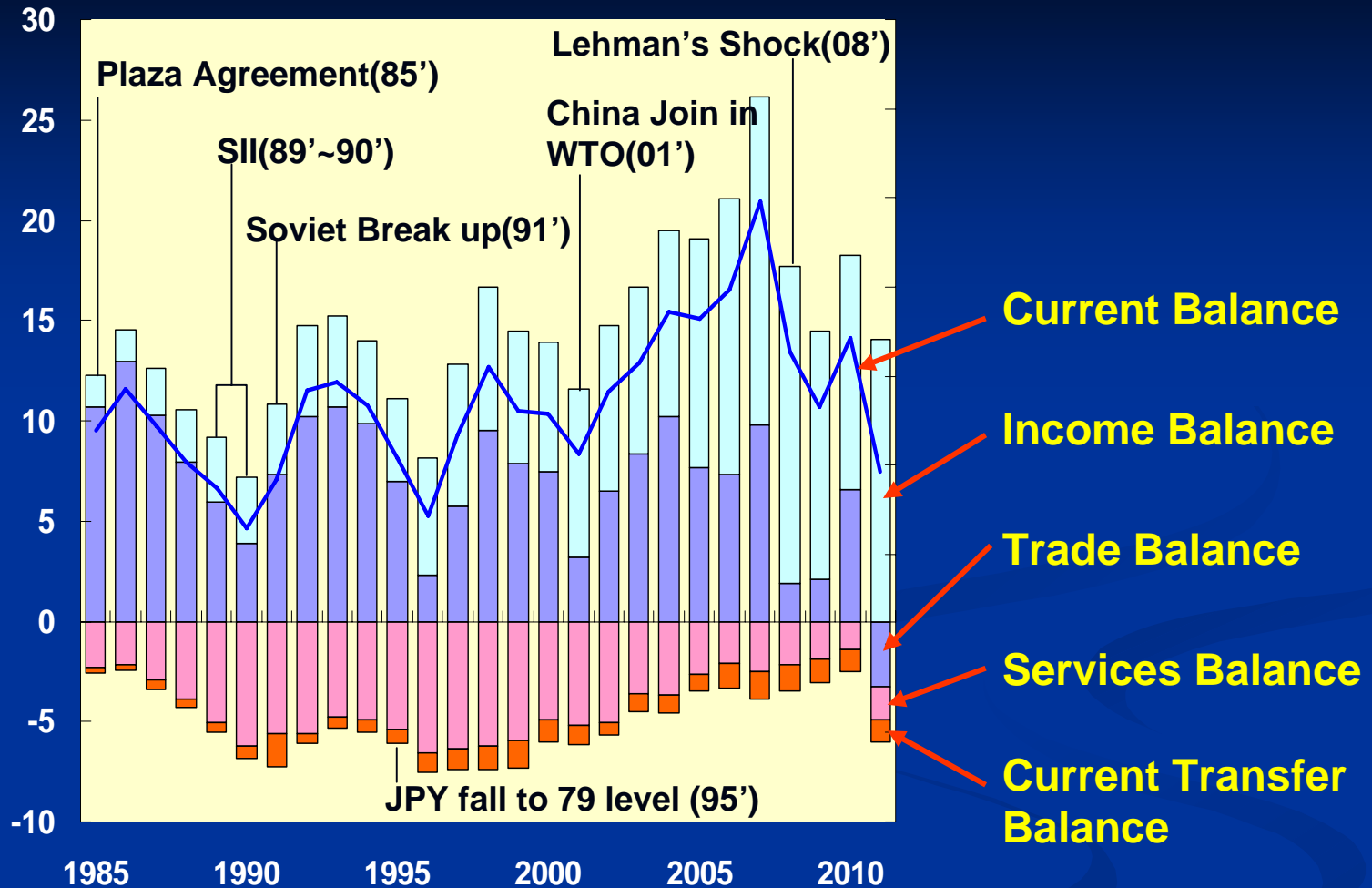
# Japan Economic Overview

Production Index  
by METI



Japan major industries production index that indicates lower level flatten by the negative global economy situation, in addition with the higher JPY exchange rate. (JPY 120 vs. 80 / \$)

# Trend In Japanese Current Balance



Oil / Gas rapid demand influenced by Nuclear Power Plant shut down as well as import component parts.

