Recent Developments in OLED Lighting

OLED Track Session: Barriers to Low-Cost Manufacturing

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Outline

• Reporting from LFI and SID 2013
• NanoMarkets OLED Lighting Forecast
• High color quality – where OLEDs can compete?
• The need for a US based OLED panel manufacturer
From LightFair International
Philadelphia, PA, April 23-25

Osram TOLED luminaire
Philips
A version of Mimosa

WAC Lighting
OLED/LED hybrid sconce

Acuity: Modelo, Lumen Being, and OLED marker lights
ABL OLED Luminaires at LFI’13

Modelo with LGC square and bar-type panels

OLED marker light series with white and amber panels from OLEDWorks

Lumen Being with LGC bar-type panels, floor-standing and desk-mount, 2-D gestural interaction
Notable panel results

- LG Chem (paper 61.1): 3-stacked WOLED, 1.8X outcoupling enhancement (IES), 80 lm/W, targeting 100 lm/W next year

- Panasonic (paper 66.2): high-n PEN substrate with microlens, 2.5X extraction, double glass encapsulation of WOLED at 87, 101, 114 lm/W depending on structure
Substrate with integrated scattering

- St Gobain (paper 43.2): SiO2 scattering center in high-n inorganic material on regular glass, 2.0 X
- AGC (paper 58.1): very high-n scattering center in high-n glass layer on regular glass, 2.1 X (now sampling)

Manufacturing equipment

- Sunic (paper 55.4): G5 equipment meeting all productivity specs, rough price estimate at 10X G2 line
Recent Nano Markets OLED Lighting Forecast

Forecast much more grounded and paints three scenarios:

1. OLED lighting prevails
   • Requires a strong industry champion
   • Suggests LG Chem to be that champion
2. OLED lighting remains a niche
   • Main issue is cost
3. OLED lighting fails
High Color Quality LEDs

- Sorra MR16 replacements
- GaN on GaN
- Vivid series @3000K Ra 95, R9 95 40.5-43 lm/W

Source: Soraa
High Color Quality LEDs

- Xicato Artist series modules
- Remote phosphor design with 2 (?) phosphors
- Very high CRI, round module efficacy at 47-59 lm/W, rectangular module efficacy at 50-64 lm/W

Source: Xicato
OLED Panel with High Color Quality

• We expect efficacy loss for narrow line width LEDs to achieve the full-spectrum result with multiple phosphors
• OLEDs may have an opening due to its intrinsic broad emission
  – Target CRI Ra 90+, R9 50+
  – Slight lower CRI than a perfect blackbody emitter but easier to achieve and the visual difference is minor
  – Aim to better LED efficacy at this color quality