2021 OLED Emitting Material Report

Chief Analyst
Dr. Choong Hoon YI

Analyst
Dae Jeong YOON

Contents

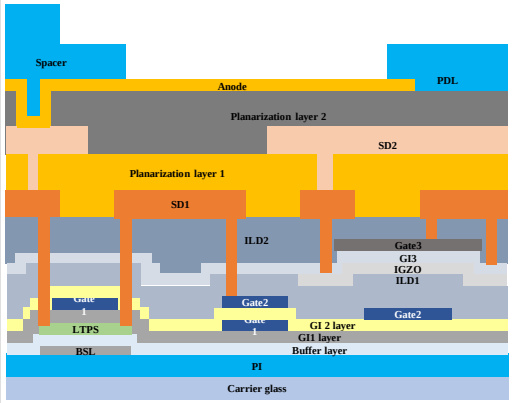
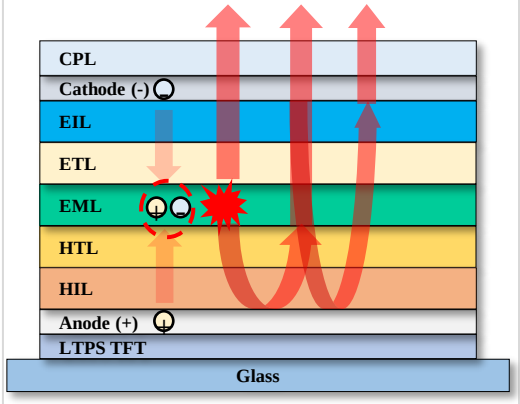
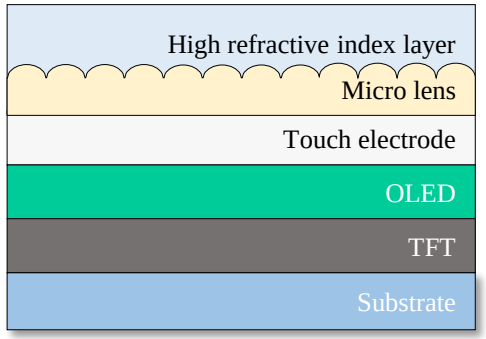
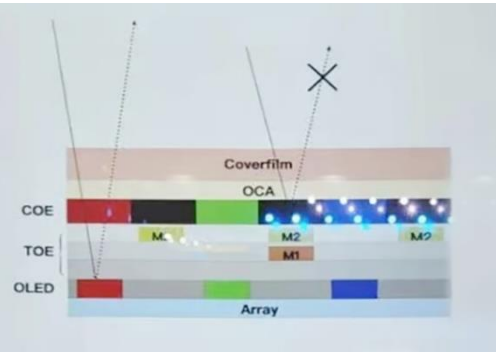
Contents

2. Analysis of OLED Development Trend for Smartphones

2.1 Low-power driving technology development trend

- Recently, as it has become common to watch videos, play games, and handle tasks for long periods of time with portable devices, battery consumption of portable devices has become an issue.
- The resolution of mobile devices is also increasing, and since the pixel size decreases as the resolution of OLEDs increases, more power is consumed than conventional low-resolution OLEDs in order to maintain a certain luminance.
- For low-power driving of OLED, Samsung Display is applying or developing the following technologies.

