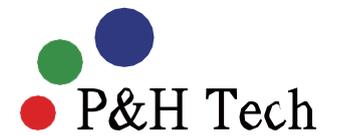




Your True Partner for Future Business

(2022.12.05)



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01 OLED 전방시장



**OLED 신규 Application 확장중, LCD시장에 대한 침투가 가속화 되고있음.
=> 아이패드,아이맥, 맥북, 전장시장(EQS), 메타버스(AR/VR/MR)**

Shipment unit down in 2022, up in 2023, recovery in 2024

- 2022 Demand down : LCD TV, PC, Monitor , Mobile phone display
- 2022 Demand grow: Automobile, AR/VR Near Eye, Public Display (a new high for public display), OLED TV, E-book, Sub-Display for foldable phone

Display shipment unit by application

→ OLED 적용 Application들은 여전히 증대되고 있다.

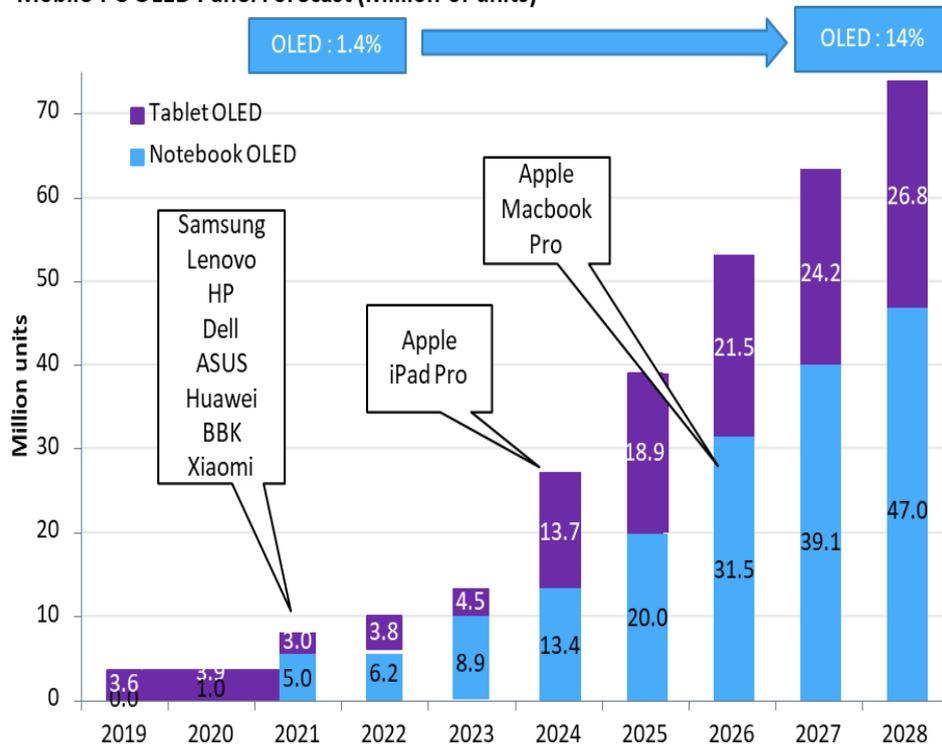
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Original specification	2021	2022	2023	2024	2025	2026
Mobile phone	1,930,030.0	↓ 1,568,679.0	↑ 1,591,520.8	1,648,233.5	1,692,487.3	1,734,981.6
Mobile PC	568,868.6	↓ 472,240.7	↓ 445,590.2	482,620.2	509,377.4	519,703.9
LCD TV	261,158.6	↓ 252,047.7	↓ 246,176.1	254,487.5	253,893.0	256,592.8
Smartwatch	221,188.0	↑ 251,989.0	↑ 273,386.7	287,831.2	295,031.3	301,213.3
Automobile monitor	187,714.0	↑ 193,398.0	↑ 207,267.4	220,340.5	231,789.7	237,867.2
Desktop monitor	172,406.8	↓ 164,981.1	↓ 160,668.9	164,440.2	167,844.0	165,743.8
Home appliance	99,588.0	95,238.0	98,525.2	99,630.0	99,111.1	97,897.6
Automotive	69,858.0	53,945.0	54,717.2	55,751.5	56,580.0	56,714.5
E-book	14,005.5	↑ 18,665.0	↑ 20,829.4	22,073.5	22,694.9	23,057.5
Mobile phone sub-display	13,408.0	18,004.0	24,604.6	31,833.9	40,753.4	50,194.7
AR VR MR near eye	11,777.0	17,869.0	36,931.5	51,655.3	67,892.3	83,484.2
Office appliance	5,255.0	16,551.0	18,146.2	18,328.8	18,266.8	17,971.9
Amusement	16,440.0	14,830.0	14,160.0	23,250.0	20,700.0	19,750.0
Public display	7,817.4	↑ 11,087.5	9,192.5	8,611.2	8,573.4	8,591.6
Multi-function printer	13,538.0	11,000.0	12,140.3	12,580.5	12,603.9	12,601.0
OLED TV	7,419.7	↑ 8,005.4	↑ 9,853.0	10,920.0	12,495.0	13,579.2
Digital still camera	8,426.0	7,686.0	7,230.0	7,060.9	7,016.2	6,828.7
Portable navigation device	2,536.0	2,266.0	2,520.0	2,720.0	2,835.0	2,898.0
Portable media player	1,300.0	180.0				
Micro LED TV	0.0	0.1	2.9	37.6	198.5	407.0
Others	362,271.1	318,883.9	319,514.8	323,920.5	325,575.5	325,519.7
Total	3,975,006	3,497,546	3,552,978	3,726,327	3,845,719	3,935,598
YoY growth	10%	-12%	2%	5%	3%	2%

