AMOLED Manufacturing Process Report

SAMPLE

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UBI RESEARCH

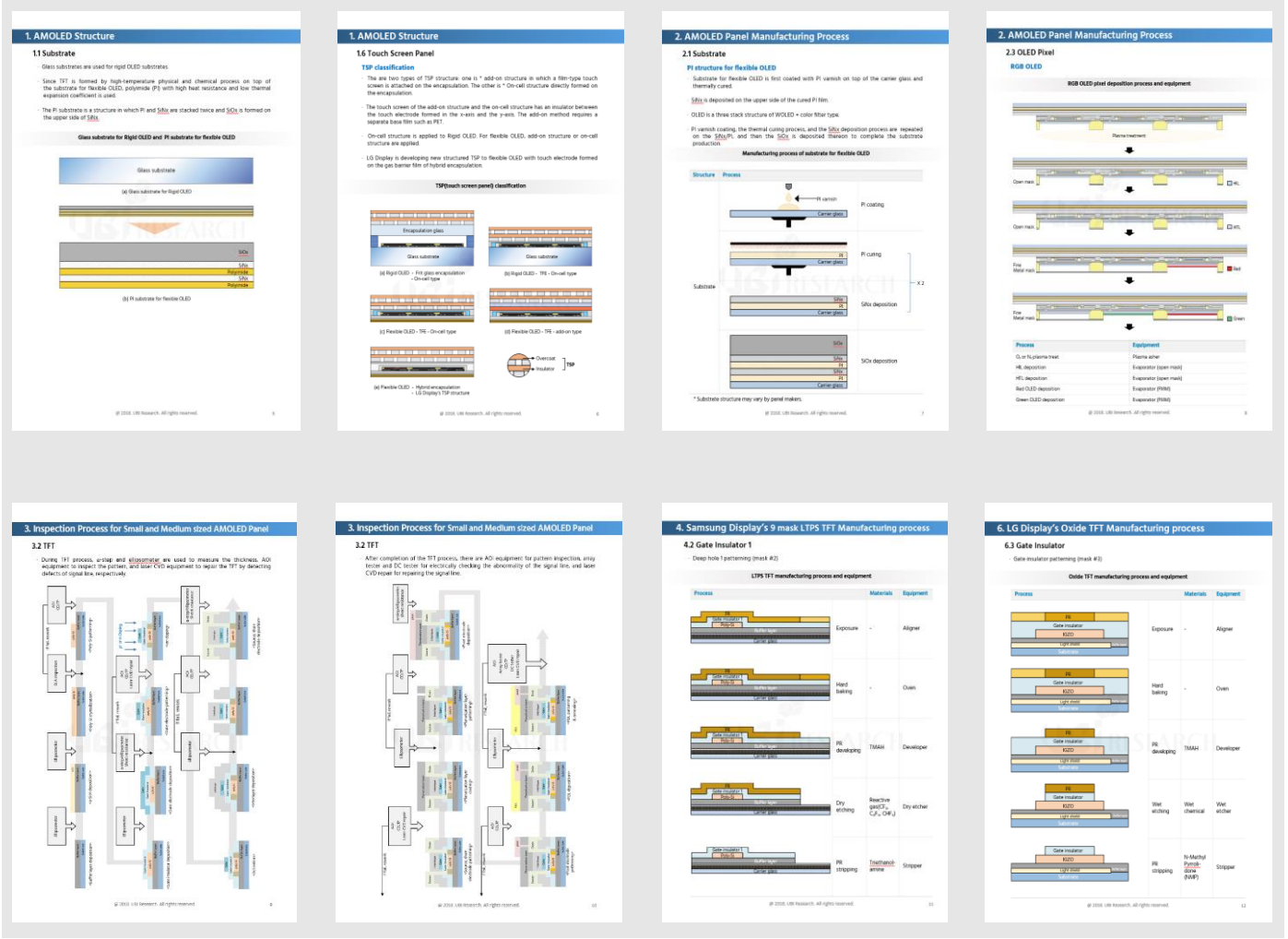
AMOLED Manufacturing Process Report

- The report analyzes the structure and manufacturing process by dividing AMOLED into small & medium-sized rigid OLED, small & medium-sized flexible OLED and large-area rigid OLED with * 6 chapters. In addition, by describing the latest processes of Samsung Display and LG Display, it aims to help our customers to understand the latest process and analyze future development direction.

