

## Roll coated large area ITO- and vacuum-free all organic solar cells from diketopyrrolopyrrole based non-fullerene acceptors with molecular geometry effects - DTU Orbit (09/11/2017)

### Roll coated large area ITO- and vacuum-free all organic solar cells from diketopyrrolopyrrole based non-fullerene acceptors with molecular geometry effects

In this paper, we investigate three diketopyrrolopyrrole (DPP) based small molecular non-fullerene acceptors, namely Ph(DPP)<sub>3</sub>, Ph(DPP)<sub>2</sub>, and PhDMe(DPP)<sub>2</sub>, focusing on molecular geometry effects on the frontier orbital level, light absorption, molecular configuration, electron mobility, thin film morphology, and photovoltaic performance of both spin-coated ITO based and roll coated large area, ITO- and vacuum-free organic solar cells (OSCs). For spin-coated devices based on P3HT as the donor polymer the solar cells gave power conversion efficiencies (PCEs) in the following order for (P3HT:PhDMe(DPP)<sub>2</sub>, 0.65%) > (P3HT:Ph(DPP)<sub>2</sub>, 0.48%) > (P3HT:Ph(DPP)<sub>3</sub>, 0.31%). All devices present an open circuit voltage ( $V_{oc}$ ) higher than 1.0 V. For the roll-coated devices, the PCEs were found to fall in another order and with lower values (P3HT:Ph(DPP)<sub>3</sub>, 0.54%) > (P3HT:Ph(DPP)<sub>2</sub>, 0.43%) > (P3HT:PhDMe(DPP)<sub>2</sub>, 0.04%) and the highest  $V_{oc}$  was 0.82 V. Our preliminary results highlight the influence of geometry, structure and processing on the performance of non-fullerene acceptors.

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