Mobile PC OLED display on the rise – with more brands and hybrid OLED

- The OLED Notebook PC panel driving force: More brands adoption, thin and light form factor, FHD with cost advantage, mini LED backlight supply chain is too complicate and there are issues like halo effect and power consumption.

Mobile PC OLED Panel Forecast (Million of units)



Source: Omdia

© 2021 Omdia

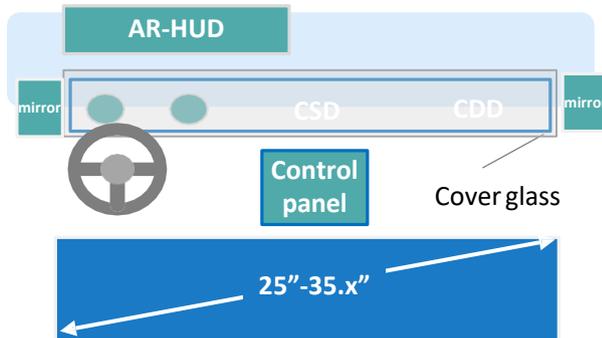
Apple's IT OLED panel roadmap scenario (Omdia's estimation)

Product	Size	2021	2022	2023	2024	2025	2026
iPad	10.9"	LCD	(10.86" OLED project dropped)				
	11.0"	Mini LED	→		Hybrid OLED	→	
	13.0"	Mini LED				Hybrid OLED	→
MacBook	14.0"	Mini LED					Foldable OLED
	16.0"	Mini LED	→			Hybrid OLED	
	21.5"	LCD					
iMac	27.0"	LCD					
	32.0"	Mini LED					2027" QD OLED or WOLED
	42.0"	-					2027" QD OLED or WOLED

Source: Omdia

© 2022 Omdia

OLED in Automotive



- Immersive experience (sensors and actuators)
- in-cabin AI (personalization)
- Multi-UI synergy for control and intelligent awareness