  *1) AMOLED Structure
  2) AMOLED Panel Manufacturing Process
  3) Inspection Process for Small and Medium sized AMOLED Panel
  4) Samsung Display's 9 mask LTPS TFT Manufacturing process
  5) Samsung Display's 13 mask LTPS TFT Manufacturing process
  6) LG Display's Oxide TFT Manufacturing process

- For further details of the supply chain, emitting materials and market track, it is recommendable to refer to the reports ** mentioned below.

  **1) Supply Chain Analysis
  2) Emitting Material Industry
  3) Material & Component Industry
  4) Manufacturing and Inspection Equipment Industry
  5) Market Track



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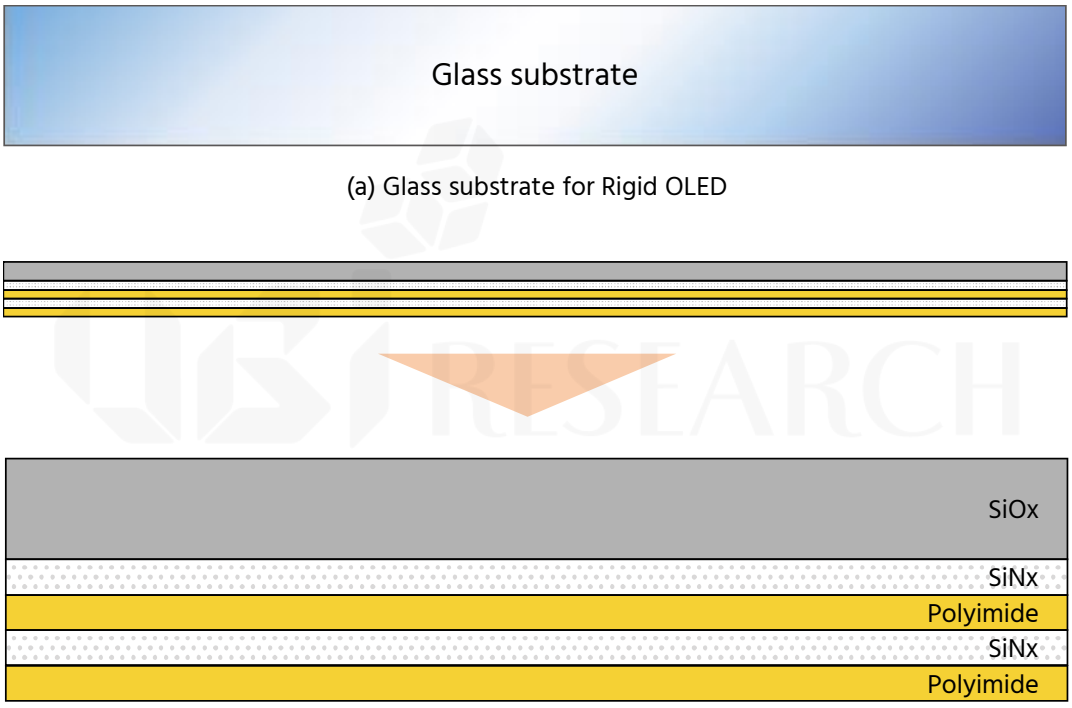
1. AMOLED Structure

1.1 Substrate

- Glass substrates are used for rigid OLED substrates.
- For flexible OLED, polyimide (PI) with high heat resistance and low thermal expansion coefficient is used since TFT is formed by high-temperature physical and chemical process on top of the substrate.
- The PI substrate is a structure in which PI and SiNx are stacked twice and SiOx is formed on the upper side of SiNx.

