Modeling the Charge and Exciton Distributions in Phosphorescent White Organic Light Emitting Diodes

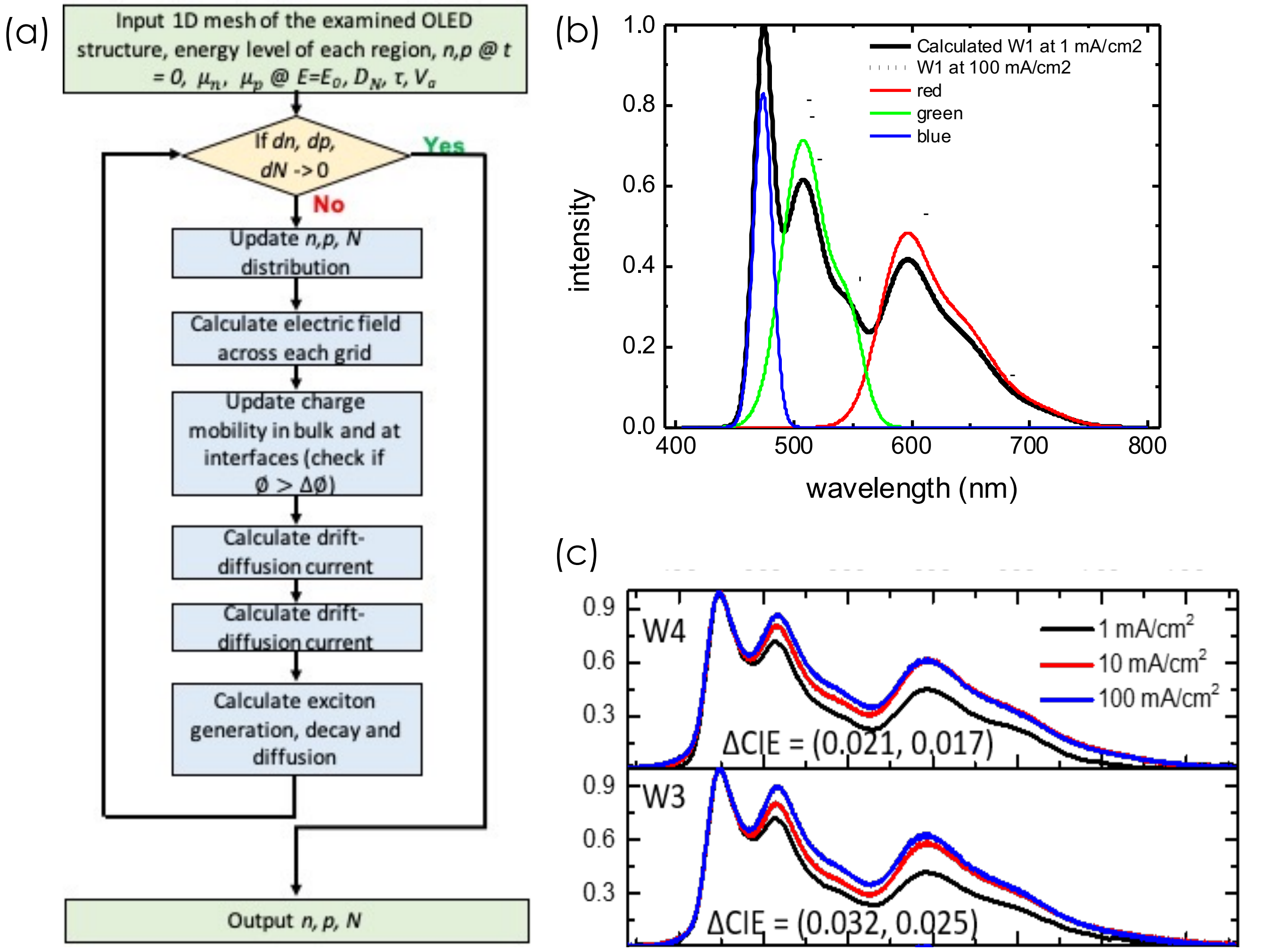

Figure: (a) Algorithm of the simulation of charge and exciton distribution in OLEDs (b) Calculated emission spectra of WOLED W1 at different currents obtained by adjusting the individual peak intensities from the three emitting dopants. (c) Normalized measured emission spectra and color shifts (ΔCIE) of WOLEDs W1 and W2 from j = 1 to 100 mA/cm^2.

Objective

- To develop a comprehensive numerical model to quantitatively analyze the charge and exciton distribution in phosphorescent WOLEDs

Impact

White organic light emitting diode (WOLED) light emission is challenging to predict due to broad emission zones containing multiple emitting dopants and material interfaces, making their optimal design accessible only through the fabrication and measurement of numerous, complex iterations. This model encompasses bipolar charge drift-diffusion transport with doping-dependent charge mobilities, field-dependent charge hopping across multiple interfaces, exciton generation, diffusion and decay. It is applied to complex, multilayer WOLEDs to accurately predict their intensity and current-dependent spectral shifts.

Facilities and Methods Used

- Vacuum thermal evaporation
- Matlab simulation

Funding

- US Department of Energy Solid State Lighting Program
- UDC

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