Ministry of Finance Japan  
Feb 2012

# Japan Industry Structure changes / Direction

- ◆ Labor Force Decreasing
- ◆ Global Warming
- ◆ Limited Natural Energy Resources
- ◆ Clean Environment (Soil, Water, Air)
- ◆ Higher Capacity Information System Progressing

## Manufacturing Industry

- ◆ Production Technology catch up / competition by other countries by digitalization.
- ◆ Strong JPY exchange rate



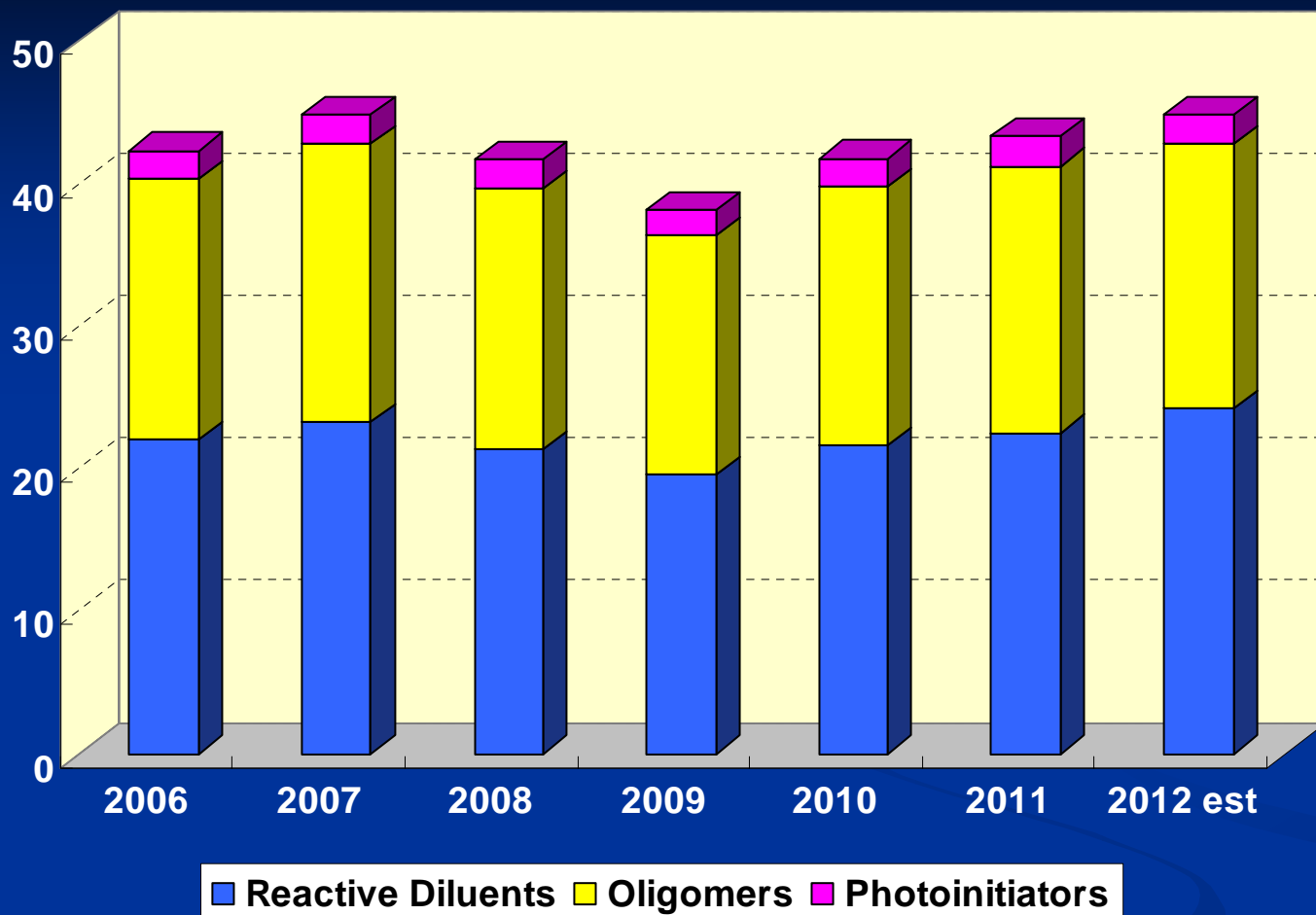
Higher Performance products with less energy consumption as well as no pollution generate.

Thinner, Smaller, Higher performance devices.

Structure control new technology

etc.