Glass substrate for Rigid OLED and PI substrate for flexible OLED



(a) Glass substrate for Rigid OLED

(b) PI substrate for flexible OLED

1.6 Touch Screen Panel

TSP classification

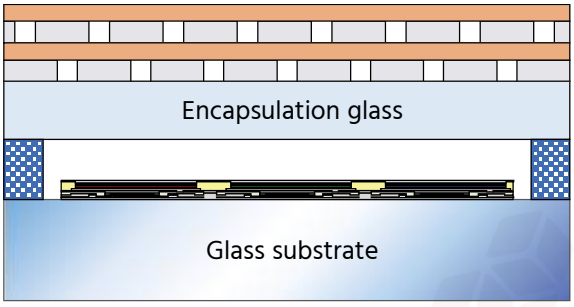
- There are two types of TSP structure: One is * add-on structure in which a film-type touch screen is attached on the encapsulation. The other is * On-cell structure directly formed on the encapsulation.

- The touch screen of the add-on structure and the on-cell structure has an insulator between the touch electrode formed in the x-axis and the y-axis. The add-on method requires a separate base film such as PET.

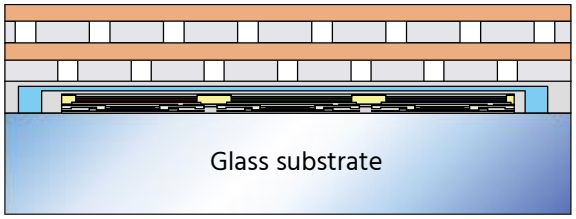
- On-cell structure is applied to Rigid OLED. For flexible OLED, add-on structure or on-cell structure is applied.

- LG Display is developing new structured TSP to flexible OLED with touch electrode formed on the gas barrier film of hybrid encapsulation.

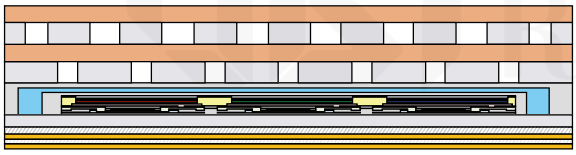
TSP(touch screen panel) classification



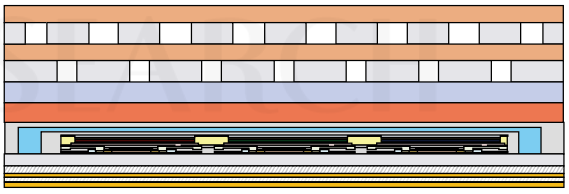
(a) Rigid OLED - Frit glass encapsulation
- On-cell type



