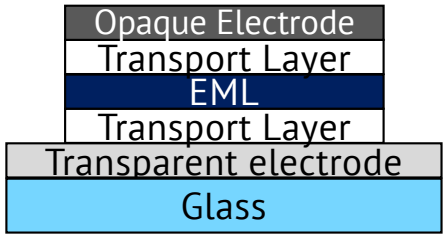
Maximizing the external efficiency of OLEDs through the manipulation of plasmon modes

(a)



(b)

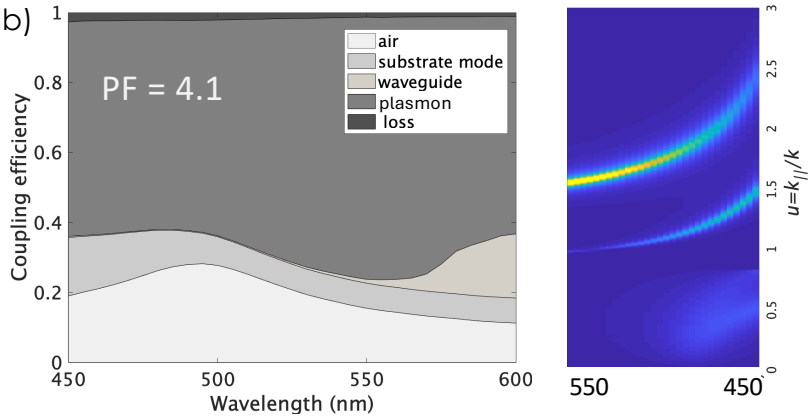


Figure: (a) Device structure. (b) *Left:* Simulated coupling efficiency as a function of emission wavelength. We achieve a high Purcell-factor (PF) because of the large fraction of coupling to plasmon modes. *Right*: In-plane wave vector $k_{//}$ vs. emission wavelength.

Objective

➢ To improve the efficiency of OLEDs by extracting high index plasmon modes from the metal-organic interface

Impact

Previous work has shown that increased coupling to plasmon modes in an OLED can extend device lifetime by more than a factor of 3 due to an increase in the Purcell factor of the structure, and a further reduction in exciton density due to energy transfer to plasmon-exciton-polariton (PEP) modes. In standard OLED structures, however, plasmon modes exist at high wavevector, *k*, values, and thus do not contribute to the external quantum efficiency (EQE) of the device. We are working to design OLEDs with operational stability provided by coupling to PEP modes with the goal of achieving EQE greater than 40%.

Facilities and Methods Used

- Vacuum Thermal Evaporation
- Solution processing
- Photolithography

Relevant Papers

- Zhao, H., et al., *Nature,* DOI: 10.1021/10.1038/s41586-023-06976-8
- Fusella, M., et al., *Nature*, DOI: 10.1038/s41586-020-2684-z

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