

Organic semiconductors / photoalignment liquid crystal  
Materials for direct metal patterning  
Blue light / UV blocking materials

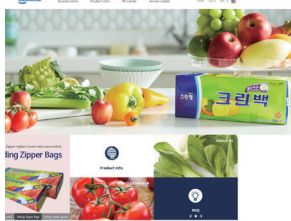
# CLAP Co., Ltd



## CLAP Co., Ltd

CLAP Co., Ltd is a specialized company equipped with an outstanding R&D workforce possessing many years of experience in producing semiconductor/liquid crystal display material. Major executives are talented people with experience in successful cases in various fields such as Samsung, LG, 3M, etc.



CLAP Co., Ltd has the credit of professional manpower and technical competence, having been in partnership with a leading German chemical corporation, BASF (including equity participation) and focusing on development of new technology and products in related fields. CLAP Co., Ltd has about 700 patents related to liquid crystal retarder film and organic synthesis semiconductor, developing material synthesis production and applied products based on original technology.








Its parent company is CLEANWRAP Co., Ltd, the number one company of kitchen consumer goods brand. CLEANWRAP Co., Ltd has invested shares in CLAP Co., Ltd for a strategy to expand B2B business of special functional film for industrial use, promoting business with massive financial support as a major shareholder for CLAP's future growth engines.

CLEANWRAP Co., Ltd ([www.cleanwrap.co.kr](http://www.cleanwrap.co.kr)) : the number one in the domestic food processing Wrap film field (over 70% of market share)

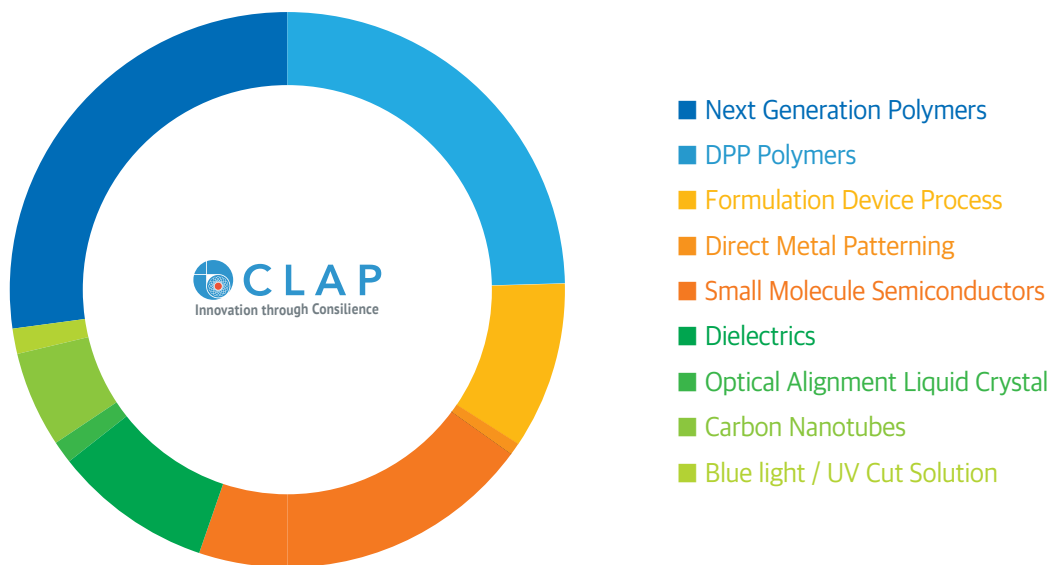
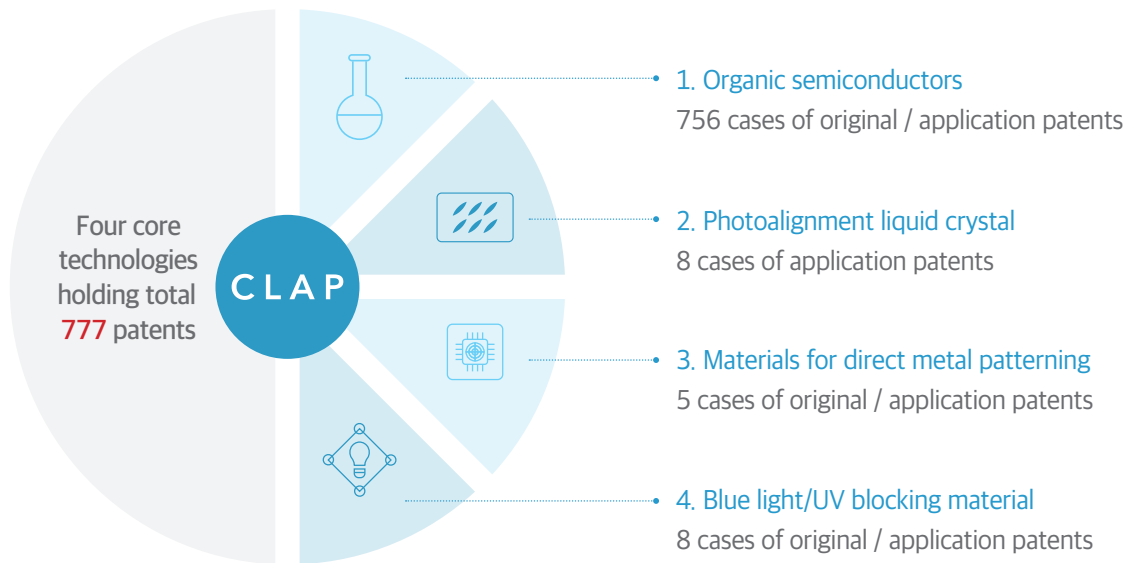
## History

