

Efficient and Stable Air-Processed Ternary Organic Solar Cells Incorporating Gallium-Porphyrin as Electron Cascade Material

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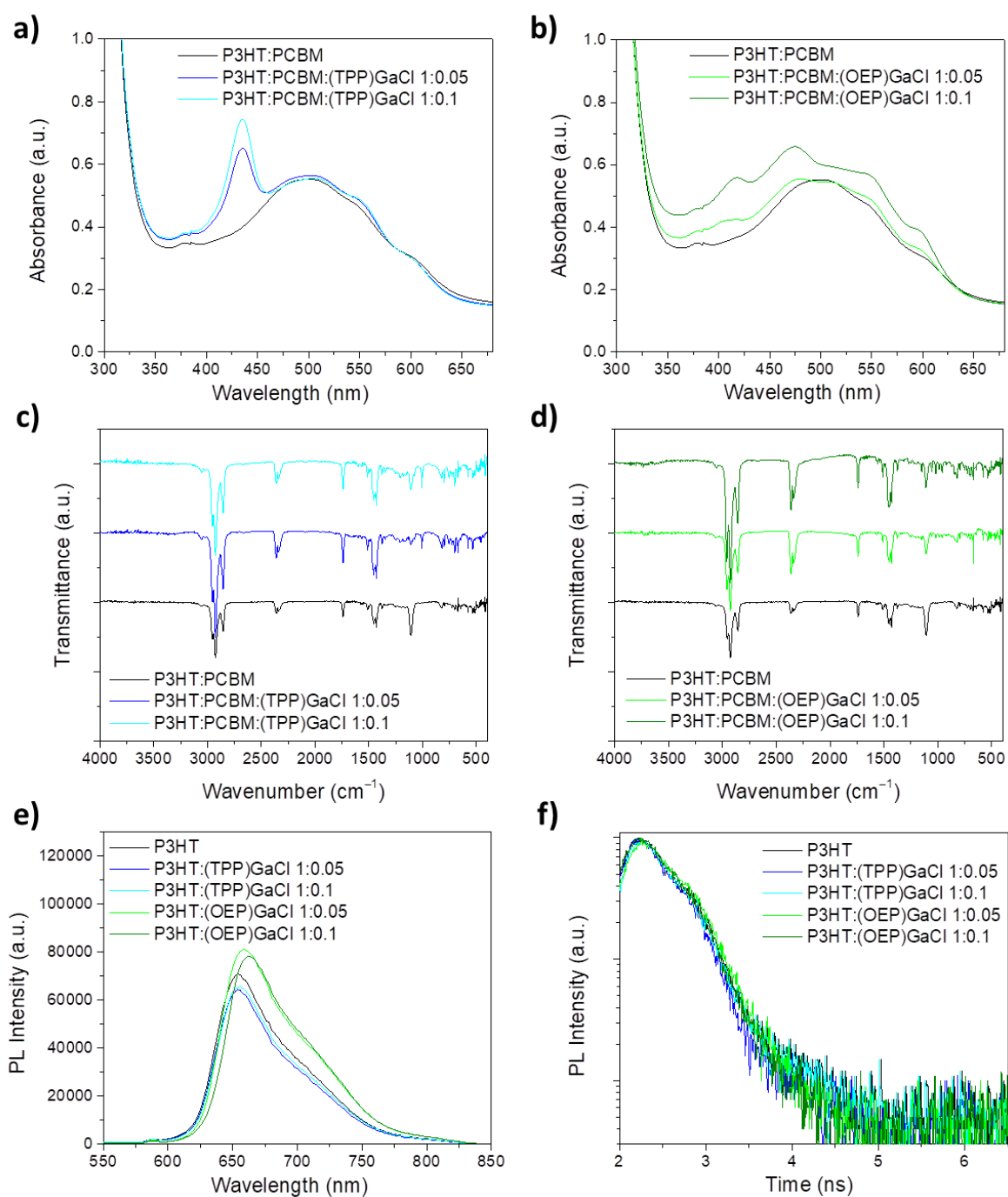


Figure S1 UV-Vis absorption spectra of binary and ternary P3HT:PCBM films with porphyrin additives: (a) (TPP)GaCl and (b) (OEP)GaCl in various ratios. FTIR spectra of binary and ternary P3HT:PCBM films with porphyrin additives: (c) (TPP)GaCl and (d) (OEP)GaCl in various ratios. (e) Steady-state PL spectra of P3HT without or with (TPP)GaCl and (OEP)GaCl in various ratios and (f) Transient PL dynamics of the same samples.

