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A comparative study of Perylene derivatives in organic bulk heterojunction solar cells

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Perylene derivative were used as electron acceptor in non-fullerene organic solar cells using the structure of ITO/PEDOT:PSS/PCDTBT:Acceptor/TiO_x/Al. Unfortunately, PCDTBT:Perylenediimide photoactive device showed a low power conservation efficiency (PCE),compared to a PCDTBT:$PC_{70}BM$ photoactive device. This results has been observed in reduced short circuit current (I_{sc}) and open circuit voltage (V_{oc}). The devices with electron acceptors as Perylene diimide-1 and Perylene diimide-2 showed excellent efficiency of 0.27% and 0.26%, respectively, with weight ratio of PCDTBT:acceptor (1:2). In addition, the morphological and optical properties of PCDTBT:acceptor thin films were investigated. The high roughness and low absorbance due to the perylene network were consistent with the low efficiency of solar cells.

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