2018	12.26	Established CLAP Co., Ltd	2020	1	Attracted investment from BASF
	3	Established affiliated research institute		2	Had exclusive contract with BASF for a liquid crystal material of foldable OLED Coated Polarizer
	6	Signed an agreement of partnership and technology transfer with BASF : Optical film material technology for OLED 		5	Selected as a host company for national project [Ministry of Trade, Industry and Energy] Developed technology for self-reliance of strategy core material Developed a highly noticeable optical retardation film material for automobile displays (OLED) [Ministry of Science and ICT] Core technology of organic photodiode for a fingerprint recognition sensor
	9	Certificate of Venture Business - R&D Business		11	Korea Display Exhibition (IMID 2020) [presented business forum - developed polarizer for coating a liquid crystal and retarder film]
2019	11	Took over OTFT original patents from BASF and contracted technology transfer 	2021	4	Presented at Sensor 2025 Technical Exchange Meeting [Sensor opening future technology / Organic semiconductor sensor]
					Selected as a host company for national project [Ministry of Science and ICT] Developed and commercialized study material of high light-detecting source polymer for research application of image sensors

## Location

Head office	5F, Cleanwrap building, 313, Bongeunsa-ro, Gangnam-gu, Seoul, Republic of Korea	
Research institute	<b>Anyang Research Institute</b> : #1405, 1412, Daerung Technotown 15th, 401, Simin-daero, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea	
	<b>Organic semiconductor Fab</b> : BASF R&D Center, Natural Science Campus of Sung Kyun Kwan University, 2066 Seobu-ro, Jangan-gu, Suwon-si, Gyeonggi-do, Republic of Korea	
	<b>Organic semiconductor R&amp;D Center (scheduled)</b> : 1342, Seongnam-daero, Sujeong-gu, Seongnam-si, Gyeonggi-do, Republic of Korea CLAP R&D Center, Global Campus of Gachon University	
Factory	<b>Chungju Factory</b> : 137-21, Giopdosi 2-ro, Daesowon-myeon, Chungju-si, Chungcheongbuk-do, Republic of Korea	

## Four core technologies/patent held by the company

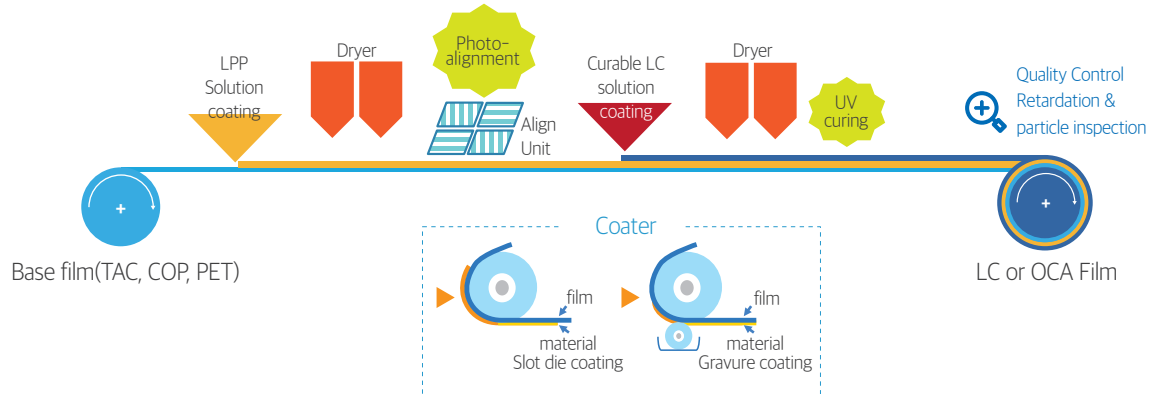


1. Korea
2. China
3. Japan
4. Taiwan
5. U.S.A
6. Germany
7. France
8. U.K
9. Italy

## Photoalignment liquid crystal

## : Antireflection film for OLED

※ Core Competence : Liquid crystal optical design, Development of photoalignment processing, Organic-inorganic nano thin-film coating



