

Exploring OLEDs for Backlighting Applications

The LRC is currently exploring the feasibility of OLEDs for niche lighting applications, specifically backlit signage. Fluorescent lamp systems (T12 with electronic ballasts) typically used in backlighting applications are rated at 60 lm/W. According to a 2012 report by the U.S. Department of Energy (DOE), OLED panel performance was around 60 lm/W in 2011 and is predicted to reach 140 lm/W by 2020. Assuming a driver efficiency of 90%, 126 lm/W can be expected at system level in 2020. Therefore, energy savings of more than 50% can be expected within the next decade, compared to currently used T12 systems.

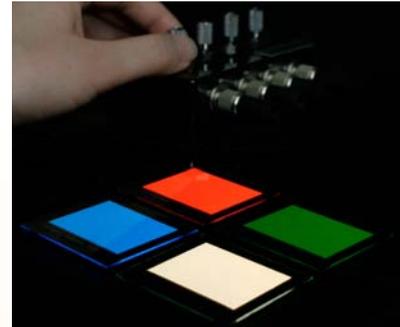


Figure 3. Commercial red, green, blue and white OLED panels with a dimmable driver

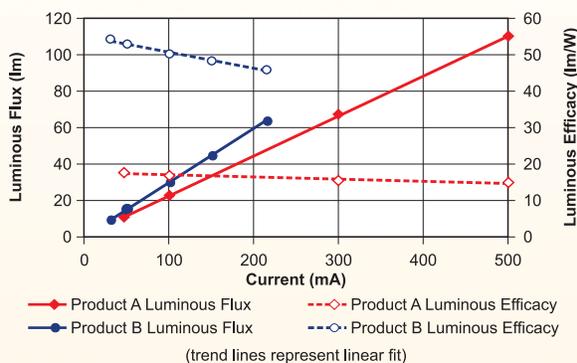


Figure 1. Luminous flux and efficacy as a function of driving current for two types of white OLED panels

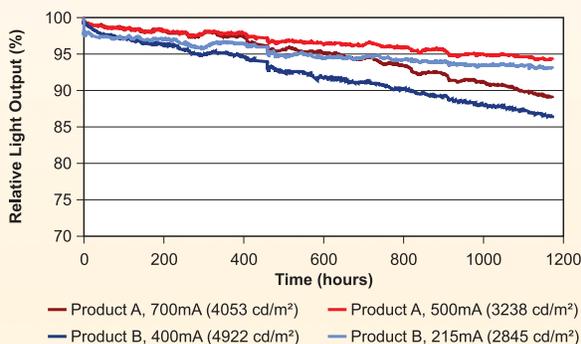


Figure 2. Lumen depreciation results of two types of white OLED panels operated at rated and high driving current for 900 hours (as of March 2013)

Project Objectives

To assess the feasibility of using white OLEDs in backlit signs and estimate their total power demand and compare it to traditional light source technologies in the same application, specific objectives include:

- Understanding the performance of commercial OLED products in comparison with traditional technologies
 - light level, uniformity, color properties, lifetime and power demand
- Understanding tradeoffs between increased luminance by higher drive current and reduced useful lifetime
 - lumen depreciation and color shift
- Demonstrating a scaled-down OLED backlighting system prototype

Results

The LRC conducted an initial literature search to understand the requirements for backlighting applications and identify commercial products. Several commercial OLED panes were procured and tested in the laboratory. Results for two commercial products are shown in Figures 1 and 2.

In addition an optical simulation was carried out to understand the feasibility of illuminating an area four-times the area of a panel to reduce the overall cost of the final system. Once a scaled down, optimized, laboratory prototype backlighting system is built, it will be evaluated for energy demand, visibility, luminance uniformity across the emitting surface, and lifetime.

Sponsor

New York State Energy Research and Development Authority (NYSERDA)



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Lighting
Research Center