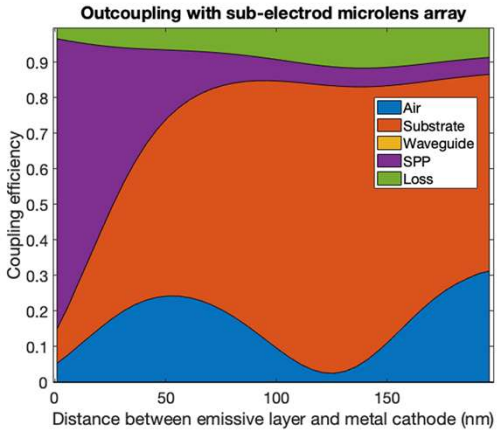
Outcoupling in plasmonic organic light-emitting diodes

(a)



(b)

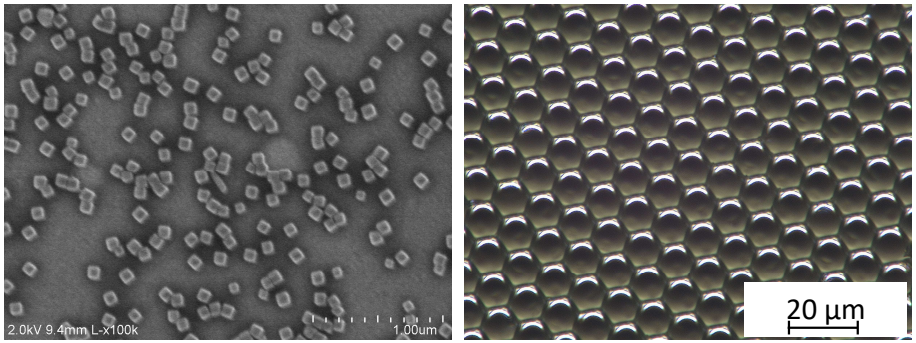


Figure: (a) Fraction of light coupled into the substrate mode of a green phosphorescent OLED and (b) SEM image of nanoparticles and optical microscope image of the MLA

Objective

➢ To study how different outcoupling structure can improve OLED plasmonic mode outcoupling efficiency.

Impact

Despite the nearly 100% internal quantum efficiency efficiency achieved by phosphorescent OLEDs, external quantum efficiency is limited, primarily by light trapped in surface plasmon polariton, waveguide, and substrate modes. In this work, we studied silver nanoparticles (NPs) and microlens arrays (MLA) and the effectiveness of the outcoupling enhancement through these structures on different OLED emission spectrum. By doing so, the device operating current will decrease, leading to extended lifetime as well as increased efficiency.

Facilities and Methods Used

- Vacuum Thermal Evaporation
- Atomic Layer Deposition
- Photolithography
- Metrology tools – SEM, confocal microscope, optical microscope

Relevant Papers

- Weaver et. Al, J. Mater. Chem. C, DOI: 10.1039/D1TC05674C

Collaborators

- Claire Arneson, Raju Lampande

Funding

- Universal Display Corporation

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