Creation of a U.S. Phosphorescent OLED Lighting Panel Manufacturing Facility

Universal Display Corporation

Principal Investigator:
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Other team members:
Moser Baer Technologies
Barry Young (consultant)

Technology focus: OLED Manufacturing

Subtask Priority Area: M.O2. Integrated Manufacturing and Quality Control
Project Objectives

- Establish a U.S. pilot phosphorescent OLED (PHOLED) manufacturing line

- Provide prototype lighting panels to U.S. luminaire manufacturers for incorporation into products to facilitate testing of design concepts and to gauge customer acceptance.

- Provide a cost of ownership analysis to quantify production costs including OLED performance metrics such as yield, materials usage, cycle time, substrate area, and capital depreciation.
Project Team / Capabilities

- **Universal Display Corporation (prime)**
  - located in Ewing, NJ
  - scale PHOLED technology, transfer and implement this technology to MBT operated pilot line
  - Expertise in OLED technology
  - R&D pilot line to develop OLED lighting panels

- **Moser Baer Technologies**
  - located in Canandaigua, NY
  - design, build and operate pilot line facility
  - develop mass production technology
  - expertise in high volume, low cost substrate manufacturing
  - Expertise in OLED panel manufacturing

- **Barry Young (consultant)**
  - provide cost of ownership analysis to quantify costs and performance metrics
  - Expertise in cost modeling and OLED manufacturing facilities
Technical Approach and Work Plan

- UDC and Moser Baer Technologies (MBT) will setup a U.S. based PHOLED pilot lighting manufacturing line.

- UDC’s PHOLED technology will be implemented.

- The manufacturing technology for PHOLED lighting products is being implemented in: i) substrate technology; ii) PHOLED technology and; iii) encapsulation technology.

- Proposed innovative manufacturing facility is based on the high throughput processing of 150 mm x 150 mm glass substrates using known and proven production methods.
## UDC: PHOLED Panel Milestone Status

<table>
<thead>
<tr>
<th>Panel Metric</th>
<th>2011 Goal</th>
<th>April 2011</th>
<th>Program Goal</th>
<th>June 2012</th>
<th>June 2012</th>
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<tbody>
<tr>
<td>Area</td>
<td>15 cm x 15 cm</td>
<td>15 cm x 15 cm</td>
<td>15 cm x 15 cm</td>
<td>2 mm²</td>
<td>15 cm x 15 cm</td>
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<tr>
<td>Efficacy [lm/W]</td>
<td>&gt; 60</td>
<td>58 - 66</td>
<td>&gt; 80</td>
<td>77</td>
<td>70</td>
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<td>CRI</td>
<td>&gt; 80</td>
<td>79 - 81</td>
<td>&gt; 80</td>
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<td>Luminance (cd/m²)</td>
<td>1,000</td>
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<td>&gt;2,000</td>
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<tr>
<td>Lifetime (LT70) [hrs]</td>
<td>&gt; 10,000</td>
<td>15,000</td>
<td>20,000</td>
<td>13,000</td>
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Selected site for pilot line: Canandaigua, NY

OLED deposition equipment ordered, built, and accepted at vendor’s facility
  • Complete final site acceptance once equipment installed

Construction of cleanroom facility near completion
  • Complete final fit-up and commission equipment Q3
Welcome to the New STC MEMS
Cutting Edge MEMS Integration

On September 20, 2010, Infotonics Technology Center merged with the Center of Excellence in Nanoelectronics and Nanotechnology at the College of Nanoscale Science & Engineering (CNSE) in Albany to create the Smart System Technology & Commercialization Center (STC).

STC offers the largest array of world-class MEMS-related solutions in the industry, all under one roof. Located outside Rochester, NY, the 140,000-square-foot, state-of-the-art STC facility includes over 50,000 square feet of certified cleanroom space with 150mm wafer production, complemented by a dedicated 8,000-square-foot MEMS and optoelectronic packaging facility.
Facility Layout

- **Pilot line cleanroom**: 9431 sq ft (876 sq M)
- **Test and characterization lab space**: 2793 sq ft (160 sq M)
- **Office area**: 1961 sq ft (182 sq M)
MBT Cleanroom

Ready for Commissioning
Plan Forward - MBT

- Complete Phase 3 “Facility Implementation” activities Q3 2012
  - Complete final fit-up and commission production equipment
  - Implement UDC PHOLED technology and best integrated substrate technology available
  - First prototype panels

- Continue Phase 4 “Commercial Implementation” activities through Q1 2013
  - Provide prototype lighting panels to luminaire makers
  - Final report of status of pilot facility
  - Commercial roadmap
Summary

- PHOLED panel technology on track for program goals
- Key OLED deposition equipment ordered, built, and accepted at vendor’s facility
- Site layout, process flows defined
- Cleanroom facility near completion
- Program set to complete January 2013