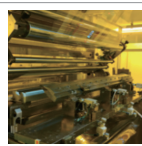
Panorama of Chungju factory (exterior)



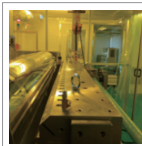
Panorama of a coating line



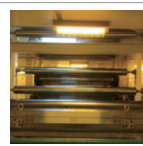
Micro Gravure



Slot Die



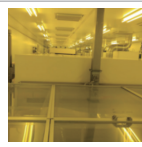
Polarizing UV irradiating device



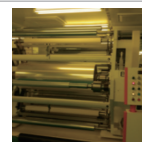
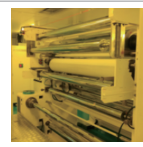
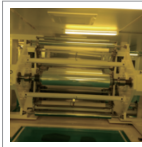
Equipment Head unit



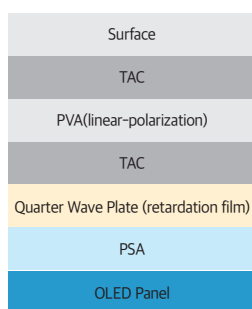
Drying furnace



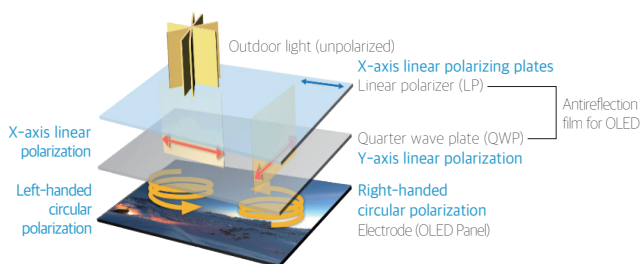
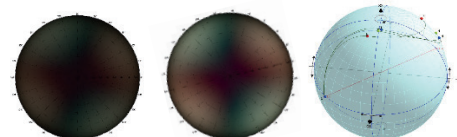
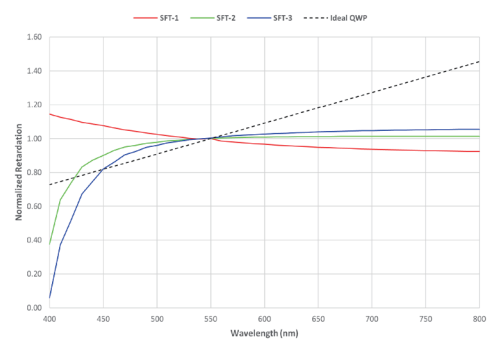
Unwinder, Rewinder unit



## Antireflection film for OLED : Retardation film



## OLED TV



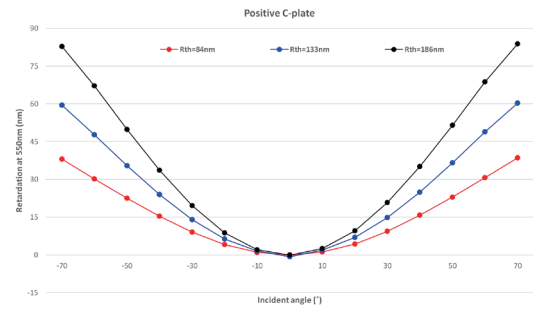
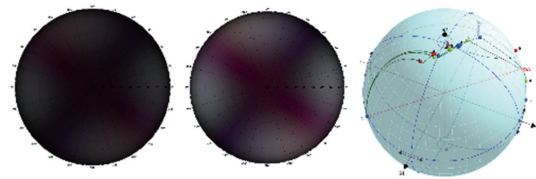
Product	$\Delta n$	$\alpha(450/55\text{nm})$	$\beta(650/550\text{nm})$	비고
SFT-1	0.11	1.08	0.95	Normal dispersion
SFT-2	0.06	0.90	1.02	Controlling dispersion
SFT-3	0.05	0.82	1.04	Controlling dispersion



