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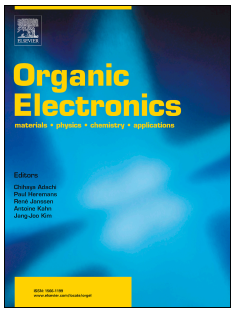

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Regulating the Polymer Crystallize Behavior via the Synergistic Additives towards High-performance Bulk Heterojunction Solar Cells

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ABSTRACT: In polymer solar cells (PSCs) which are typically processed from solution, the molecules inside the active layer accumulate disorderly, which greatly hinders the exciton dissociation and carrier transport, especially in thick active layers. Here, we propose an effective and simple strategy to solve such problem in poly[(5,6-difluoro-2,1,3-benzothiadiazol-4,7-diyl)-alt-(3,3’’’-di(2-octyldodecyl) 2,2’;5’,2’’;5’’,2’’’-quaterthiophen-5,5’’’-diyl)] (PffBT4T-2OD) polymer based thick active layer by regulating the polymer crystallize behavior via incorporating two synergistic additives diphenylether (DPE) and 1-chloronaphthalene (CN) during the film processing. The as-prepared active layer enables the PSC exhibiting a remarkable high photoelectric conversion efficiency of 10.93%, which is much higher than the standard PSC fabricated without additives under the same conditions (9.05%) or with single additive. The high PCE of the PSCs is a result of the highly ordered molecular packing and the formation of three-dimensional charge transport channels of the polymer donor. It is evidenced that the microstructure of the active layer treated simultaneously with DPE and CN undergoes a double change in the orderly stacking of the alkyl chain and the π-π bond, which is more favorable for the charge transport. The results indicate that the active layer with two synergistic additives can be used as