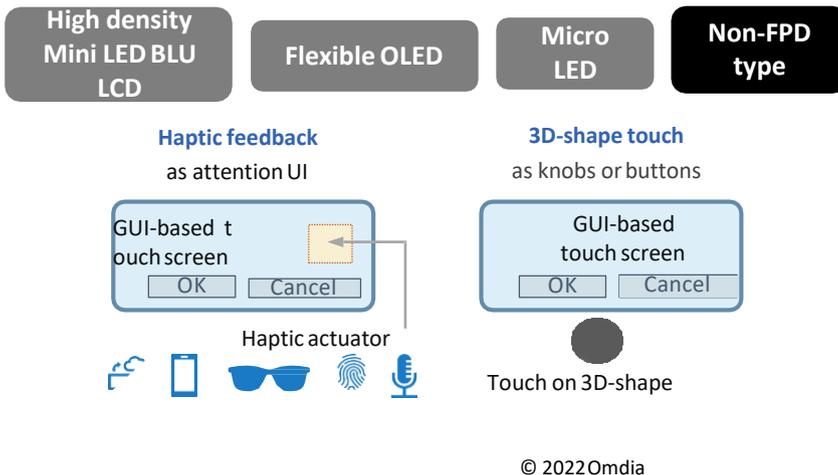
• OLED 적용 장단점

장점 - 얇고 가볍다, 화질이 선명하다, 소비전력이 낮다. 플렉서블하다. 투명, 플렉서블, 롤러블 등 다양한 폼팩터로 활용가능.

단점 - 비싸다.
- 휘도가약하다. (탠덤구조로 보강)

시장예상 - 연평균 42% 고성장

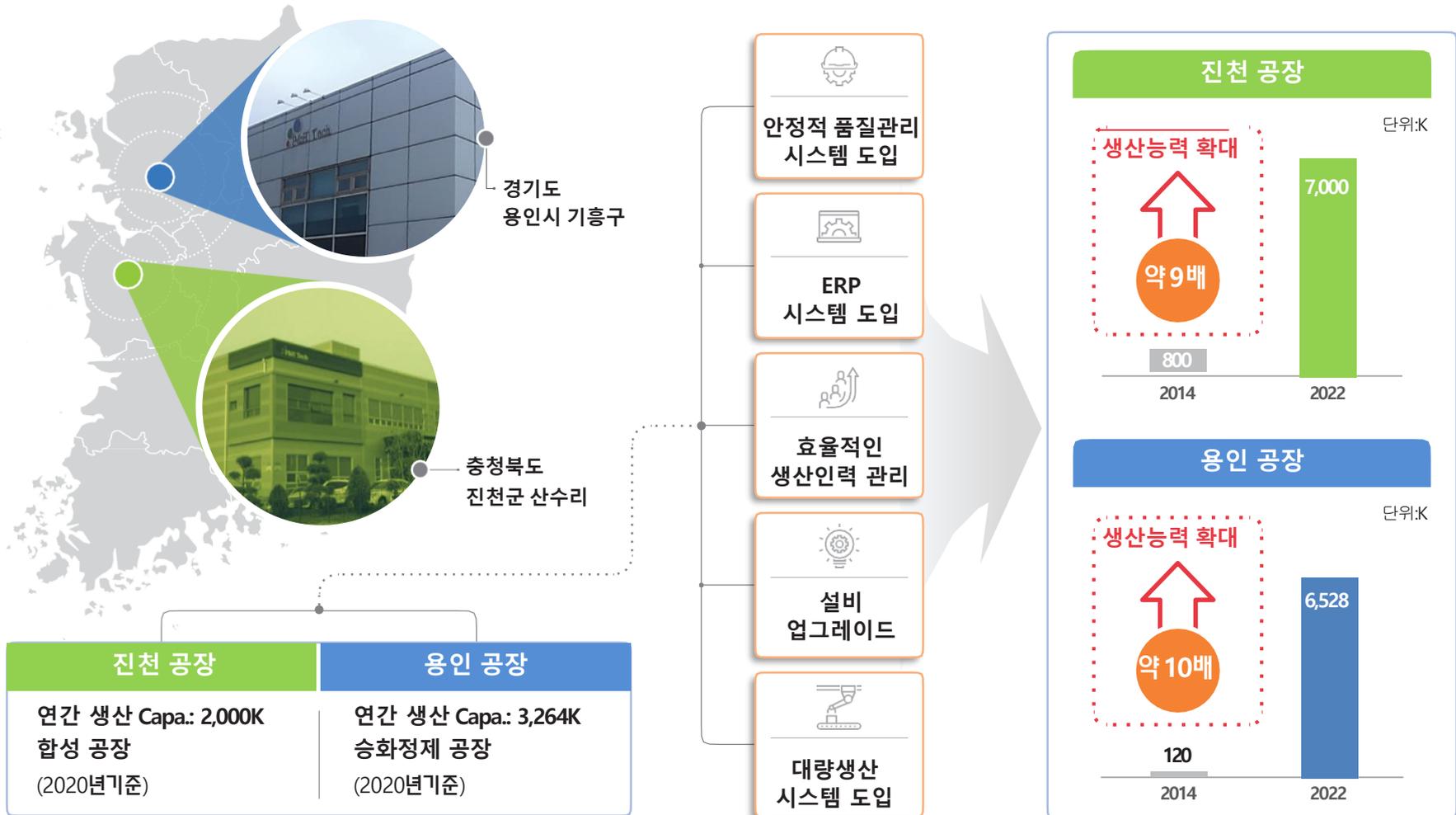
Many car companies are starting to mixing LCD and OLED in car



