



2023 OLED Emitting Material Report



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2. Development Trends of Blue Emitting Materials

2.2 Comparison of Candidate Technologies for High Efficiency and Long Life Blue Emitting Materials

- Professor Lee Jun-yeop of Sungkyunkwan University said at a seminar held by UBI Research in 2021 that blue emitting materials with external quantum efficiency of 15% or more and a lifetime of 1,000 hours (@T97, 1,000 nit, CIEy ≤ 0.05) are urgently needed.
- This means that an improvement of more than twice the current level is needed.

Comparison of blue fluorescence, phosphorescence, TADF and hyperfluorescence(HF) device characteristics

		Fluorescence (TTF)	Phosphorescence	Delayed Fluorescence (TADF)	HF
Theoretical maximum internal quantum efficiency		100%	100%	100%	100%
External Quantum Efficiency (Back Emission)		~10%	~20%	~10%	~10%
Lifetime	Material stability	~1000h	~1000h	~1000h	~1000h
	Device Stability	~1000h	~1000h	~1000h	~1000h
Color Purity		~100%	~100%	~100%	~100%
Core technologies	Host	~100%	~100%		
	Dopant	~100%	~100%	~100%	~100%

Source: Lee Jun Yeob(2021 UBI Seminar)

4. OLED Industry Issue Analysis

4.7 Samsung Display's Emitting Structure Application Model Status and Future Forecast

- Samsung Display's M11 was first applied to Samsung Electronics' 'Galaxy S21 Ultra' released in early 2021, and was used in some of Samsung Electronics' 'Galaxy S22' series released in 2022 and Apple's 'iPhone 14' series.
- The M12 was first used in Samsung Electronics' 'Galaxy Z Fold4' in 2022 and was also applied to the 'Galaxy S23' series released in 2023, and is expected to be applied to Samsung Electronics' '*****' and '*****' to be released in the first half of 2023.
- The M12 is also expected to be applied to Apple's iPhone 15 series, which will be released in the second half of 2023.
- The M13 will not be used for Samsung Electronics or Apple in 2023, but is expected to be applied to Samsung Electronics' '*****' series to be released in 2024.
- M13 was initially expected to be applied to '*****', but it will not be applied in the end.
- M14 is expected to be applied to Apple's '*****' series, and even-numbered emitting structures are expected to be developed exclusively for Apple.

Samsung Display's emitting structure and expected major application models

		M11	M12	M13	M14
Main Model	Samsung Electronics	Galaxy S21 Ultra, Galaxy S22, Galaxy Z Fold4, Galaxy S23, *****	Galaxy Z Fold4, Galaxy S23, *****	*****	
	Apple	iPhone 14	iPhone 15, *****		*****

