

Electronic Supplementary Information

Fully-solution-processed organic solar cells with a highly efficient paper-based light trapping element

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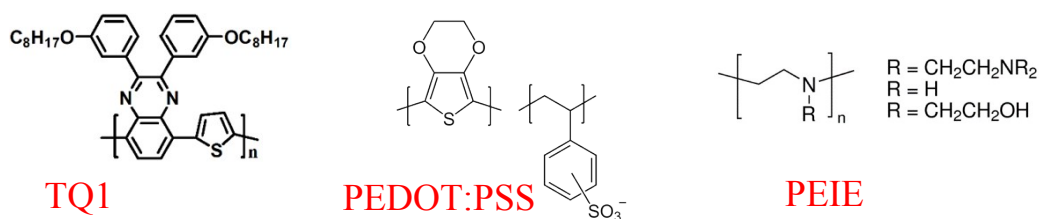


Figure S1. Chemical structure of the materials used in this work.

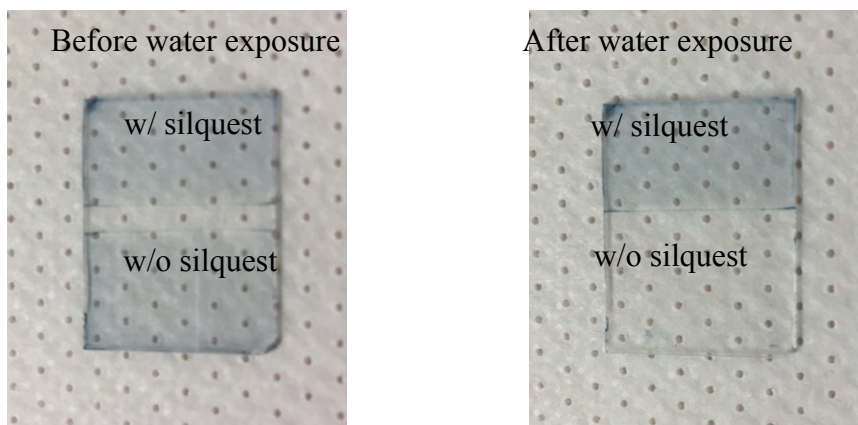


Figure S2. PEDOT:PSS coated glass substrates before and after exposure to running water. Only the PEDOT:PSS layer employing the silquest additive stayed intact, i.e. silquest promotes the PEDOT:PSS to ‘stick’ better to the glass surface. We propose that this surface property also reduces the swelling of the PEDOT:PSS film, thereby reducing pin-hole formation.

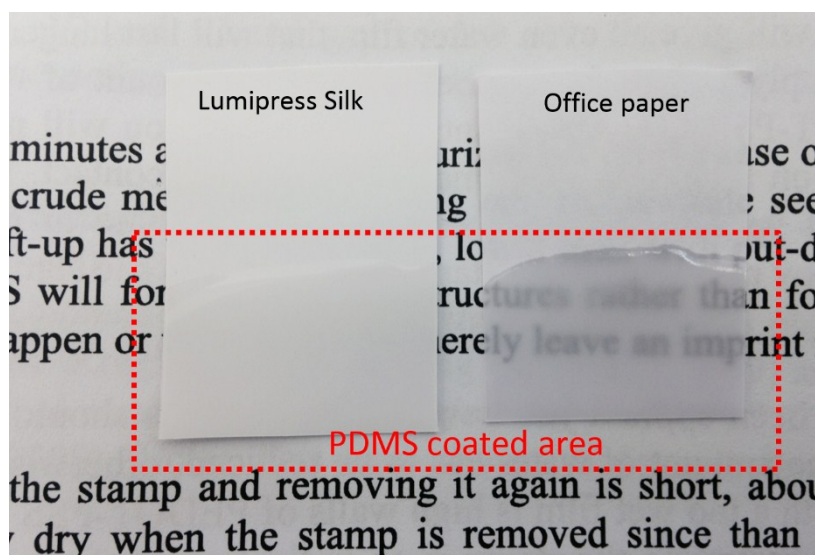


Figure S3. Coating of PDMS on top of paper reflectors. The Lumipress Silk surface has a desirable property to sustain the uncured liquid form of PDMS, i.e. the paper does not get wet. Concomitantly, the reflectance of the paper remains unmodified after the deposition of PDMS. However, the surface of regular office paper is less resistant to the liquid form of PDMS: the deposition of PDMS leads to wetting and soaking of paper, which in turn reduces the opacity and the diffuse reflectance of paper.

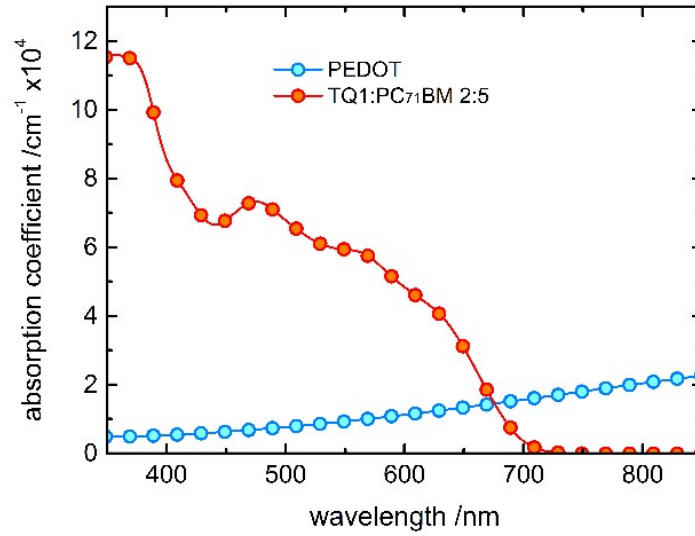


Figure S4. Absorption coefficients of the active layer and the PEDOT:PSS electrode.

Table S1. Representative photovoltaic performance parameters of PEDOT-PEDOT solar cells with different thicknesses of the bottom PEDOT:PSS electrode, with and without a back-reflector.

| Burn-in | Back reflector | Bottom PEDOT:PSS | Jsc [mA cm ⁻²] | Voc [V] | FF | PCE [%] | IQE <i>avg.</i> | Jsc enhancement |
|---------|----------------|------------------|----------------------------|---------|------|---------|-----------------|-----------------|
| No | No | 80 nm | 2.62 | 0.44 | 0.25 | 0.29 | 0.43 | n/a |
| Yes | No | 80 nm | 5.08 | 0.80 | 0.53 | 2.14 | 0.84 | n/a |
| Yes | Lumipress silk | 80 nm | 8.42 | 0.81 | 0.43 | 2.96 | 0.84 | 1.66 |
| Yes | Office paper | 80 nm | 6.63 | 0.81 | 0.46 | 2.46 | 0.84 | 1.31 |
| Yes | Ag mirror | 80 nm | 6.74 | 0.81 | 0.46 | 2.50 | 0.84 | 1.33 |
| Yes | No | 200 nm | 5.21 | 0.81 | 0.61 | 2.54 | 0.86 | n/a |
| Yes | Lumipress silk | 200 nm | 8.18 | 0.81 | 0.58 | 3.87 | 0.86 | 1.57 |
| Yes | No | 320 nm | 5.25 | 0.77 | 0.56 | 2.28 | 0.87 | n/a |
| Yes | Lumipress silk | 320 nm | 7.70 | 0.81 | 0.57 | 3.54 | 0.87 | 1.47 |