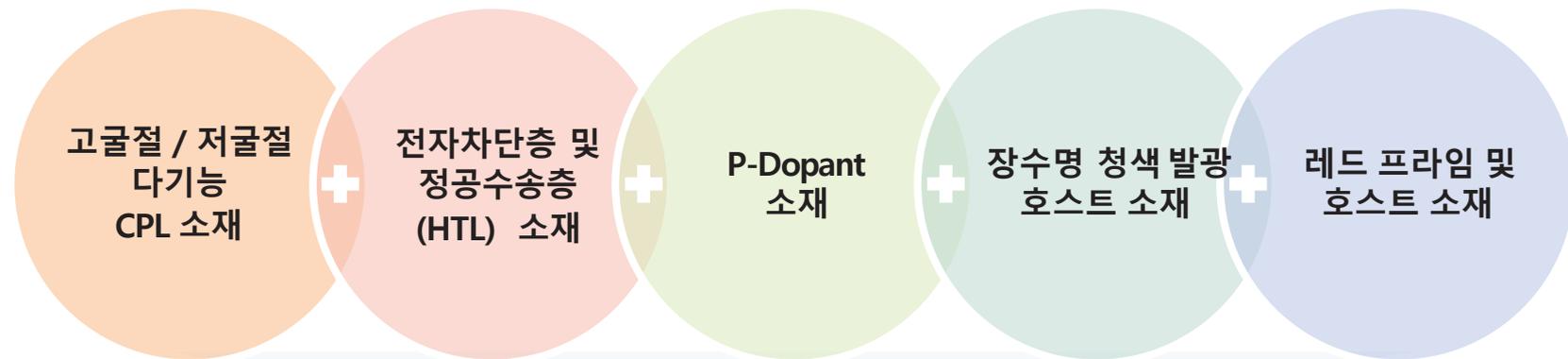
The next investment on OLED for TV and IT – China makers hesitating ...