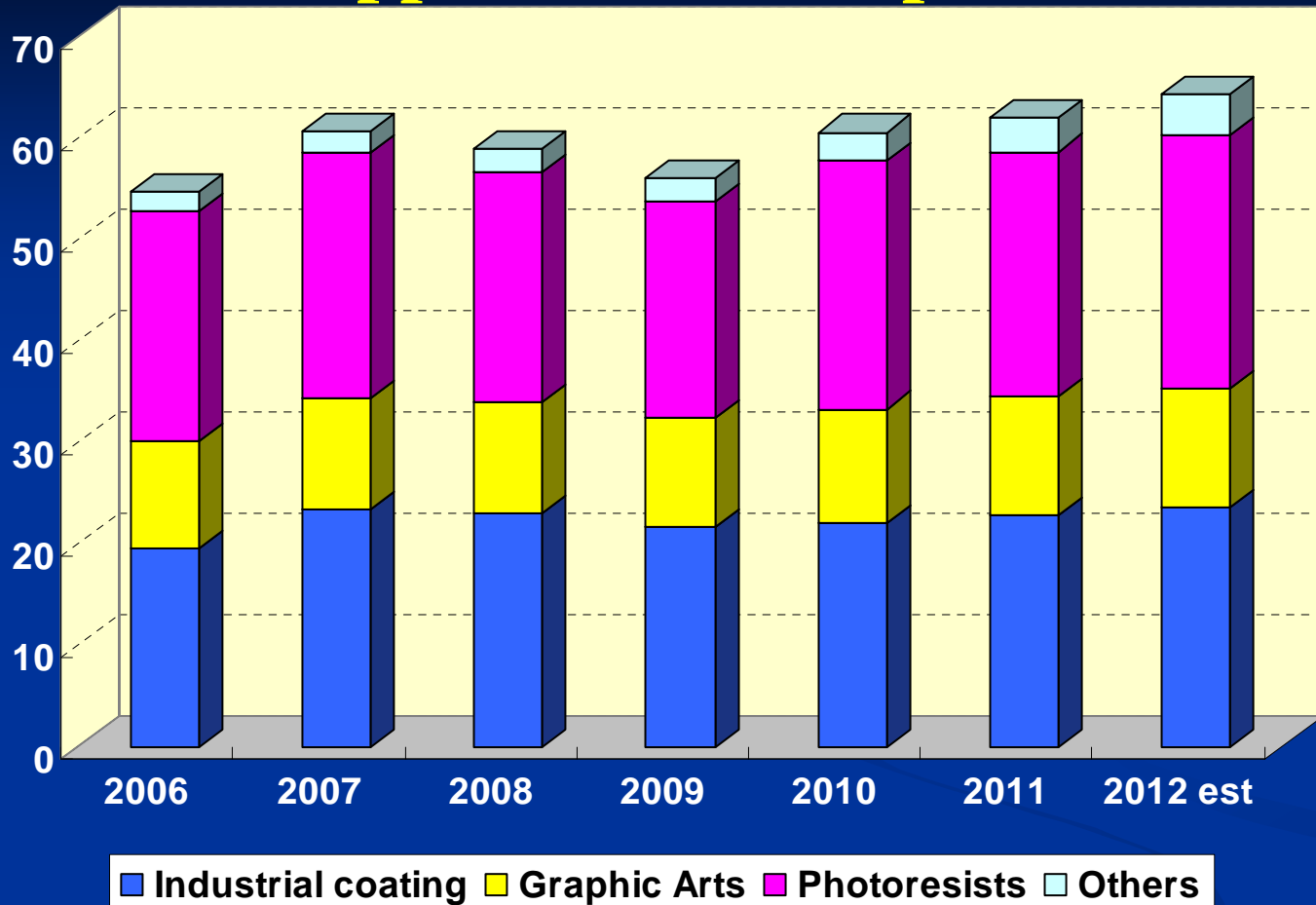
# EB/UV Curing Raw Materials Market in Japan



2011 slightly increased than in 2010.

2012 expects higher than in 2007, which is robust economic year.

# EB/UV Curing Formulated Materials by Applications in Japan



3.5% growth prediction in 2012, which is more than double from GDP prediction figure announcement.



# Industrial Coating

- UV functional coating on various plastic film substrates:
  - 6% growth from the previous year (2010), 12% higher than in 2007.
  - Major portion of this growth is within FPD market related optical film.
  - Further higher functionality with low shrinkage and distortion properties are demanded by the display technology progressing.
  - Further more, this technologies are progressing to non-FPD applications including Touch panel, OLED lighting, and Solar Cell.