Samsung Display's low-power driving technology development example

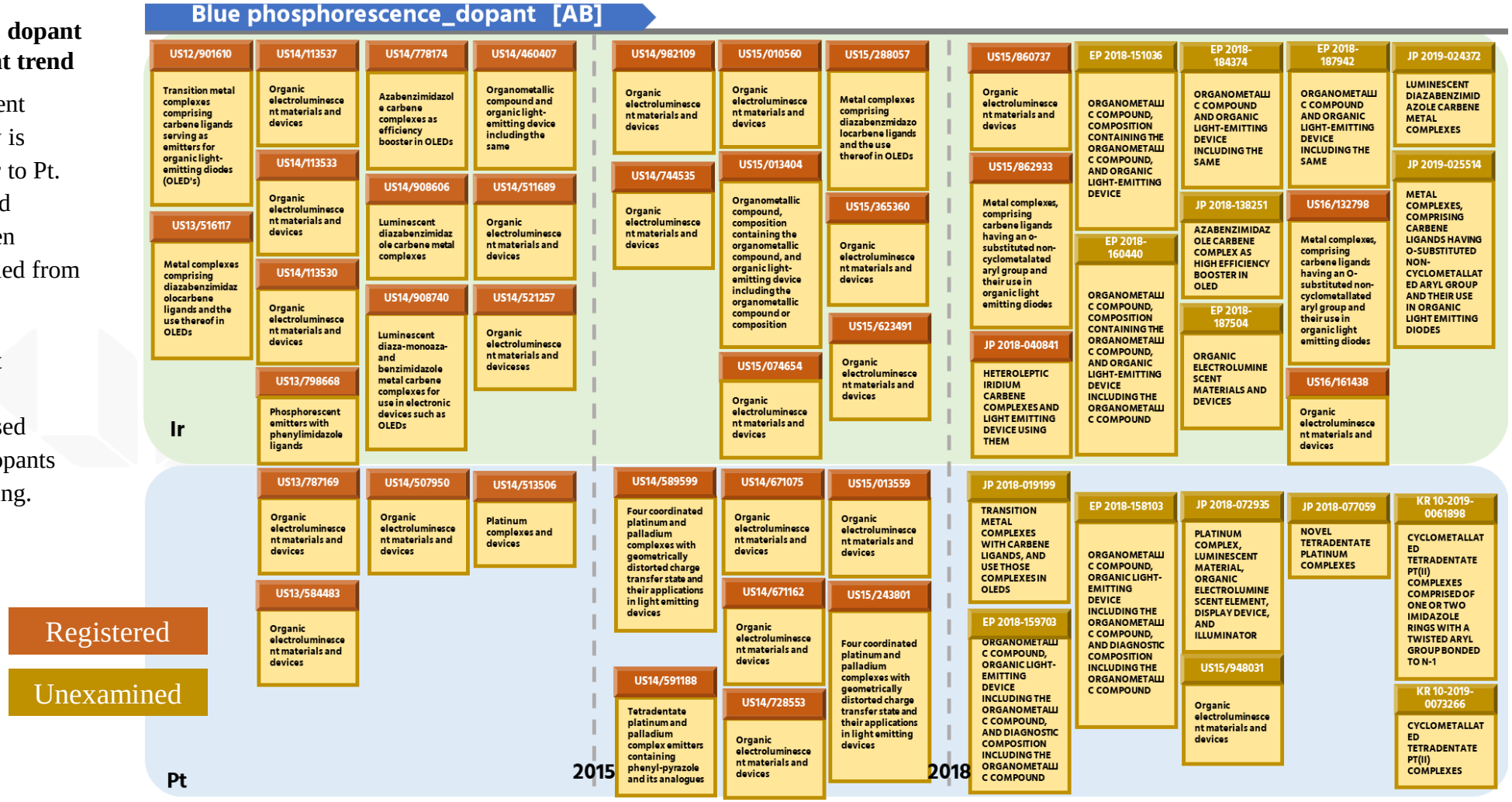
Technology	LTPO TFT	High refractive index CPL	Micro lens array	Pol-less
Explanation	Combining LTPS TFT and oxide TFT technology	Application of CPL with higher refractive index than before	Micro lens applied on the top of the touch electrode	Polarizer removal and color filter, black PDL, and anti-reflect technology applied
Effect	Total power consumption reduction through reduction of driving current	Increased external quantum efficiency	Increased external quantum efficiency	Increased external quantum efficiency
Application Model	Galaxy Note 20 Ultra, Galaxy Z Fold2, Galaxy S21 Ultra	Galaxy S10 series~ (M9,M10,M11)	Galaxy Note 20 Ultra	Galaxy Z Fold3(Expected)
Structure				

Source: UBI Research DB, news.samsungdisplay.com, Visionox

3. Blue Phosphorescent Material Development Trend

3.2 Phosphorescent Materials Research Trend

- **Blue phosphorescent dopant technology and patent trend**
  - Blue phosphorescent dopant technology is converting from Ir to Pt. Patents for Ir-based materials have been continuously applied from before.
  - Since 2015, patent applications for tetradentate Pt-based phosphorescent dopants have been increasing.