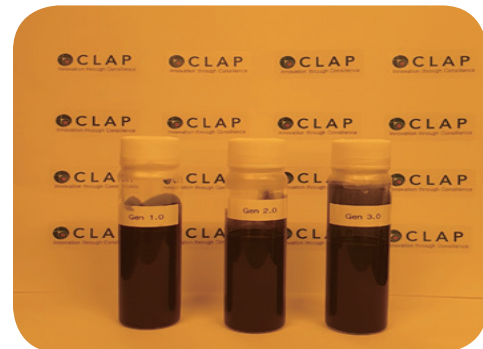
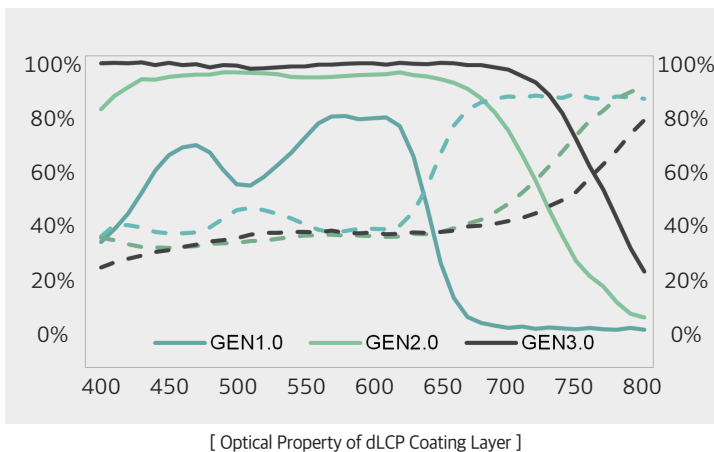
## Optical film

### OLED Mobile

Type	Structure
<b>1. SFM-1</b> * 2 Layers Structure * r-QWP + C plate (Lami, or Transfer)	Polarizer r-QWP PSA +C plate
<b>2. SFM-2</b> * Mono Layer * r-QWP on +C plate (double coating)	Polarizer r-QWP +C plate Substrate Take off



### PE & Ts of dLCP<sup>1)</sup>



dLCP Coating Solution

### Coatable Polarizer on UTG<sup>2)</sup>

UTG (~40 $\mu$ m)
Coated Polarizer (~5 $\mu$ m)
PSA (~1 $\mu$ m)
Retarder $\lambda/4$ (~5 $\mu$ m)
OCA (25 $\mu$ m)

Total Thickness : ~75 $\mu$ m  
 Circular Polarizer : ~10 $\mu$ m  
 dLCP : Dye Liquid Crystal Polymer (Coatable Polarizer)  
 UTG : Ultra Thin Glass

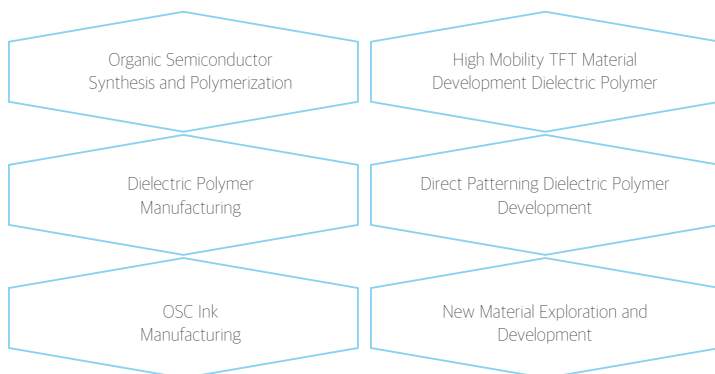
#### Technologies possessed by the company

- Optical design
- Liquid crystal materials synthesis
- Liquid crystal retardation



## Organic Semiconductors : Organic Semiconductor

※ Core competence : organic-inorganic materials compound



### [ Commercialization ]

- DPP based polymers
- Next Gen polymers
- N type semiconductor molecules

- Thermal X linker
- Photo X linker for Direct Patterning

- Low permittivity polymers

### [ Research ]

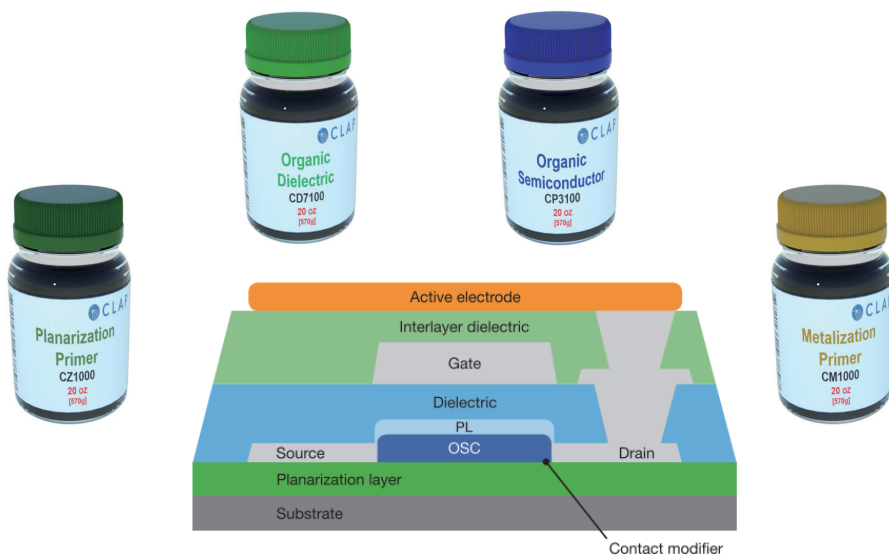
- Carbon Nanotubes
- Low T Sintering OTFT molecules