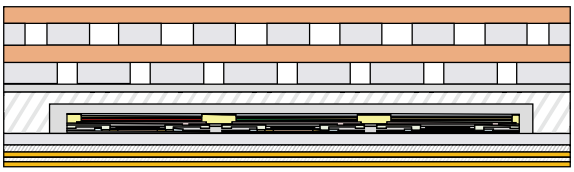
(b) Rigid OLED - TFE - On-cell type



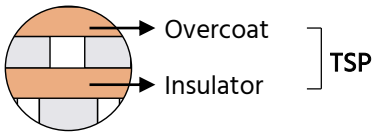
(c) Flexible OLED - TFE - On-cell type



(d) Flexible OLED - TFE - add-on type



(e) Flexible OLED - Hybrid encapsulation
- LG Display's TSP structure



2. AMOLED Panel Manufacturing Process

2.1 Substrate

PI structure for flexible OLED

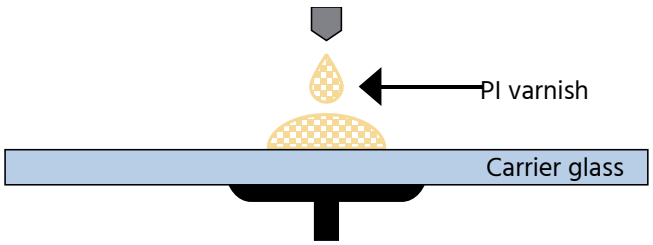
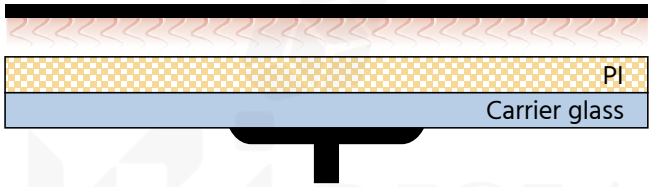
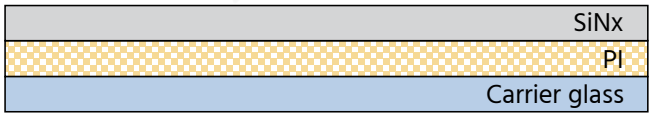
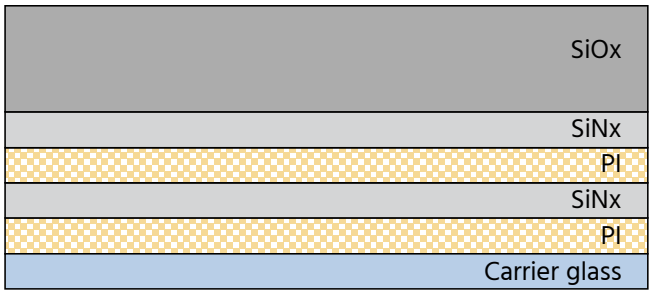
· Substrate for flexible OLED is first coated with PI varnish on top of the carrier glass and thermally cured.

· SiNx is deposited on the upper side of the cured PI film.

· OLED is a three stack structure of WOLED + color filter type.

· PI varnish coating, the thermal curing process, and the SiNx deposition process are repeated on the SiNx/PI, and then the SiOx is deposited thereon to complete the substrate production.

Manufacturing process of substrate for flexible OLED

Structure	Process	
Substrate		PI coating
		PI curing
		SiNx deposition
		SiOx deposition