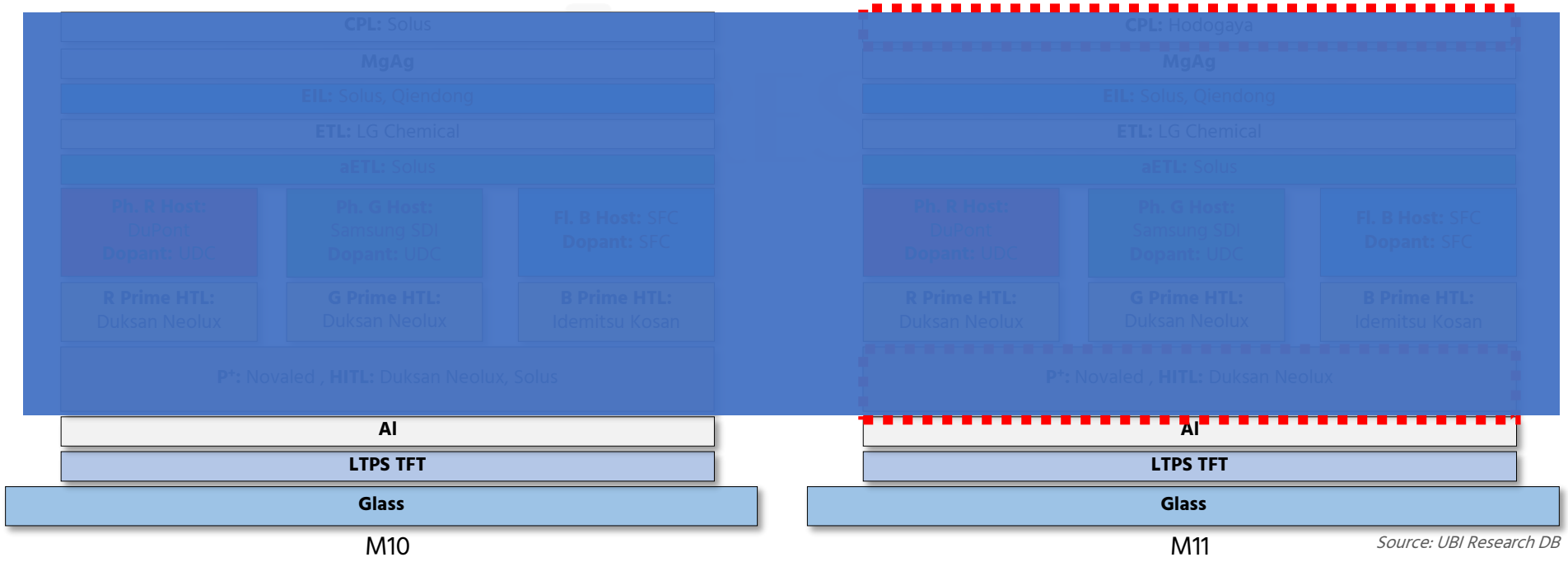
Source: UBI Research DB

6. Supply Chain and Panel Structure Analysis by Panel Maker

6.1 Samsung Display

- **Samsung Display's Small and Medium-Sized OLED Light-Emitting Structure and Supply Chain**
  - In M11, only the CPL supplier has been changed from Solus to Hodogaya, and HITL materials are solely supplied by Deoksan Neolux.
  - M11 was applied only to Samsung’s 'Galaxy S21 Ultra', and M10 was applied to 'Galaxy S21' and 'Galaxy S21 Plus'.
  - Apple's new iPhone, which will be mass-produced in the second half of 2021, will be applied with the M11, and some vendors may change.

