ITRI DISPLAY PROGRAM
DISPLAY TECHNOLOGY CENTER

Flex Your Life

VISION
To become the pioneer of Taiwan’s display industry.

MISSION
To lead Taiwan into the flexible display new era, while continuing to invigorate the growth of the industry.
ITRI has been developing the flat panel display technology since 1967, first in then ERSO (Electronic Research & Service Organization), later joined by Materials Research Laboratories, Union Chemical Laboratories, and Mechanical System Laboratories. The display industry in Taiwan has since grown rapidly, year after year, both in manufacturing capacity, and product variety. Today, as the manufacturers in Taiwan celebrate their global achievement, plenty of new challenges lie ahead as one searches for means to sustain the growth rate, and build the future on new generations of product and technology that meet the increasing mobile life style.

Display Technology Center (DTC), along with four other Technology Focus Centers, was established in ITRI, on January 1, 2006, as a part of the most significant restructuring effort of ITRI in its 33 years history. The objective is to align and integrate the display related projects and resources across the organizations in ITRI. As a result, DTC is positioned to play the ‘center’ role in ITRI to lead in tackling new wave of challenges facing the Taiwan display industry in the next decade. In this brochure, we wish to present to you some highlight of the projects and technologies that the members in DTC have proudly made contribution. We are also confident that the theme of flexible display which we choose for the future will in time bear the fruit to feed the continuous growth of the display industry.

Janglin (John) Chen, Ph.D.
Vice President and DTC General Director
RESEARCH PROGRAM

Hybrid Liquid Crystal Display (LCD) Technique

This technology is based on the single-glass substrate idea which combines the design and development of plastic color filter process. Such product can reduce its weight and thickness at least 30% compared to the conventional two-glass substrates LCD.

- Set up the technology of plastic substrate process of color filter (3.3'X 17.7')
- Developing low temperature sealing process and high accuracy alignment assembly technology.
- Developing 4.1” single-glass substrate transflective liquid crystal display technology.

Flexible Display Technology

- Low Temperature Flexible TFT Technology
- Flexible Display Media Technology
  - Flexible LCD Technology
    - Mask-Free Technology
    - Color Break-up Analyzing and Processing
    - Integrated Optical Film
- Materials for Flexible Display
- Equipment for Flexible Display

Flexible Bi-stable Display Technology

This technology combines flexible substrate process, bi-stable display medium and single-layer color structure. Accomplish the development of colorful bi-stable display technology.

- Set up technologies of controlling shrinkage of plastic substrate, low temperature sealant material process, high accuracy alignment assembly and uniform LC filling process for large size panel.
- Set up the single-layer color bi-stable medium digital jetting process and separating area filling skill.
- Set up electro-optical performance measurement platform of flexible display.

Ink-Jet Printing Process & Mask-Free Technology

To develop mask free technology for next generation TFT LCD, it’s necessary to build up the digital ink-jet printing technology for fabricating the color filter, circuit patterning, polyimide layer, liquid crystal dispensing, polymer light-emitting diode, organic thin film transistor, organic / inorganic back light unit on display field. It not only reduces the cost but also upgrades the efficiency.

- Print Head Drving & Quality Analysis, Printing Algorithm Design / Protocol Design / Image Trimming, Surface Treatment & Device Design.
- Ink-Jet Printing System Design & Integration.
- To develop and verify fast liquid crystal (LC) material.
- To develop mask free electrode with high transparency and low resistance.
Color Break-up Analyzing and Processing Technology

The purpose of the program is to set up a color break-up evaluating system and procedure, and to develop advanced image processing for eliminating the color break-up issues and enhancing LCD picture quality.

- To build up color break-up picture evaluating procedure.
- To develop no-pattern design and process technology compatible with RGB LED BLU (backlight unit). Furthermore, to develop multi-frequency domain driving method for enhancing LCD display quality.

Low Temperature Flexible Amorphous Silicon Thin Film Transistor Technology

This technology for flexible amorphous silicon thin-film transistor (a-Si TFT) array combines evaluation of transparent flexible substrate and a-Si TFT processing technology. Through the stress modeling and the analytical techniques for thin-film materials, the process of a-Si TFT array with low stress can be achieved.

- To develop high accuracy photolithography process for flexible substrates.
- To develop reliable low temperature a-Si TFT process compatible with commercial production facilities.
- To establish effective metrological techniques for flexible a-Si TFT device.

Active Matrix Flexible Display by Organic Thin Film Transistor

This technology for Organic Thin Film Transistor (OTFT) display combines Flexible OTFT process and flexible display.

- To develop high accuracy photolithography process on flexible substrates.
- To build up the organic semiconductor deposition technology.
- To build up the integration technology of OTFT and OLED.
- To establish effective metrological techniques for OTFT device.

Carbon Nanotube Field Emission Display Technology (CNT FED)

The purpose of the program is to develop and integrate cost-competitive thick film printing process for carbon nanotube field emission display module. By realizing the unique display quality, CNT-FED technology is potential for entering the market of large-size flat panel displays.

- To suppress driving voltage to 50 V, realizing driving circuit for a 30 Inch CNT FED display.
- To set up process integration of high vacuum CNT-FED module, including assembly, spacer side frame and high vacuum sealing.
DISPLAY PROGRAM IN ITRI

Display Technology Center (DTC)

Center for Measurement Standards (CMS)
Material and Chemical Research Lab. (MCL)
Electronics and Optoelectronics Research Lab. (EOL)
ITRI South (IS) Mechanical and Systems Research Lab (MSL)
Flexible Electronics/LED Backlight/SD Technology
Process Equipment
Strategy and Technology/Integration

DISPLAY PATENT PROFILE

Taiwan
- 439 Granted
- 724 Filed
US/Asia
- 350 Granted
- 957 Filed
As of Oct. 2006

INTERNATIONAL PARTNERSHIP

North America
- USA
  - Joint Development
  - EWD
  - SLS Crystallization
  - OLED Technology
  - Cholesteric LC
  - CNT-FED Materials
  - Thin Film Process and Equipment
  - Ink Jet Printing

Europe
- France, Germany
  - Joint Development
  - QLED Technology

Russia
- Joint Development
  - Fused LC
  - CNT-FED Materials

Asia
- Japan
  - Joint Development
  - Optical Film
FACILITY

The clean room equipped 3124-square-foot laboratory produces 20 inch TFT-LCDs, 20 inch CNT-FEDs, 5 inch Organic-TFTs.

Lab. and Clean Room: G2 (370x470 mm², 20° panel)
TFT-LCD Pilot line with 3,124 m².

O-TFT (5” Capacity)
- Evaporator
- O₂ Plasma Cleaner
- Ink Jet Printer

CNT-FED (20” Capacity)
- Photo Aligner
- Screen Printer
- Laminator

TFT Array
- Laser
- PE-CVD
- Implanter

Cell
- Piller
- Rubbing

LCM
- COG
- COF

TECHNICAL SERVICES OF ITRI DISPLAY PROGRAM

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