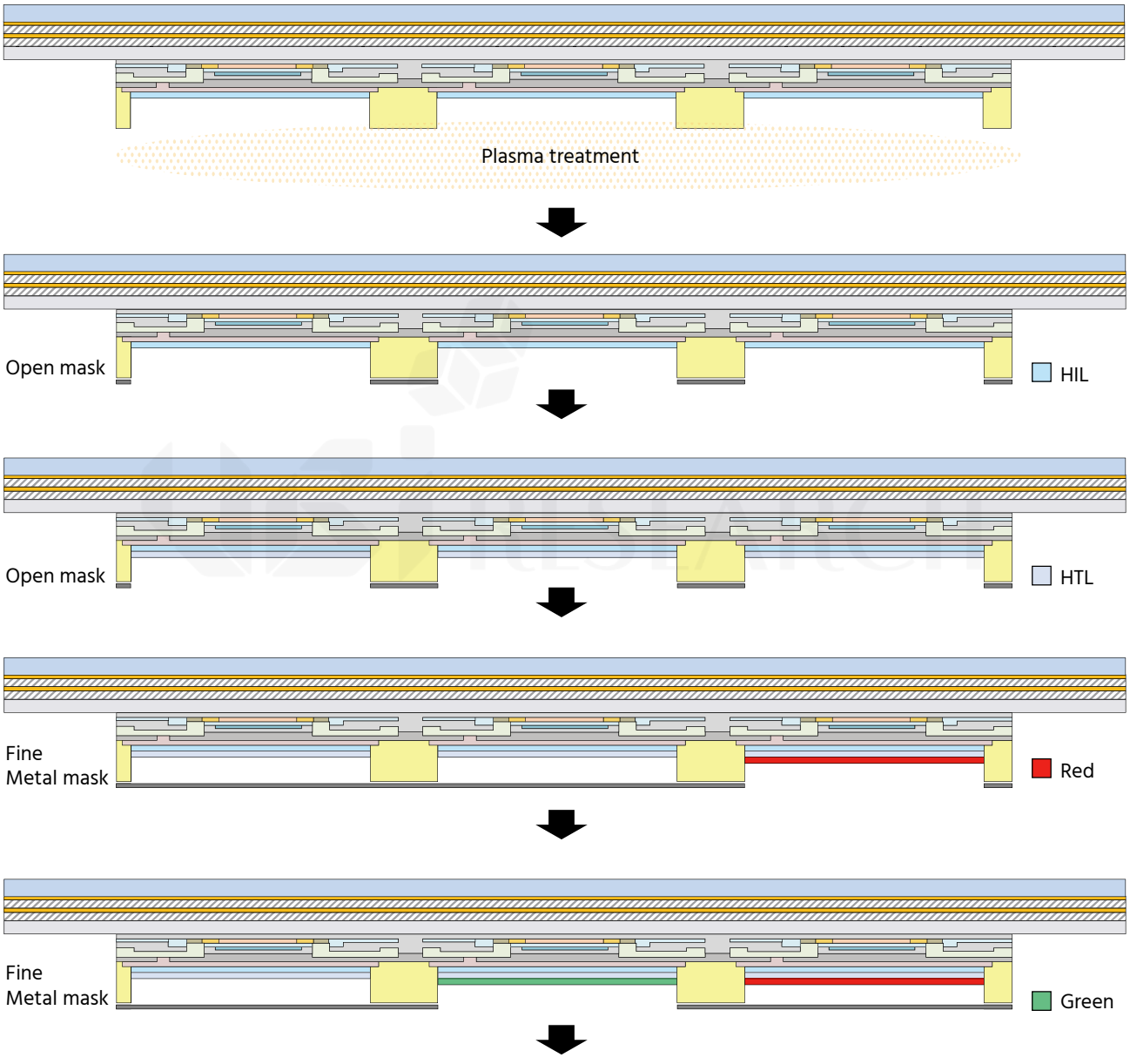
X 2

* Substrate structure may vary by panel makers.