# Graphic Arts

- 20% of the formulated chemical volume is for the graphic arts inks and OPV.
- Challenging by the decrease in printed paper consumption and anti-excessive packaging campaign as well as recent domestic economic downturn.
- In fact, the volume has grown 9% compare with in 2007.
- For the offset UV inks and OPV, although the demand has been flat, the volume is still the second largest application in Japan.
- UVIJ has been forecast to grow rapidly, however, to date, it has failed to meet the expectation.

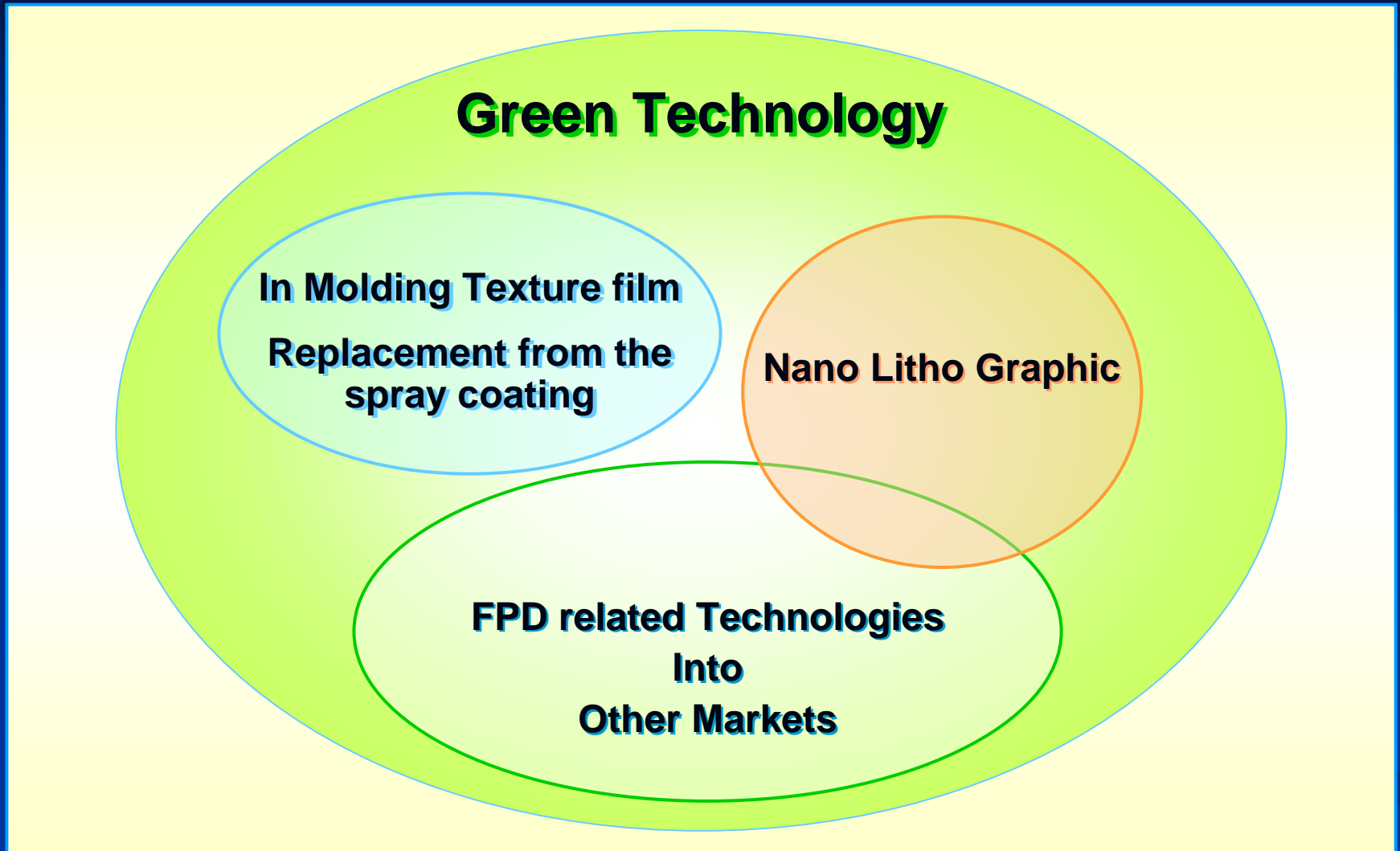
# Photo Resist

- This segment includes; “Printed Circuit Board”, “LCD”, “Plasma Discharge Panel”, “Semiconductor”, and “Printing Plate”.
- Around 38% of the total volume of formulated products are from this market.
- The growth is dependent on the consumer demand for the consumer electric products.