- High resolution photo patterning polymers

- SilvArmor™ : Ag nano complex

### Organic Thin Film Transistor InkSet

- Providing organic semiconductor materials suitable for various coating methods, gate or interlayer insulating layer materials, and materials for contact modifier and planarization
- Having uniform device characteristics and excellent air stability
- Manufacturing ink by using Non-halogenated solvent
- Providing detailed processing technology guide

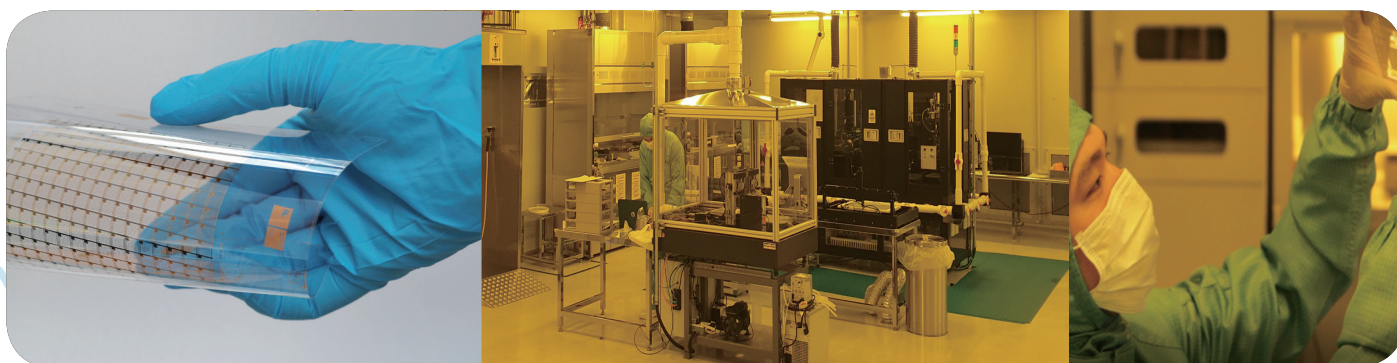


## Organic Semiconductors : Organic Semiconductor

### Formulation Selection Guideline

※ Selection of various organic semiconductor materials on the basis of coating process and performance and application of transistor devices

Formulation	Coating Method				Mobility
	Spin	Slot-die	Inkjet	Gravure	
CP3100	●	●	●	●	0.5 ~ 1.0
CP4100	●	●	●	●	0.3 ~ 0.6
CP5100		●			~ 4.0
CN5100	●	●	●	●	~ 0.5

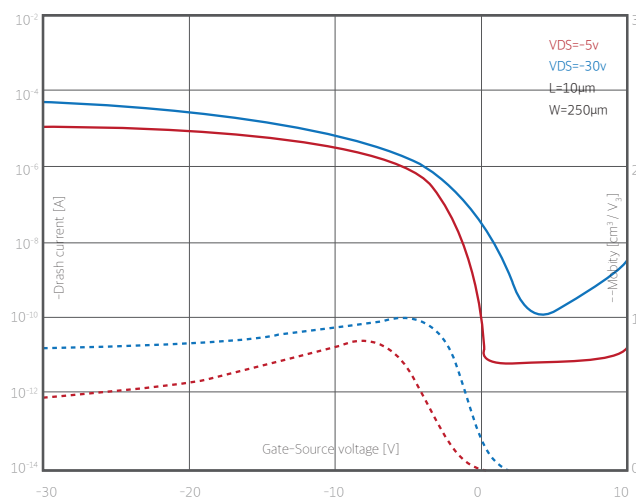


Planarization layer	Semiconductors p-types	Semiconductors n-types	Dielectrics	Ink Sets	Applications
Planarization Layer A5XXX	<b>CP3100 Series</b> <ul style="list-style-type: none"> <li>• Enable aSi replacement</li> <li>• Mobility up to 1 cm<sup>2</sup>/Vs</li> </ul>	<b>CN5000 Series</b> <ul style="list-style-type: none"> <li>• Mobility up to 1.5 cm<sup>2</sup>/Vs</li> </ul>	<b>CD2200 Series</b> <ul style="list-style-type: none"> <li>• Thermally cross-linking dielectric</li> </ul>	<b>Inkset C1000SP</b> <ul style="list-style-type: none"> <li>• Based on CP3100</li> <li>• Optimized for spin-coating</li> </ul>	<b>X-Ray Detector Fingerprint Sensor</b>
	<b>CP4100 Series</b> <ul style="list-style-type: none"> <li>• Mobility up to 1 cm<sup>2</sup>/Vs</li> <li>• Cross-linkable semiconductor</li> </ul>				
	<b>CP5100 Series</b> <ul style="list-style-type: none"> <li>• Mobility up to 4 cm<sup>2</sup>/Vs</li> </ul>				
			<b>CD7100 Series</b> <ul style="list-style-type: none"> <li>• UV photopatternable dielectric</li> </ul>	<b>Inkset C2000SL</b> <ul style="list-style-type: none"> <li>• Based on CP5100</li> <li>• Optimized for slot die or blade coating of OSC</li> </ul>	<b>X-Ray Detector</b>
				<b>Inkset C3000S</b> <ul style="list-style-type: none"> <li>• Inkset for Metal Layer</li> </ul>	
					<b>Display Backplanes</b> OLED, Micro-LED