2.3 OLED Pixel

RGB OLED

RGB OLED pixel deposition process and equipment

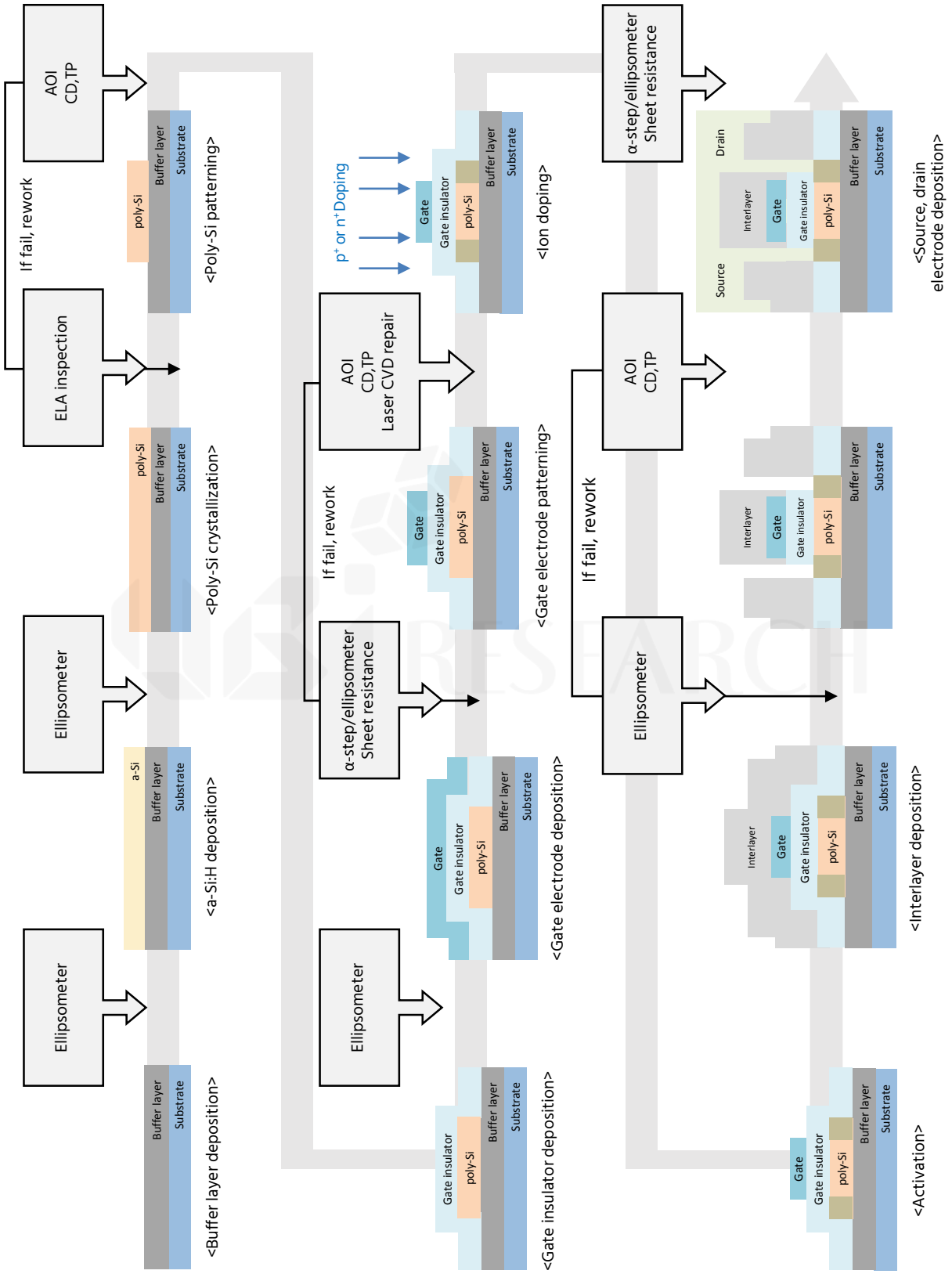


Process	Equipment
O_2 or N_2 plasma treat	Plasma asher
HIL deposition	Evaporator (open mask)
HTL deposition	Evaporator (open mask)
Red OLED deposition	Evaporator (FMM)
Green OLED deposition	Evaporator (FMM)