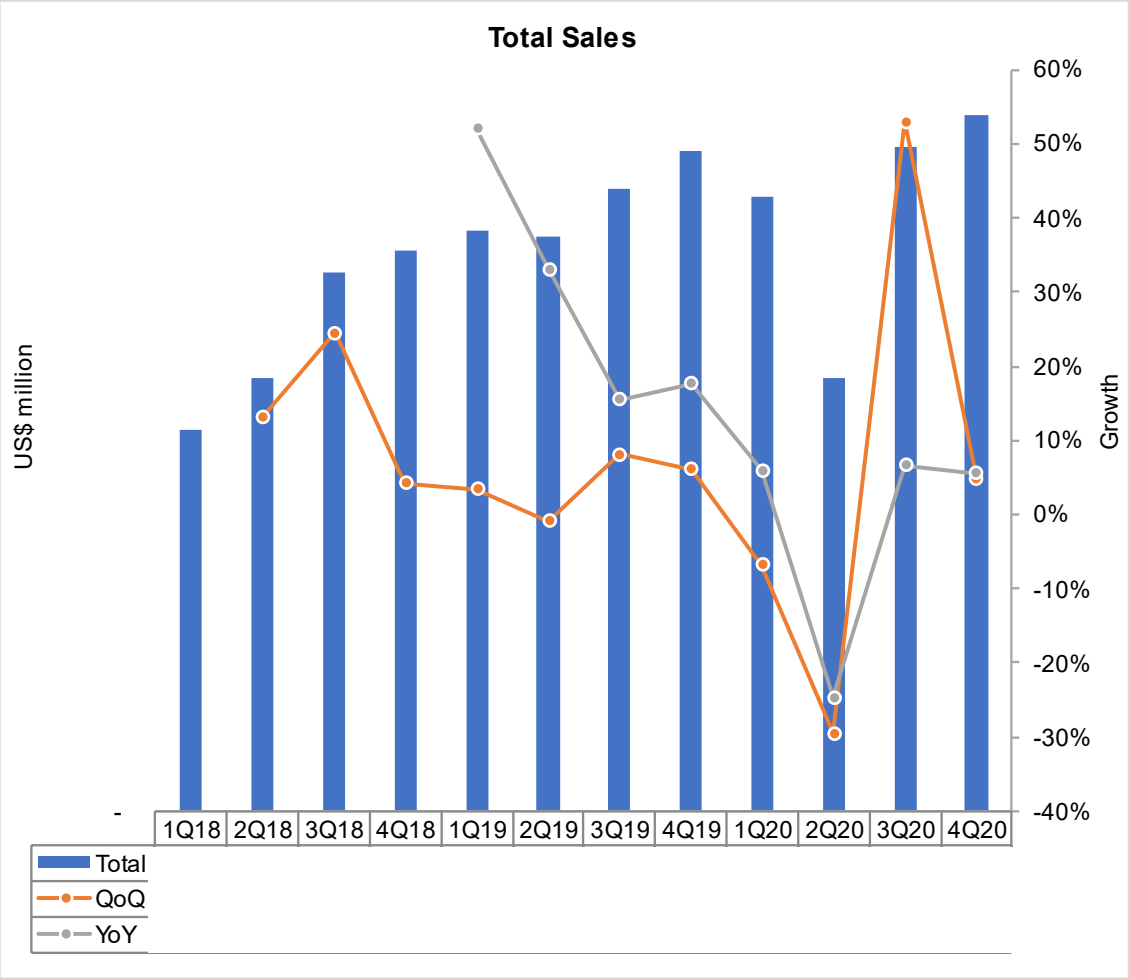
Supply chain for each material used in the M10 (left) and M11 (right) structures