## Organic Semiconductors : Organic Semiconductor

### CP3100 Formulation Series

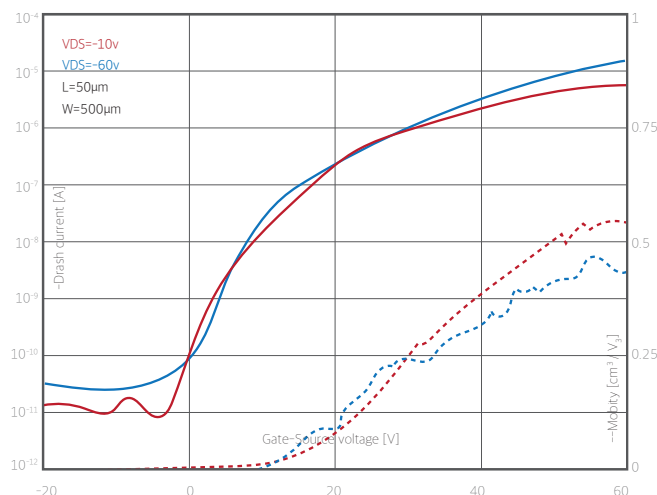
- p-type Organic semiconductor material suitable for various coating methods
- Possessing uniform device characteristics and excellent air stability
- Manufacturing ink by using non-halogenated solvent
- Possible to apply to Bottom-gate and Top-gate transistor structure
- Mobility 0.5~1 cm<sup>2</sup>/Vs
- On/Off ratio > 10<sup>6</sup>
- Possible to realize a-Si device performance with low cost materials



Method	Viscosity (mPas)	Availability	Applications
Spin-coating	1.0 - 2.0	●	EPD, LCD (display backplane) Logic Circuits, Sensors (in logistics, packaging, ...)
Slot-die coating	1.0 - 8.0	●	
Inkjet printing		●	
Gravure printing		●	
Stripe coating	0.5 - 3.0	●	
Flexographic printing		●	

### Organic Thin Film Transistor InkSet

- Manufacturing liquid of organic semiconductors and having excellent air stability
- Manufacturing ink by using Non-halogenated solvent
- possible to apply to Bottom-gate and Top-gate transistor structure
- Mobility ~0.5 cm<sup>2</sup>/Vs
- All processes are available for PET materials



Method	Viscosity (mPas)	Availability	Applications
Spin-coating	0.5 - 1.5	●	EPD, LCD (display backplane) Logic Circuits, Sensors (in logistics, packaging, ...)
Slot-die coating	1.0 - 8.0	●	
Inkjet printing		●	
Stripe coating	0.5 - 3.0	●	

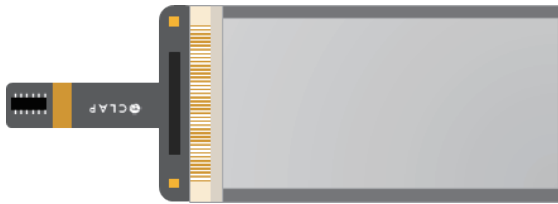
## Applied products based on organic semiconductors

### Fingerprint on Display Sensor

- ※ Fingerprint-recognition sensor for large-scale display mobile for attaching on the bottom end of OLED
- ※ Optical method applied its own OTFT/OPD (Organic Photo Diode) technology



#### Image of structure



Large-scale display : 5x2.5cm

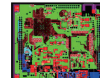
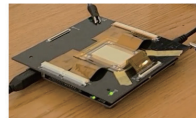
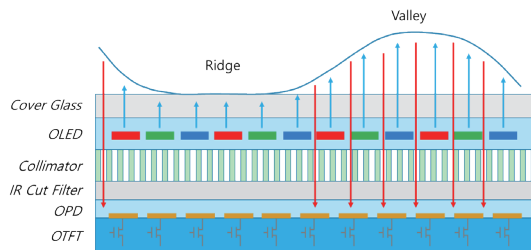
High resolution : 500dpi

Multi Finger

Thickness of thin film : 0.1mm or less than

Flexible substrates materials

(prototype)