3. Inspection Process for Small and Medium sized AMOLED Panel

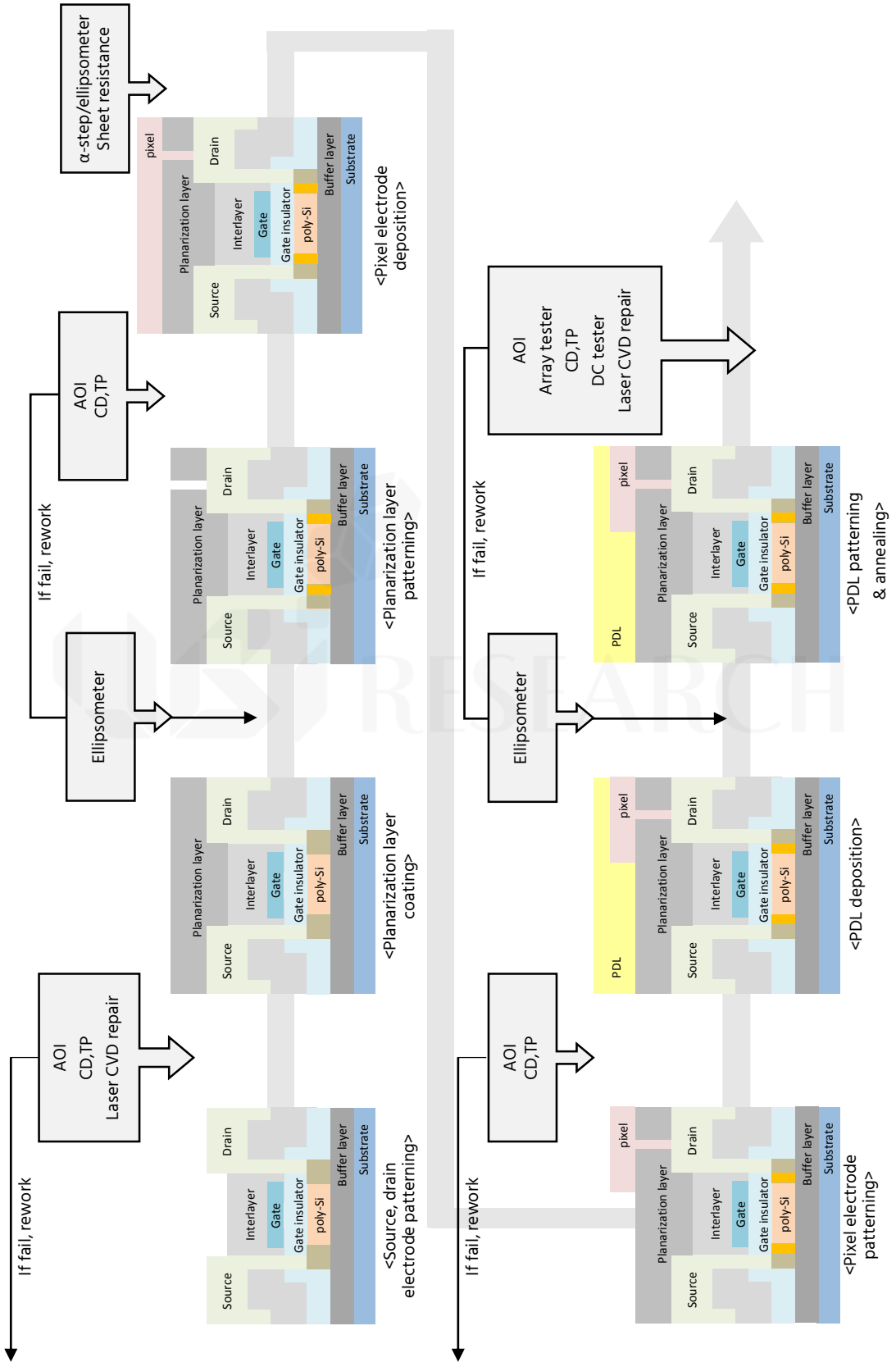
3.2 TFT

· During TFT process, α-step and ellipsometer are used to measure the thickness, AOI equipment to inspect the pattern, and laser CVD equipment to repair the TFT by detecting defects of signal line, respectively.



3.2 TFT

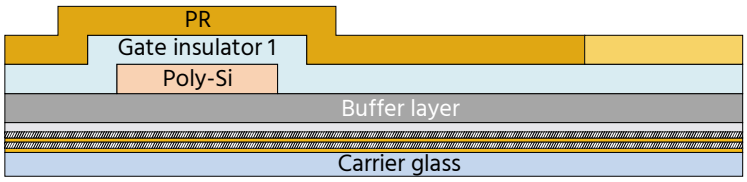
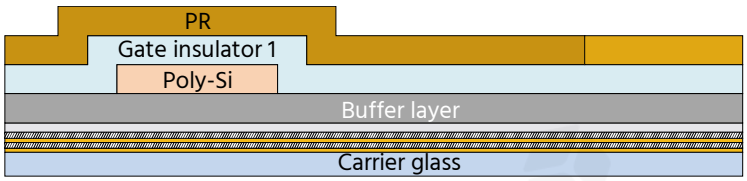
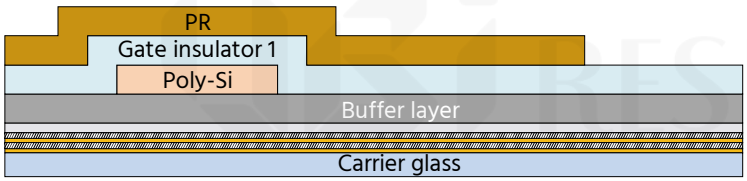
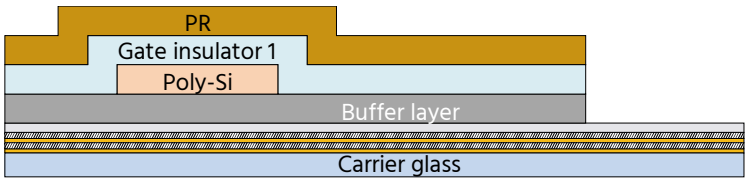
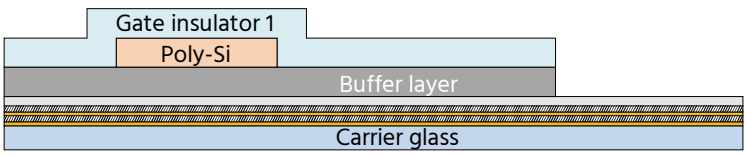
· After completion of the TFT process, there are AOI equipment for pattern inspection, array tester and DC tester for electrically checking the abnormality of the signal line, and laser CVD repair for repairing the signal line.



