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Operando GIWAXS Observation of the Stabled degradation process of Green-solvent Based PBDB-TF-T1: BTP-4F-12 Organic Solar Cells with EH-P as Solid Additive

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Solvent additives play an important role in organic solar cells. Traditional additives are mostly liquids, such as DIO, CN, DPE, which makes the solution fabrication process easy while, but they also share the disadvantage of being highly toxic. Thus, nowadays solid additives have called more research interest due to their various advantages in morphology-directing abilities, post treatment, enhanced device performance and stability. We explore an effective solid additive named EH-P in green-solvent based organic solar cells (PBDB-TF-T1: BTP-4F-12). A greatly increased device performance and stability are achieved with EH-P doping. In-situ GIWAXS and GISAXS are used to observe the evolution of micro-structure and crystallinity during the degradation process in air under illumination. The stability increasement mainly comes from morphology modification rather than photo-oxidation, which is proved with charge mobility measurements and UV-vis spectroscopy. The achieved scattering data will be treated with machine learning methods.

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