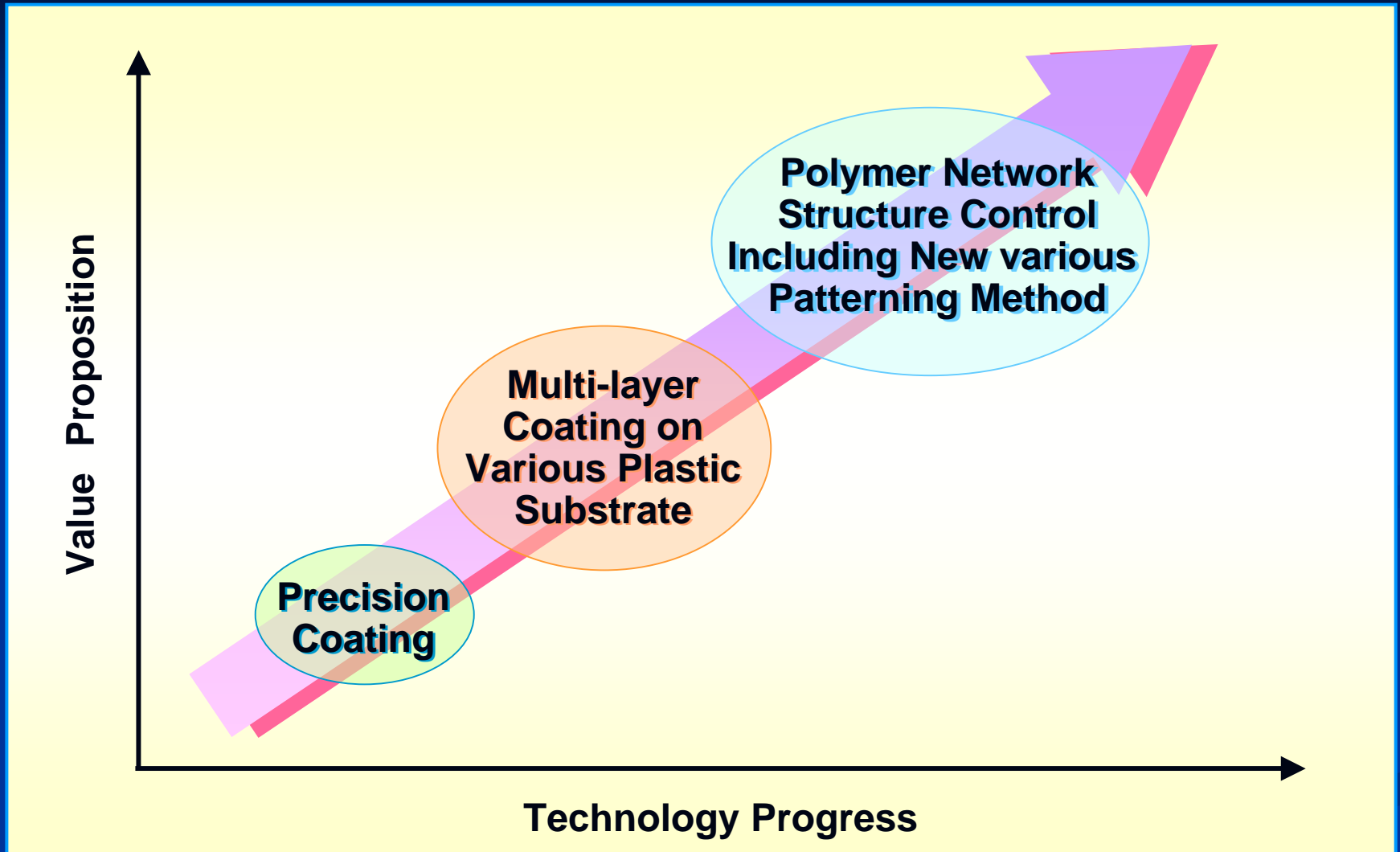
# Other Market Segments

- The major consumption for this segment is Rapid Prototyping and Adhesive applications.
- Significant growth is LOCA (Liquid Optical Clear Adhesive) for the air gap under the display surface glass, plastic, or touch panel due to control the incident light reflection scattering by the refractive index control.