4.2 Gate Insulator 1

· Deep hole 1 patterning (mask #2)

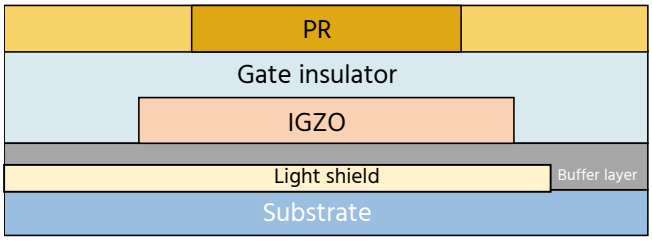
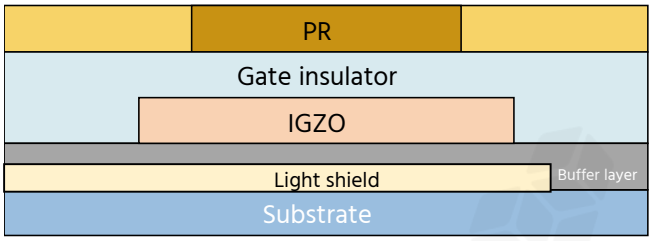
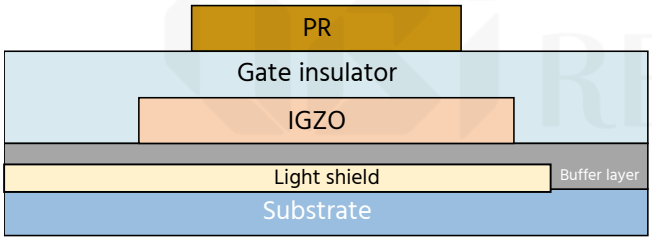
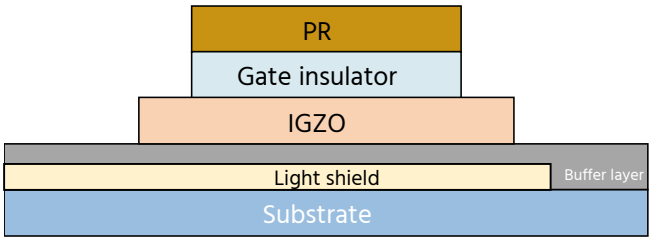
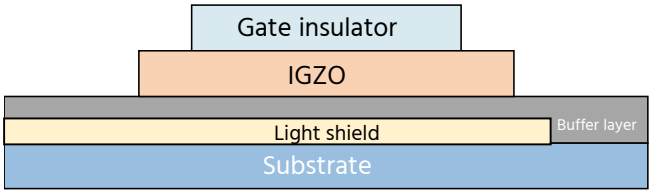
LTPS TFT manufacturing process and equipment

Process		Materials	Equipment
	Exposure	-	Aligner
	Hard baking	-	Oven
	PR developing	TMAH	Developer
	Dry etching	Reactive gas(CF_4, C_4F_4, CHF_4)	Dry etcher
	PR stripping	Triethanol-amine	Stripper

6.3 Gate Insulator

· Gate insulator patterning (mask #3)

Oxide TFT manufacturing process and equipment

Process		Materials	Equipment
	Exposure	-	Aligner
	Hard baking	-	Oven
	PR developing	TMAH	Developer
	Wet etching	Wet chemical	Wet etcher
	PR stripping	N-Methyl Pyrroli-done (NMP)	Stripper

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