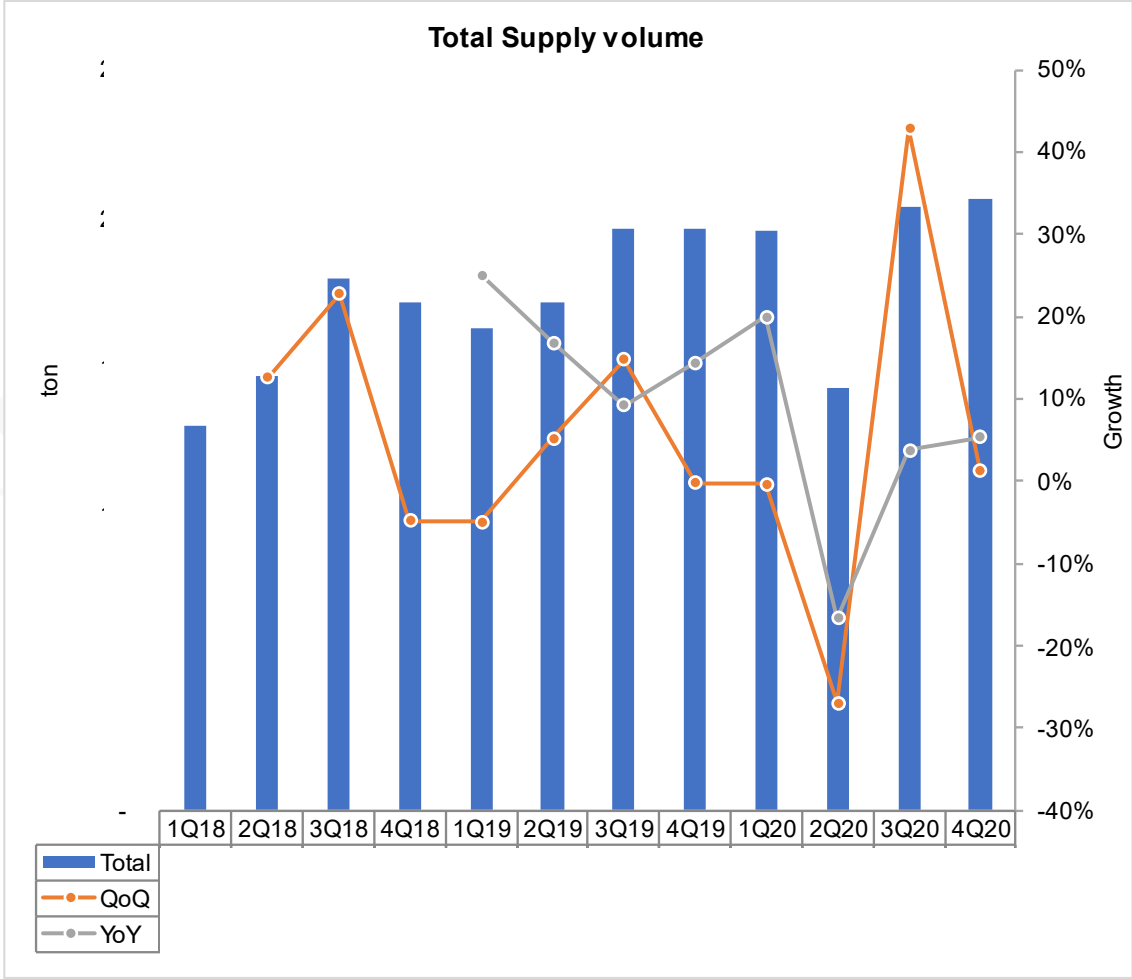


Source: UBI Research DB

9. OLED Emitting Material Performance Analysis

9.1 Total



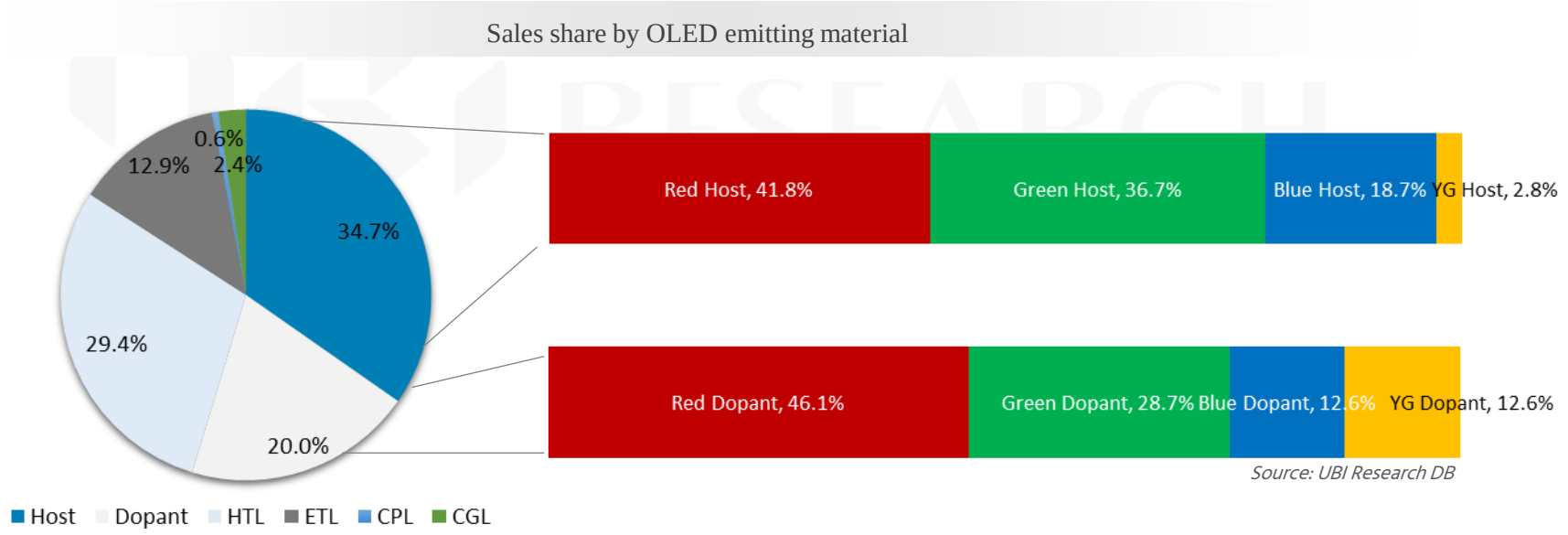


Source: UBI Research DB

10. Market Share Analysis of OLED Emitting Materials in 2020

10.1 Total

- The market share of OLED emitting materials sales in 2020 was analyzed by dividing into host, dopant, HTL, ETL, and others.
- HTL includes HIL, HTL, HITL, HTL prime (red, green, blue), p dopant, ETL includes EIL, ETL, aETL (advanced ETL), and other materials include CGL and CPL.
- Host materials' sales share was the highest with **% of total sales, followed by HTL materials with **%.
- Both host materials and dopant materials have the highest sales share in the order of green, red, blue, and yellow-green.



