Minimizing Energy Losses in Multi-component Organic Photovoltaics

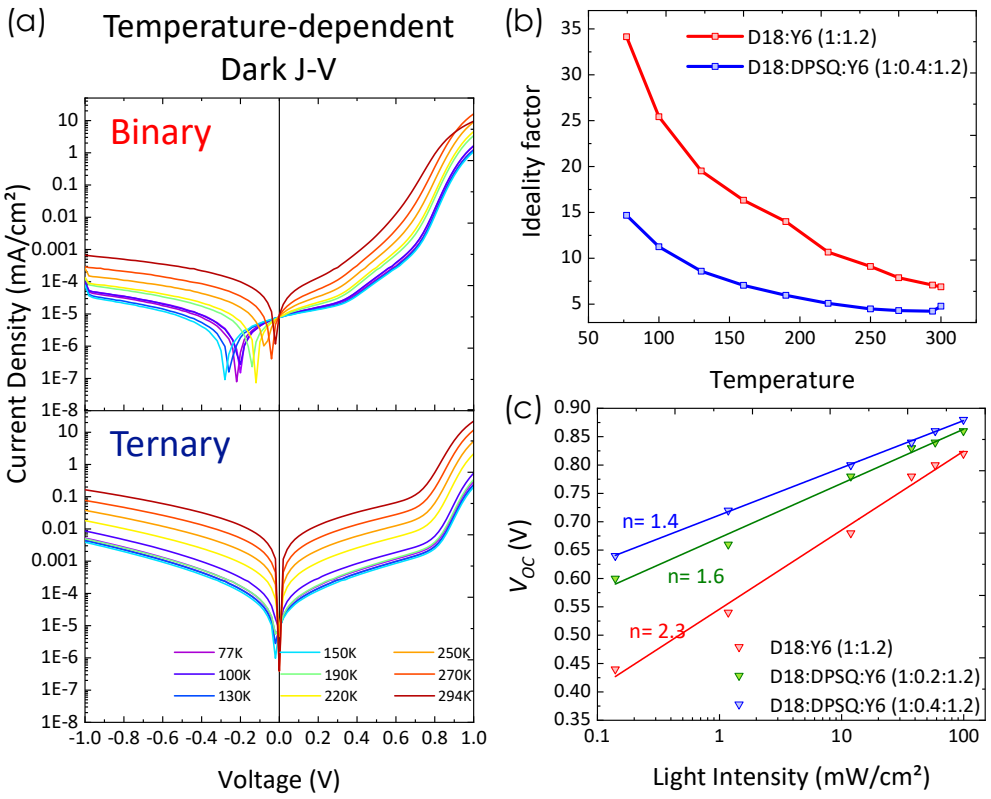

Figure: (a) Temperature-dependent dark J-V curves of binary D18:Y6 and ternary D18:DPSQ:Y6 OPVs (b) extracted ideality factor vs temperature from fitting the curves presented in (a), and (c) V_{OC} dependence on light intensity of binary and ternary OPVs with varying ratios of the third component showing lowest ideality factor for the ternary with 0.4 ratio of DPSQ.

Objective

➢ To understand and minimize V_{OC} losses in binary and ternary bulk-heterojunction organic photovoltaics.

Impact

Despite the recent growth in efficiency, organic photovoltaics (OPVs) still suffer from high energy losses compared to other solar cell technologies. This project aims to tackle the non-radiative losses in binary and ternary OPVs, while understanding the origin of V_{OC} in these devices. Our work emphasizes the relationship between morphology and device performance, highlighting the role of the third component in reducing non-radiative recombination, as seen from the evolution of ideality factor as a function of light intensity and temperature.

Facilities and Methods Used

- Electroluminescence
- Temperature-dependent characterization
- Morphology characterization
- Vacuum Thermal Evaporation
- Solution processing

Relevant Papers

- Zeng Chen and Xu Chen, et al., *Joule.*, DOI:10.1016/j.joule.2021.04.002
- Upreti, et. al, 2022 Solar RRL, DOI: 10.1002/solr.202200450
- N. C. Giebink, et al., 2010 Phys. Rev. B, DOI: 10.1103/PhysRevB.82.155305

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