			2022				2023				2024				2025				2026				2027				2028			
Stage			1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Market Demand	OLED –NB/Tablet	IT	10.2M				13.5M				27.5M				42.2M				53.1M				63.5M				73.9M			
	OLED –MNT	IT	0.3M				0.7M				0.8M				0.9M				1.0M				1.0M				1.1M			
	OLED TV	TV	8.8M				10.5M				11.3M				12.5M				13.6M				15.2M				16.6M			
Fab	ChinaStar	IT	T9 Gen8.6 a-Si+Oxide TFT for IT/Auto/Smartphone																											
		IT	T5 Gen6 LTPS TFT LCD for IT and Micro LED																											
		TV	(?) T8 Gen8.5 Ink Jet Printing RGB Oxide + OLED for TV/Monitor ?																											
		IT	(?) TX Gen8.6 OLED LTPS/LTPO + OLED for Tablet/Notebook ?																											
	Samsung Display	IT	A2 Gen5.5 Rigid LTPS+OLED For Notebook												A4E Gen6 OLED				A5 Gen8.5 Oxide + OLED for IT (15K/M)								+15K/M			
		TV	Q1 Fab Oxide + QD OLED Phase 1												QD OLED Phase 2												QD OLED Phase 3 ?			
	LG Display	IT	E6 Gen6 LTPS/LTPO+OLED for IT												E7 Gen8.5 Oxide + OLED for IT (22.5K/M)															
		TV	M1/M2/GP3 Gen8.5 WOLED												P7 Gn8.5 OLED				GP3 P-3 Gen8.5 WOLED				(?) P10 Gen10.5 WOLED ?							
	BOE	IT	Chengdu B16 Gen8.6 LTPS/LTPO + OLED for IT (15K/M)																											
		TV	B5 Gen8.5 WOLED R&D & Pilot-run																(?) New Gen8.5 WOLED Fab ?											
	JOLED	IT	Nomi Gen5.5 Ink Jet Printing RGB Oxide + OLED for IT																											
	Visionox	IT	(?) V4 Gen8.6 LTPS/LTPO + OLED for IT ?																											
	Tianma	IT	TM19 Gen8.6 a-Si/Oxide TFT LCD																(?) TM19 Gen8.6 OLED ?											
	HKC	TV	(?) H6 New gen8.5 WOLED Fab ?																											

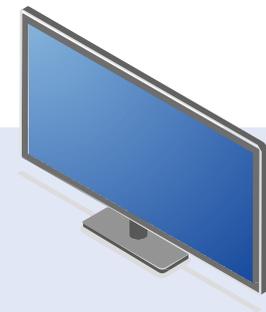
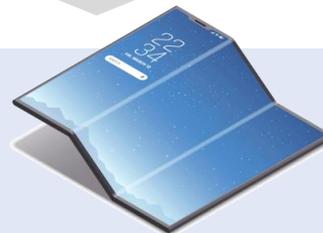
신규 물질의 대량 양산 계획으로 '21~22 설비 증설 진행중