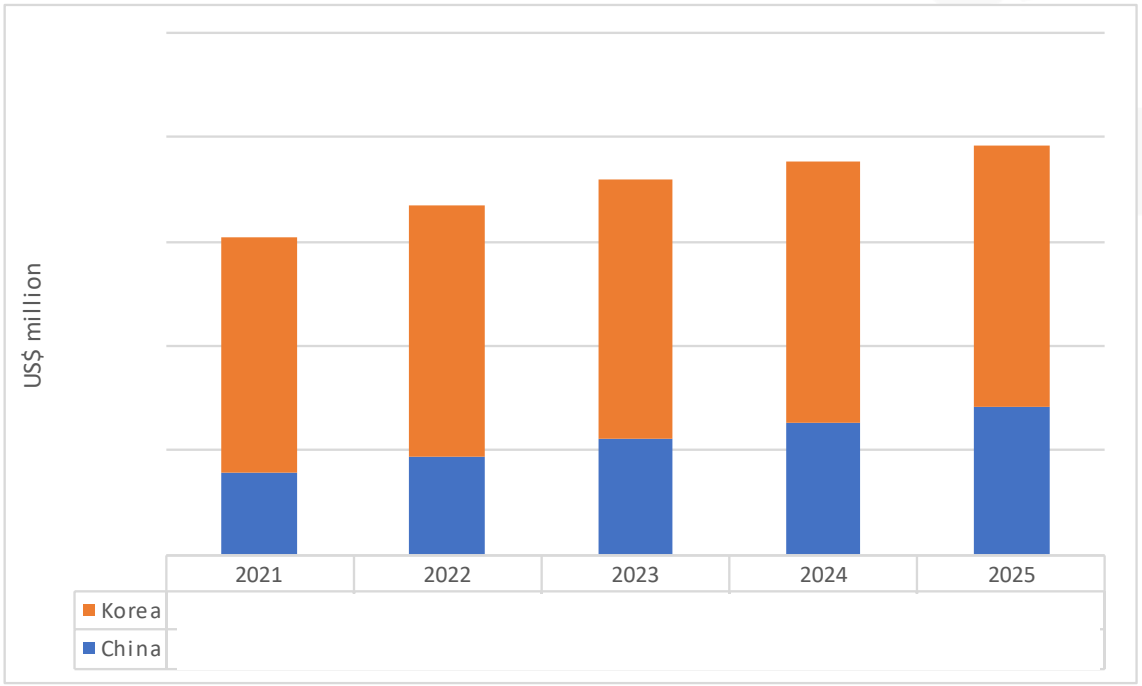
Source: UBI Research DB

12. OLED Emitting Material Market Forecast

12.2 By Country

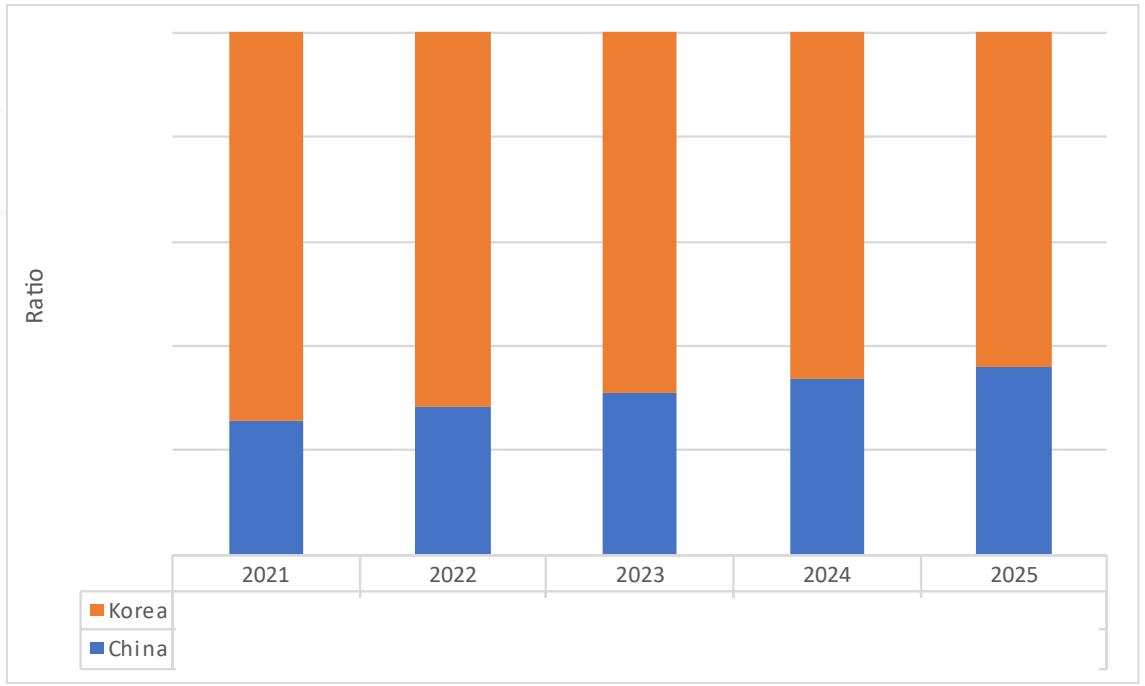
- **Total**
  - The purchase amount of OLED emitting materials by Korean panel makers is expected to reach US$ **billion in 2021 and US$ ** billion in 2025.
  - In 2021, Chinese panel makers' material purchases are expected to grow **% annually from $**million to form a market of $** million by 2025.
  - Over the next five years, Korean panel makers' material purchases are expected to reach **% of the total market.

Total market forecast by country



Source: UBI Research DB

Total market share by country



Source: UBI Research DB

Chief Analyst
Dr. Choong Hoon YI

Analyst
Dae Jeong YOON