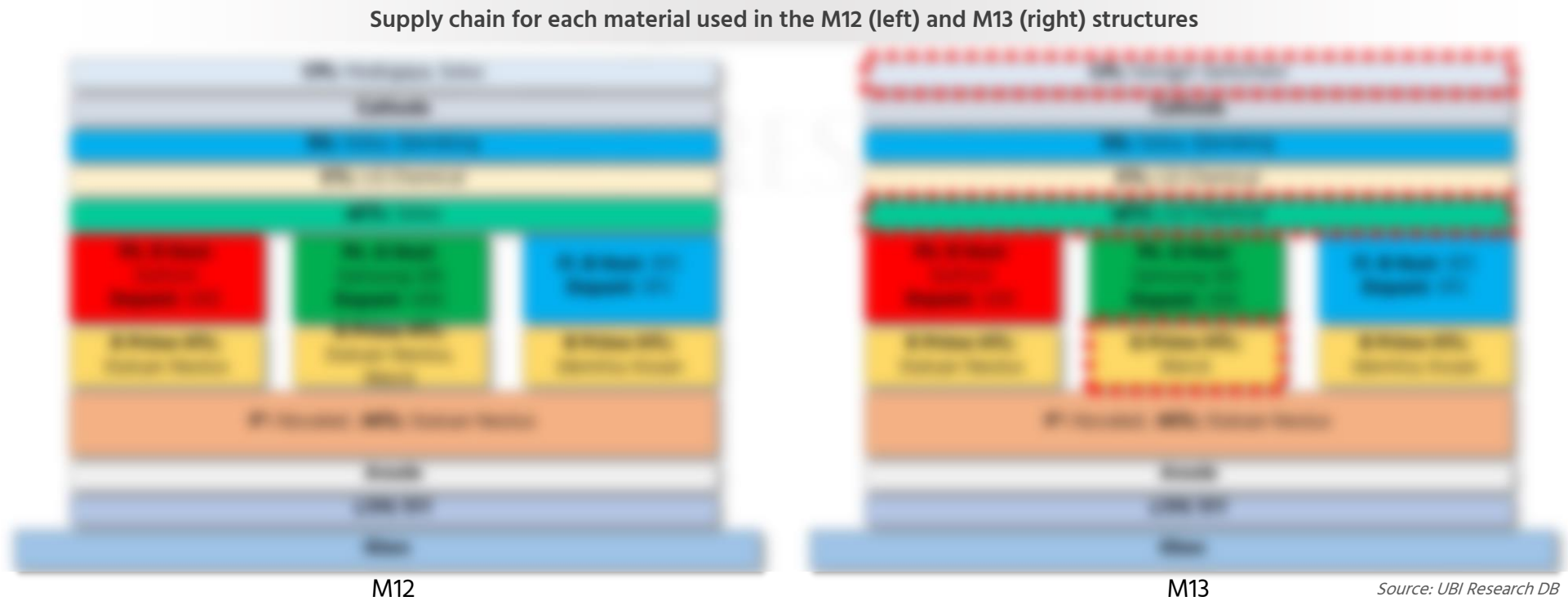
Source: UBI Research DB

7. Analysis of Supply Chain and Panel Structure by Panel Maker

7.1 Samsung Display

■ Samsung Display's Small OLED Emitting Structure and Supply Chain

- In M12, Hodogaya's CPL and Duksan Neolux's G' were supplied to Apple, and Solus' CPL and Merck's G' were supplied to Samsung Electronics.
- In M13, *****'s CPL and *****'s G' were used exclusively, and the aETL supplier was changed from Solus to *****.
- The M13 is expected to be exclusive to *****'s smartphones in 2023.

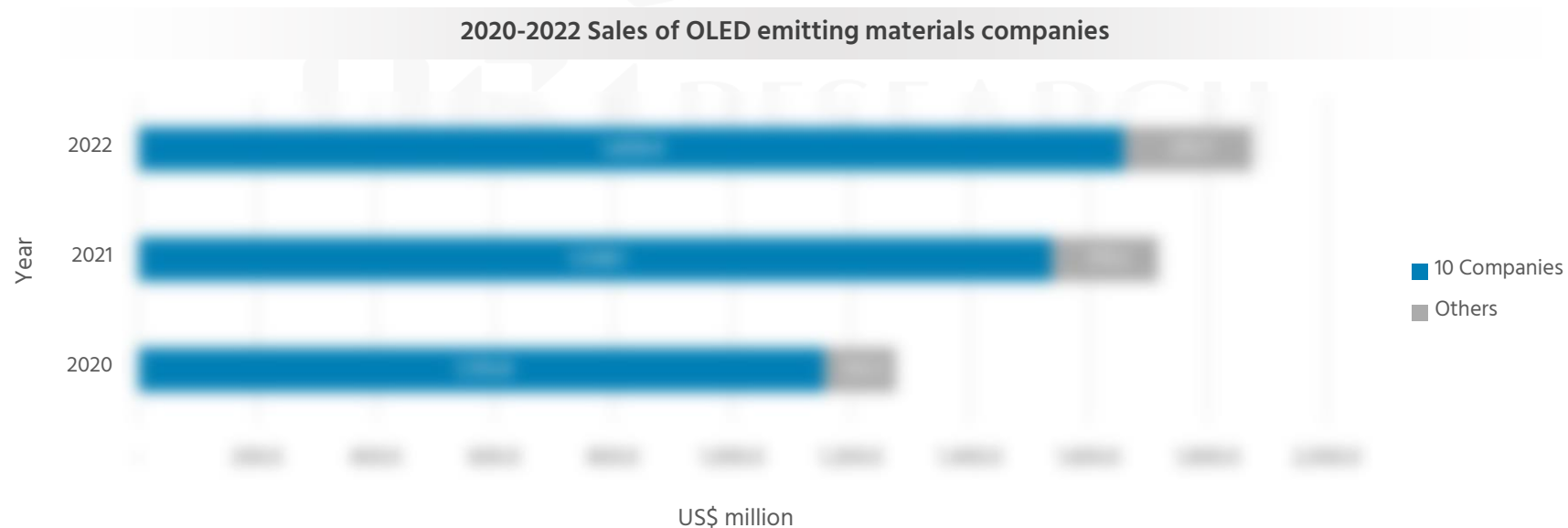


8. OLED Emitting Material Sales Analysis

8.8 By Material Company

■ Sales Analysis by Year

- Sales of all OLED emitting material makers including 10 major emitting material makers (Duksan Neolux, DuPont, Idemitsu Kosan, LG Chem, Merck, Novaled, Samsung SDI, SFC, Solus, UDC) were investigated.
- Recycled materials and materials for development are included, and since it was calculated based on the amount of panel mass-produced by panel makers and the price of new emitting materials, the presented sales may differ from the actual sales of emitting material makers.
- Until 2022, the exchange rate was calculated as 1,100 won per dollar.