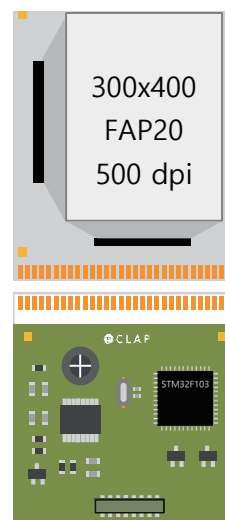
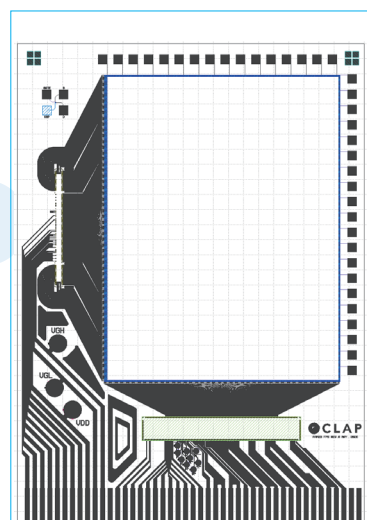
Sensor B/D

FPGA B/D



### Biometric Fingerprint Sensor

- ※ Flexible capacitive fingerprint recognition sensor for security purposes
- ※ Large capacitive sensor supporting FAP20 and FAP30



- 1, OTFT : Organic Thin Film Transistor, OPD : Organic Photo Diode, DMP : Direct Metal Patterning
- 2, FAP : Fingerprint Acquisition Profile



## Applied products based on organic semiconductors

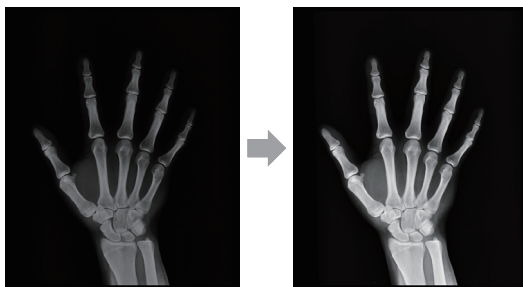
### X-Ray Sensor



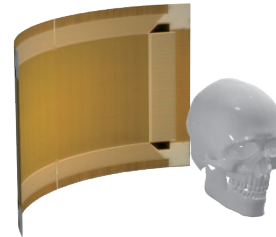
#### · Unbreakable X-Ray Detector



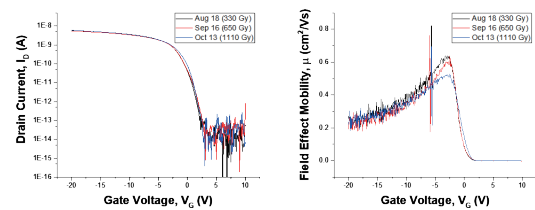
#### · High Sensitivity



#### · Curved X-Ray (Minimize Vignetting)



#### · Stable X-Ray Dose

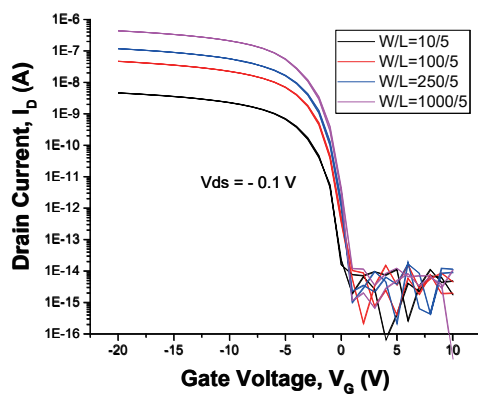


### micro & mini LED Display

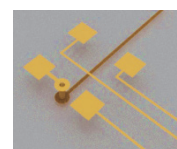
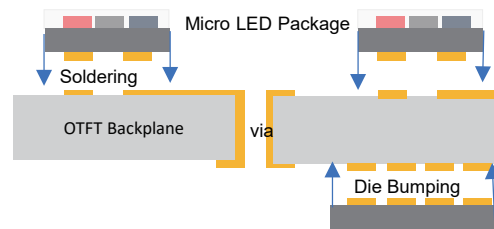
- ※ High-performance OTFT Backplane possible to actuate LED
- ※ High-performance wiring on Glass/VIA processing technology



