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Master thesis

Display technologies based on quantum dots assembled in porous polymer films using inkjet printing

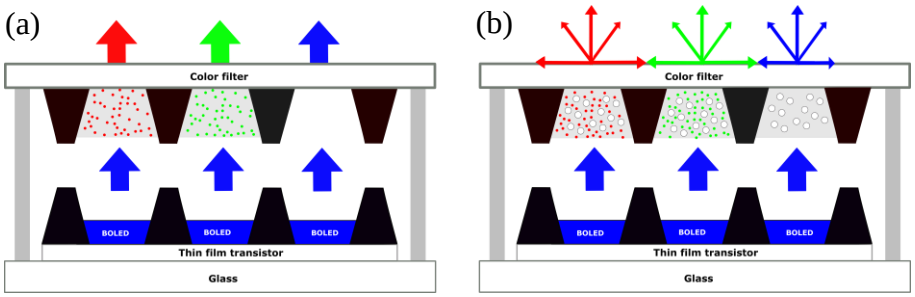

Figure 1: A schematic illustration of the proposed architecture for the QD-OLED display panel. (a) QDs dispersed in a polymeric matrix. (b) QDs assembled in porous polymer.

Motivation

In recent years, colloidal quantum dots (QDs) have emerged as an alternative to conventional rare-earth phosphors due to their outstanding properties, such as broad absorption band, narrow emission linewidth, tunable peak emission wavelength, and high photoluminescence quantum yield. In particular, QDs can be used as practical color-conversion materials in various types of high performance displays and lighting, such as QD liquid crystal display television (QLCD-TV) and QD light-emitting diodes (QD-LEDs). In such applications, QDs are dispersed into a polymeric matrix to form hybrid films (see Fig. 1a). However, most QD films suffer from insufficient excitation and light extraction efficiencies, along with nonradiative energy transfer between closely adjacent QDs. In this project, we propose to solve these problems by exploring a self-assembly method to fabricate polymeric film with a fine porous structure by phase separation of polymer blends (see Fig. 1b) to enhance the photoluminescence of QDs.

Objectives

The general scope of the project is to establish a stable and reproducible fabrication route using different deposition techniques (doctor blading & inkjet printing) for volumetric light scattering layer based on disordered micro/nano-pores in a polymer film with tunable characteristics. The project spans from questions on the fabrication of reproducible volumetric scattering layers via phase separation process, over their assessment using topographical (SEM & AFM) and optical characterization to their integration in QD-LEDs.

Prerequisites

We are looking for candidates with strong affinity for conceptual and experimental work. Basic knowledge in nanofabrication and photonics are expected. A rigorous and self-dependent working style is essential.

Research areas
Optoelectronics, Nano-photonics

Places
LTI (KIT, Campus South)

Focus
Nanotechnology

Study paths
ETIT, Optics & Photonics, Physics, Optics and Photonics, or related disciplines

Application period
As soon as possible.

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