융복합 다기능 소재 개발로 OLED 적용 제품 확장



OLED 재료 적용 제품



05

제품 개발 로드맵



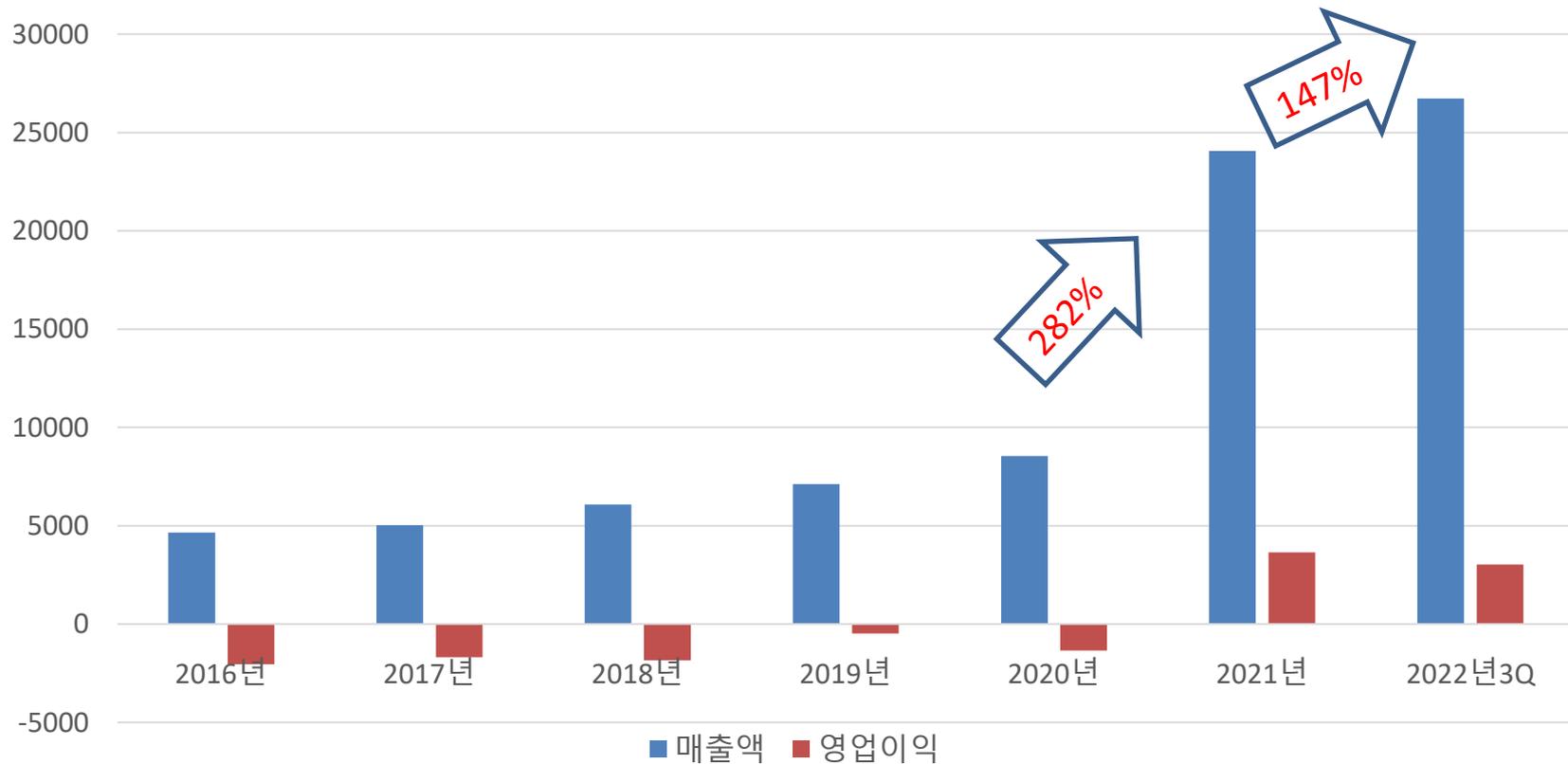
소재명	양산현황				
	2021년	2022년	2023년	2024년	2025년
R-prime	● 양산 중				
고굴절 CPL	● 양산 중				
장수명 BH (Mobile)	● 양산 중				
장수명 BH (TV)	● '19~21년	● 양산 대기중			
레드 호스트	● 양산 중				
저굴절 CPL	● '20~22년		● 양산 예정		
장수명 YG (TV)	● '20~21년	● 양산 대기중			
EBL	● '20~			● 양산 예정	
HTL	● '21~			● 양산 예정	
B-prime			● '22~		● 양산 예정
P-Dopant	● 연구단계		● 개발 평가 단계		

단위:백만원)

구분	1Q21	2Q21	3Q21	4Q21	21년 전체	1Q22	2Q22	3Q22	22년 3Q 누적
매출액	3,622	4,978	7,117	8,343	24,059	7,642	10,711	8,382	26,735
영업이익	398	466	1,445	1,344	3,653	592	1,062	1,373	3,028
영업이익율	11.0%	9.4%	20.3%	16.1%	15.2%	7.7%	9.9%	16.4%	11.3%

(단위:백만원)

다년간 축적된 유기물 소재 개발로 성장 지속



구분	2016년	2017년	2018년	2019년	2020년	2021년	2022년 3Q
매출액	4,653	5,023	6,082	7,127	8,540	24,059	26,735
영업이익	-2,045	-1,683	-1,841	-478	-1,340	3,653	3,028
이익율	-43.9%	-33.5%	-30.2%	-6.7%	-15.7%	15.2%	11.3%

감사합니다.