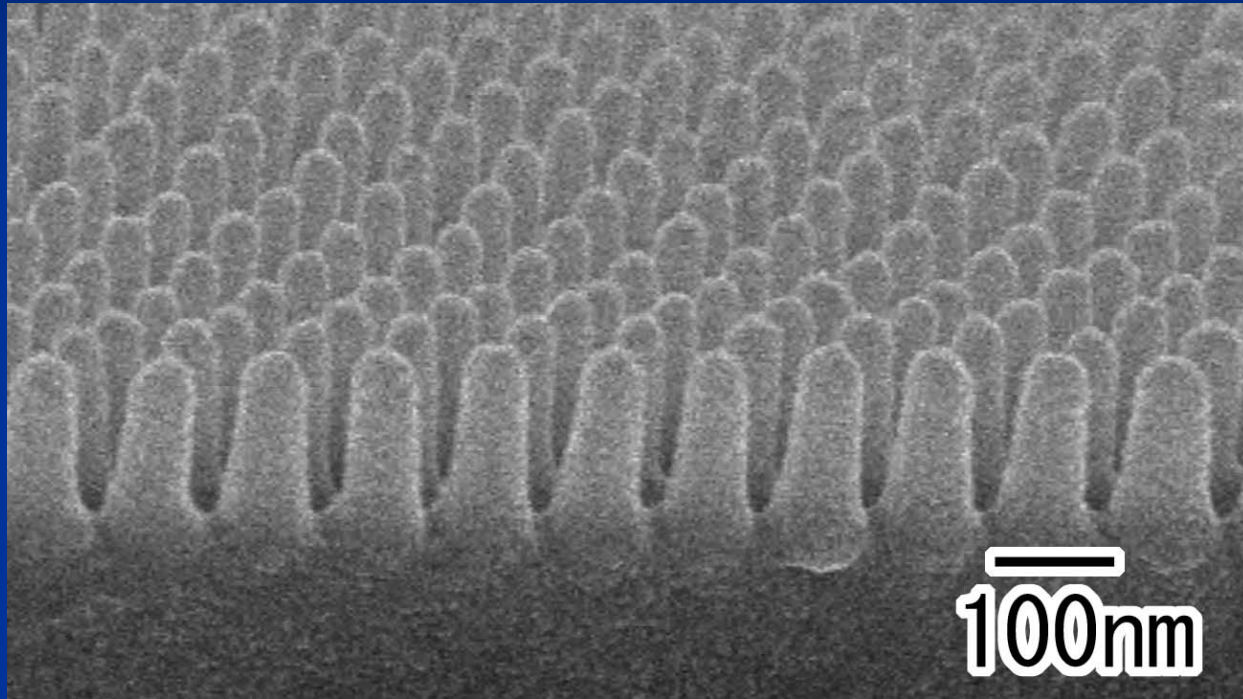
# Future Growth Market for UV/EB Progressing