Source: UBI Research DB

9. Analysis of OLED Emitting Material Market Share in 2022

9.1 Total

- 2022 OLED emitting material sales share analyzed by dividing into host, dopant, HTL, ETL, and others.
- HTL includes HIL, HTL, HITL, HTL prime (red, green, blue), and p+ dopant, ETL includes EIL, ETL, and aETL (advanced ETL), and other materials include CGL and CPL.
- The sales share of host materials is the highest with ***% of total sales, followed by HTL with ***%.
- Both host and dopant materials showed high sales share in the order of green, red, blue, and yellow-green.

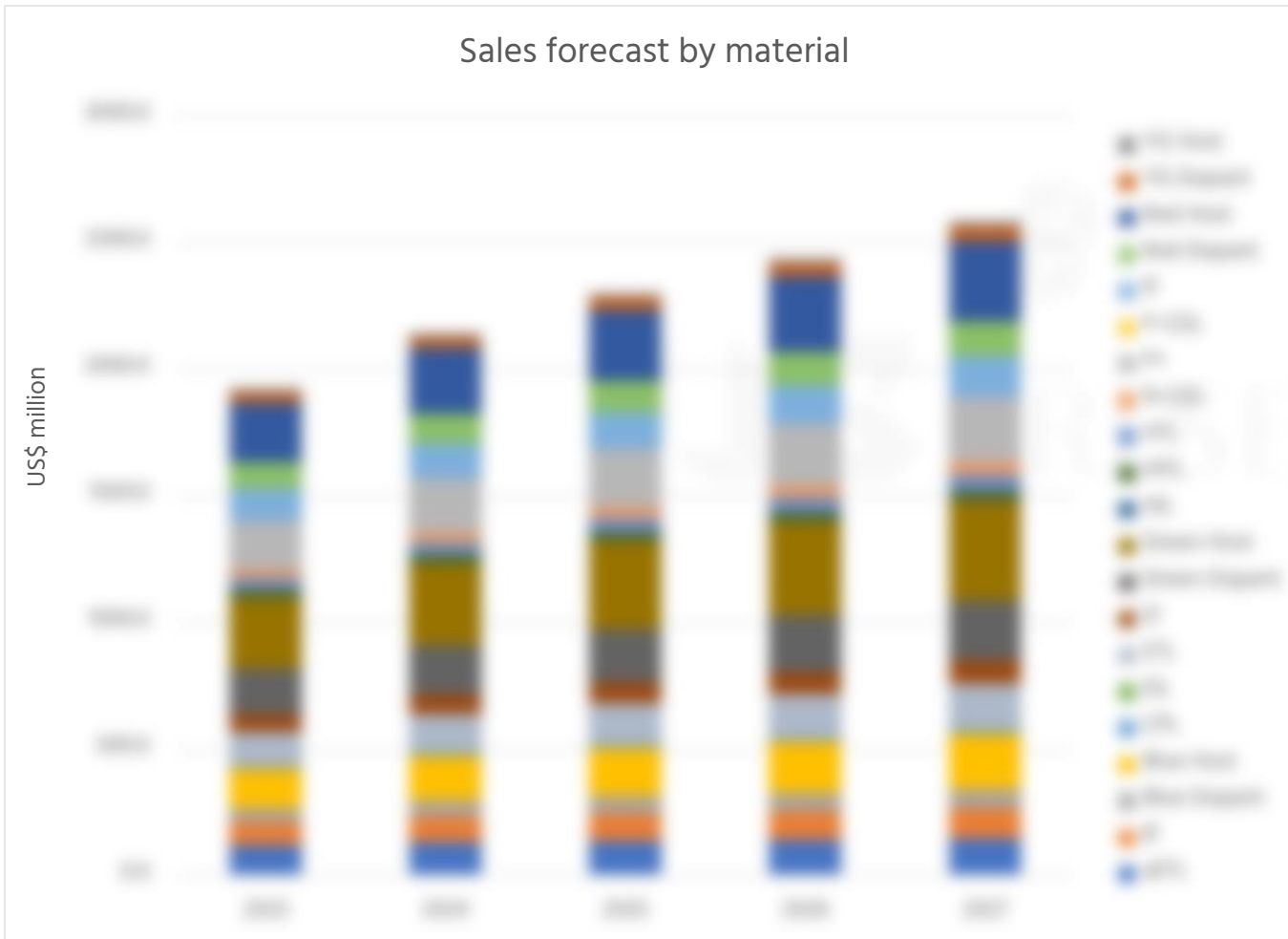


Source: UBI Research DB

11. OLED Emitting Materials Market Forecast

11.6 By Emitting Material

■ Total



Source: UBI Research DB

(US\$ million)

Material	2023	2024	2025	2026	2027
YG host					
YG dopant					
Red host					
Red dopant					
R'					
P+					
N-CGL					
HTL					
HITL					
HIL					
Green host					
Green dopant					
G'					
ETL					
EIL					
CPL					
Blue host					
Blue dopant					
B'					
aETL					

Source: UBI Research DB



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