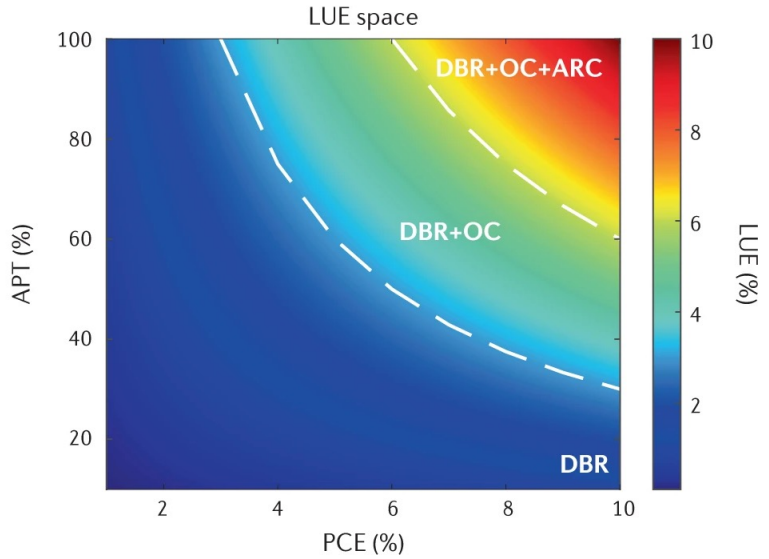
Optical Design of Neutral Color Semitransparent OPV

(a)



(b)

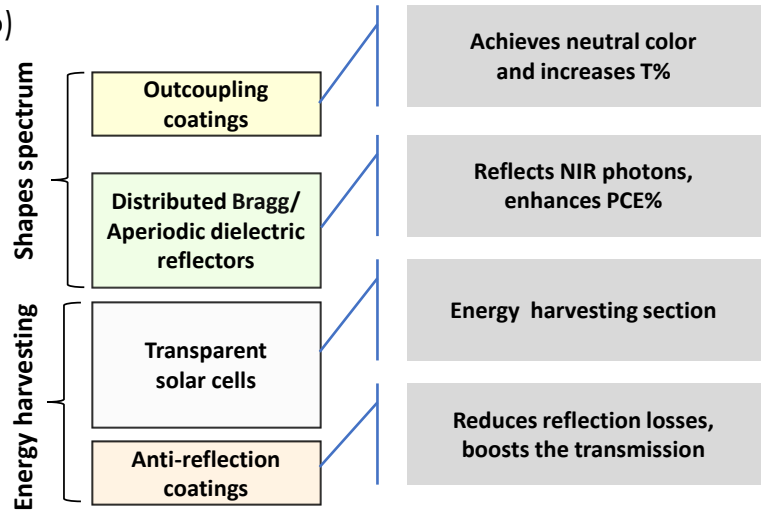


Figure: (a) Light utilization efficiency (LUE) space illustrating the competition between average photopic transmittance (APT) and power conversion efficiency (PCE) encountered in the design of ST-OPVs. (b) Design schematics of various sections of the ST-OPV.

Objective

➢ To design and implement aperiodic thin film coatings to achieve semitransparent OPV with neutral transmittance within the visible band and 100% reflection and absorption in the UV and NIR bands, respectively

Impact

Semitransparent organic photovoltaic (ST-OPV) can be integrated with windows of buildings and vehicles. For such applications, the devices must have high average photopic transmittance, practically zero transmittance within the UV and NIR bands (to block out harmful UV radiation and harvest NIR photons, respectively), and neutral transmittance across the visible band. We achieve these – while simultaneously increasing the power conversion efficiency of the device – by appending aperiodic thin film coatings to the structure of the device.

Facilities and Methods Used

- Vacuum thermal evaporator
- Ebeam deposition chamber
- Spin coater
- UV/VIS/NIR spectrophotometer
- Ellipsometer
- Transfer matrix formalism

Relevant Papers

- H. K. M. Sheriff, Jr., Y. Li, B. Qu, S. R. Forrest, *Applied Physics Letters*, DOI: 10.1063/5.0037104
- Y. Li, X. Huang, H. K. M. Sheriff, Jr., S. R. Forrest, *Nature Reviews Materials*, DOI: 10.1038/s41578-022-00514-0

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