# Functional Plastic Film Technology Direction

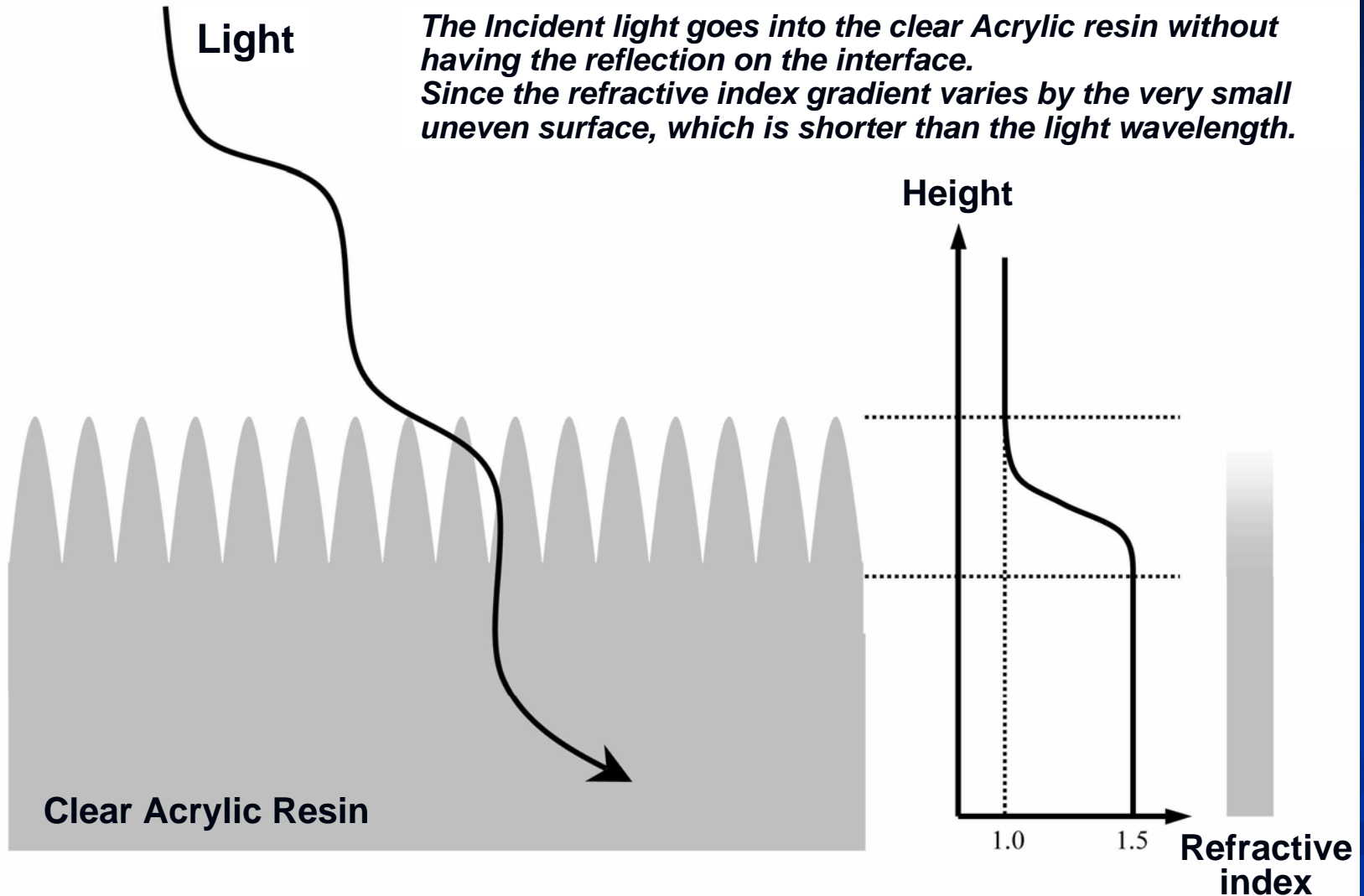


# Moth Eye Film / UV Nano Inprint



Source: Mitsubishi Rayon Co. Ltd

# Low Reflection structure





# Ultra Hydrophobic / Lipophobic Coating by UV Organic / In-Organic Hybrid Coating

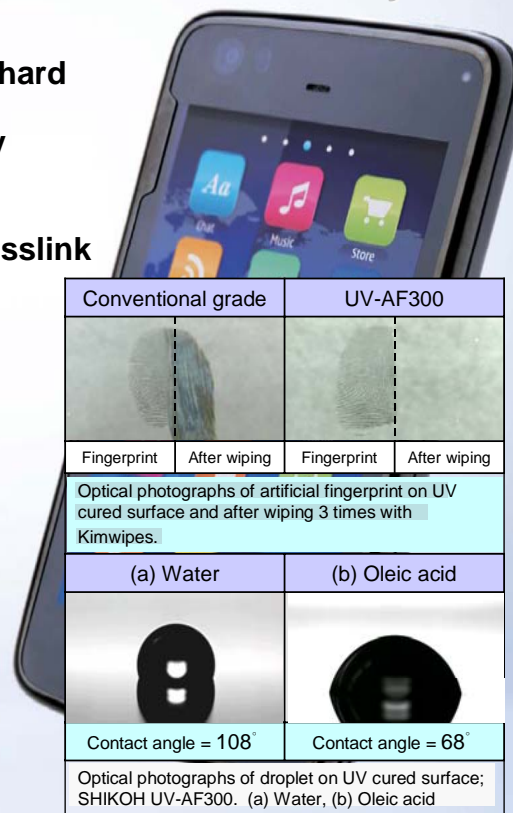
## SHIKOH UV-AF300

UV curable hard coating with **stain guard and removability**

### 【Properties】

- UV-AF300 is 4<sup>TH</sup> generation UV curable hard coating resin
- Good stain guard and easy removability especially in fingerprints
- Good adhesion to various plastics
- Good balance of high hardness and crosslink density
- High scratch resistance

Properties		UV-AF300
Stain guard	ink removability	○ Excellent
	Fingerprints removability	○ Excellent
Hardness	Pencil hardness	4H
	Scratch resistance	○ Excellent
Adhesion	PET film	100/100
	TAC film	100/100
	Polycarbonate plate	100/100
	Polyacrylate plate	100/100