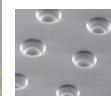
#### · High Mobility



#### · OTFT Backplane & Device Mount



Fine Patterning

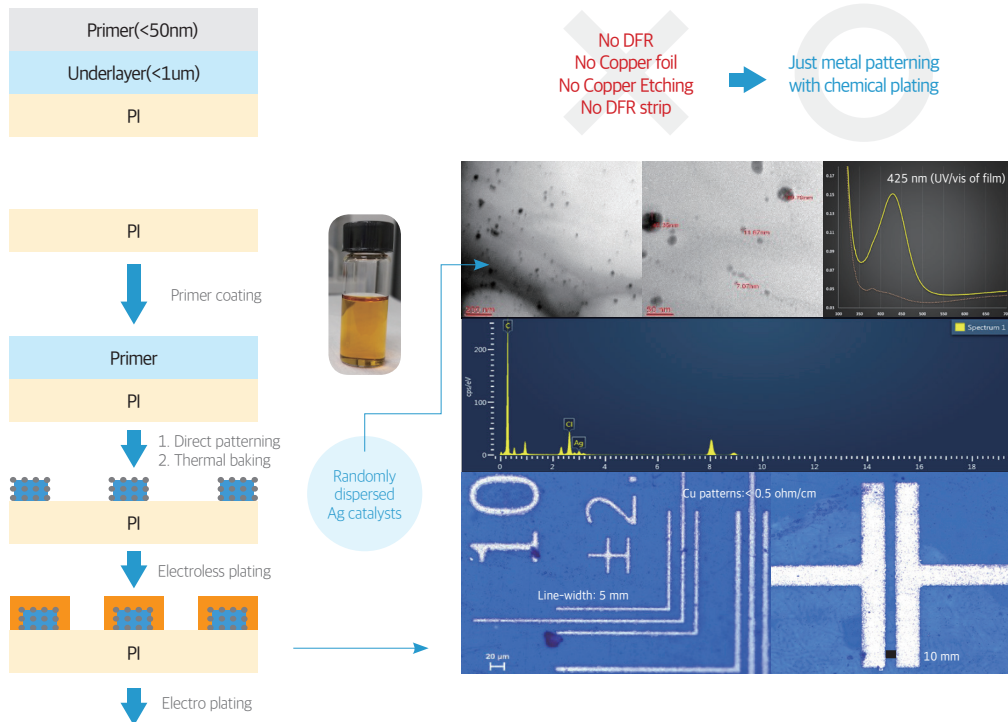


TGV



Bumped Die Mount

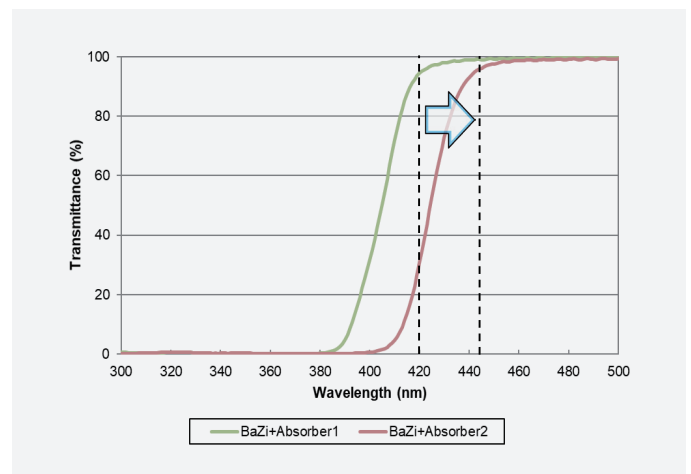
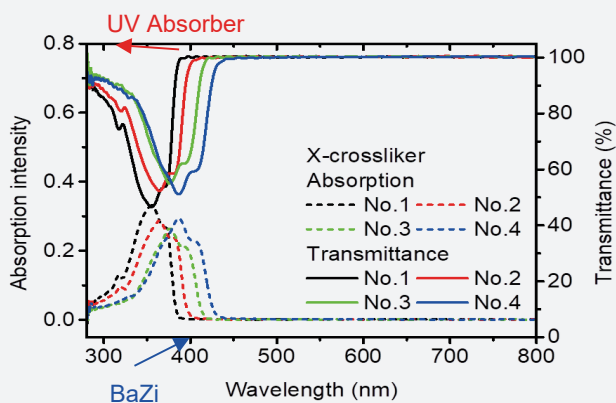
## Materials for direct metal patterning



## Blue light / UV blocking material

: BaZi

※ BaZi (Bis-aZide) is our company's own material featuring excellent absorbing capacity from 350nm to 450nm. possible to adjust light absorbance up to 450nm by mixing BaZi and UV absorbers



Innovation  
through  
Consilience

# CLAP



**Head office**

#502, Cleanwrap building, 313, Bongeunsa-ro, Gangnam-gu, Seoul, Republic of Korea

**Research institute**

#1412, 401, Simin-daero, Dongan-gu, Anyang-si, Gyeonggi-do,  
Republic of Korea (Daerung Technotown 15th)

**Factory**

137-21, Gieopdosi 2 ro, Daesowon-myeon, Chungju-si, Chungcheongbuk-do, Republic of Korea

**Company telephone number**

+82-31-260-3160

**E-Mail**

johnny@clap.co.kr