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Revealing the effect of solvent additive selectivity on the formation kinetics in printed active layers for organic solar cells

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Solvent additives have received tremendous attention in organic solar cells as an effective way to optimize morphology and phase separation. However, most research primarily focuses on solvent additives with superior solvation for non-fullerene acceptors (NFA) over polymer donors, such as 1-chloronaphthalen (1-CN) and 1, 8-diiodooctane (1,8-DIO). Few researches are related to solvent additives characterized by better solubility for polymer donors than NFA. Furthermore, the impact of solvent additives is mainly investigated in the case of films prepared via spin coating rather than slot-die coating, which exhibits distinct differences in the kinetics of film formation. Hence, the influence of solvent additive selectivity on the kinetics of active layer formation in the printed active layer remains unknown. In this study, we use PBDB-T-2F as the donor and BTP-C3-4F as the acceptor and introduce two distinct solvent additives, one with superior solubility for PBDB-T-2F compared to BTP-C3-4F, and another with inferior solubility for PBDB-T-2F. The drying process of the slot-die coated active layers with different solvent additives is studied by in situ UV-vis absorption spectra and in situ grazing incidence wide angle X-Ray scattering (GIWAXS). The achieved scattering data will be treated with machine learning methods.

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