Source: The Nippon Synthetic Chemical Ind. Co., Ltd

# Self-Healing UV Coating

## SHIKOH UV-SH100

### Self-Healing UV Curable Resin

#### 【Properties】

- Extremely quick self-healing
- One-component UV curable urethane acrylate oligomer
- Soft feeling surface
- Good adhesion to various plastics
- Diluted in Ethyl acetate (Oligomer/Ethyl acetate=60/40)



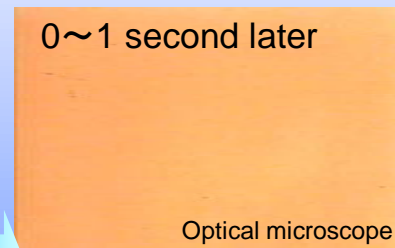
Properties		UV-SH100
Surface	Pencil hardness On PET	2B
	Healing ability	◎ Excellent
Adhesion	PET film	100/100
	ABS	100/100
	PC	100/100

Right after scratching

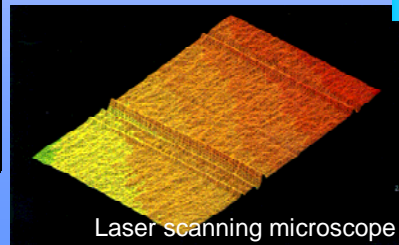


Optical microscope

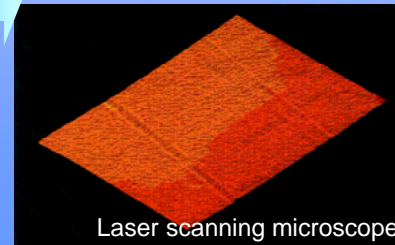
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Optical microscope



Laser scanning microscope

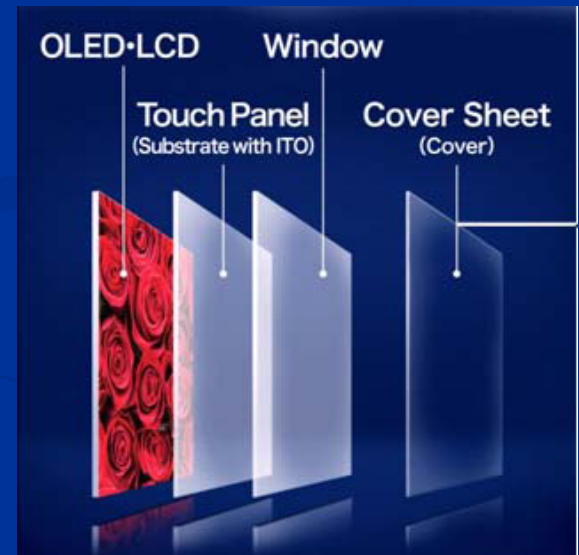
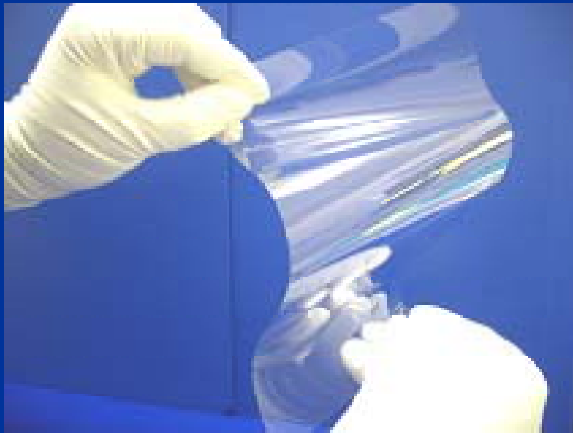


Laser scanning microscope

Source: The Nippon Synthetic Chemical Ind. Co., Ltd

# Glass-Like Plastic

As transparent as glass, and zero optical strain  
Heat resistant to more than 200°C,  
pencil hardness >3H (max. 7H)  
Light, tough, good workability  
Scratch-resistant, chemical-resistant



Source: The Nippon Synthetic Chemical Ind. Co., Ltd

# Summary

- UV/EB market in Japan has been robust as under the 2011 triple disaster and negative global economic situation.
- UV/EB market growth direction in Japan is higher performance of cured film structure control into various industries based upon Green and Energy save environment.
- The development of new innovative UV/EB chemistry, equipment, and process applications will continue to drive the future growth in the use of UV/EB technology.

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