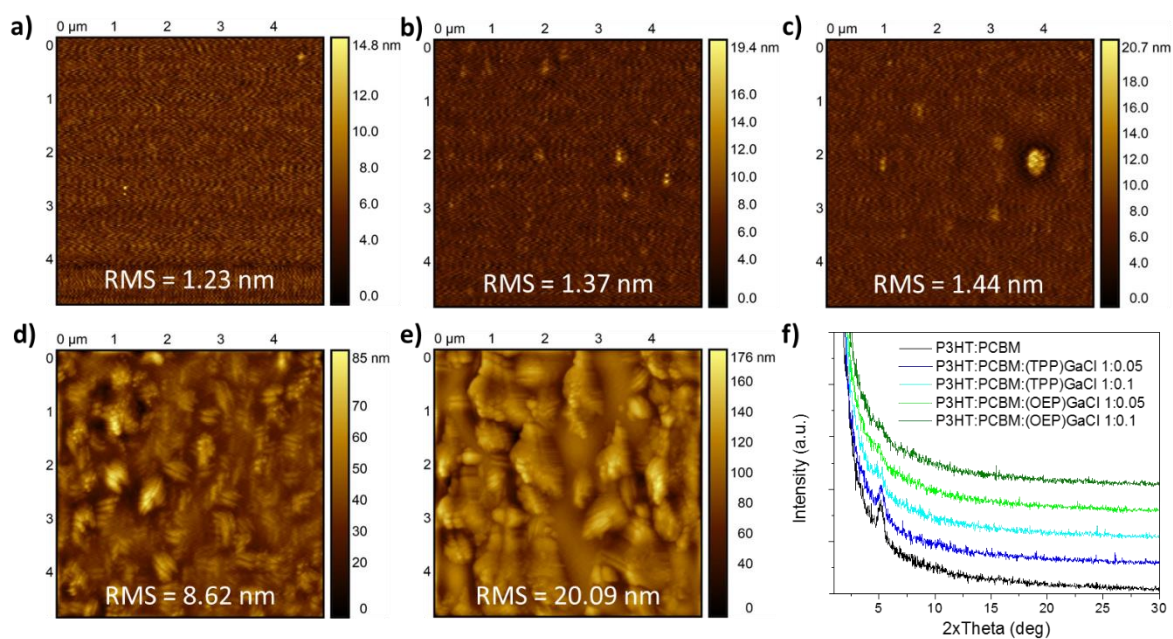


Figure S2 5x5 μm^2 AFM height images of (a) binary P3HT:PCBM, (b) P3HT:PCBM:(TPP)GaCl 1:0.05 (c) P3HT:PCBM:(TPP)GaCl 1:0.1, (d) P3HT:PCBM:(OEP)GaCl 1:0.05 and (e) P3HT:PCBM:(OEP)GaCl 1:0.1 ternary blended films. (f) XRD patterns of the same samples.

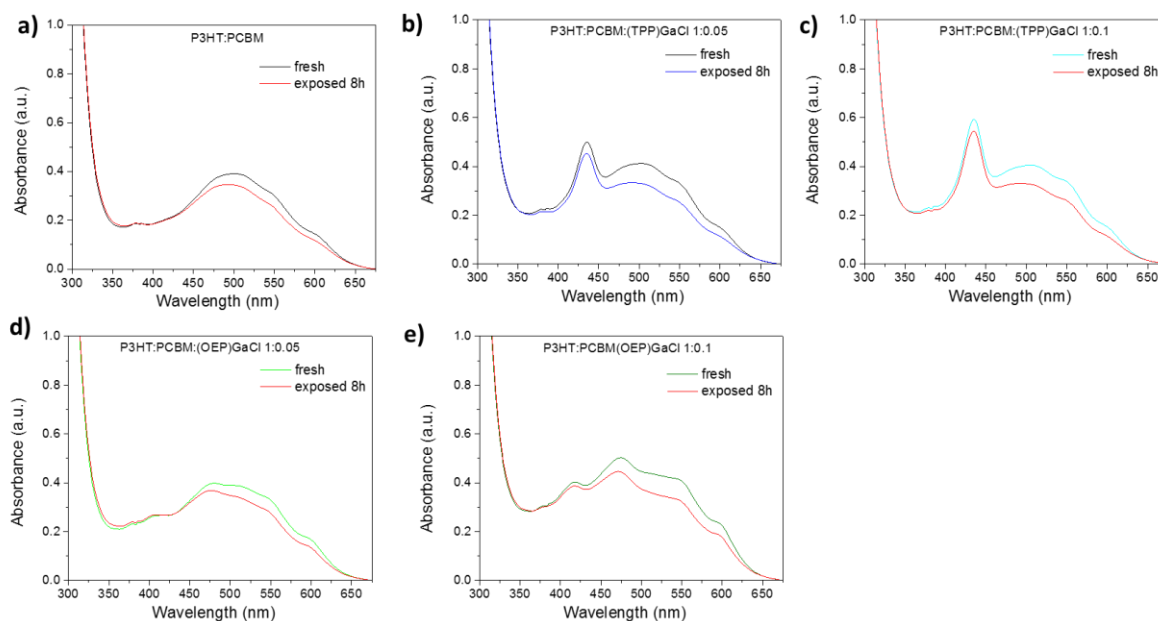


Figure S3 UV-Vis absorption spectra of fresh and exposed to sunlight illumination for 8 h of (a) binary P3HT:PCBM and ternary (b) P3HT:PCBM:(TTP)GaCl 1:0.05, (c) P3HT:PCBM:(TTP)GaCl 1:0.1, (d) P3HT:PCBM:(OEP)GaCl 1:0.05, and (d) P3HT:PCBM:(OEP)GaCl 1:0.1 films.

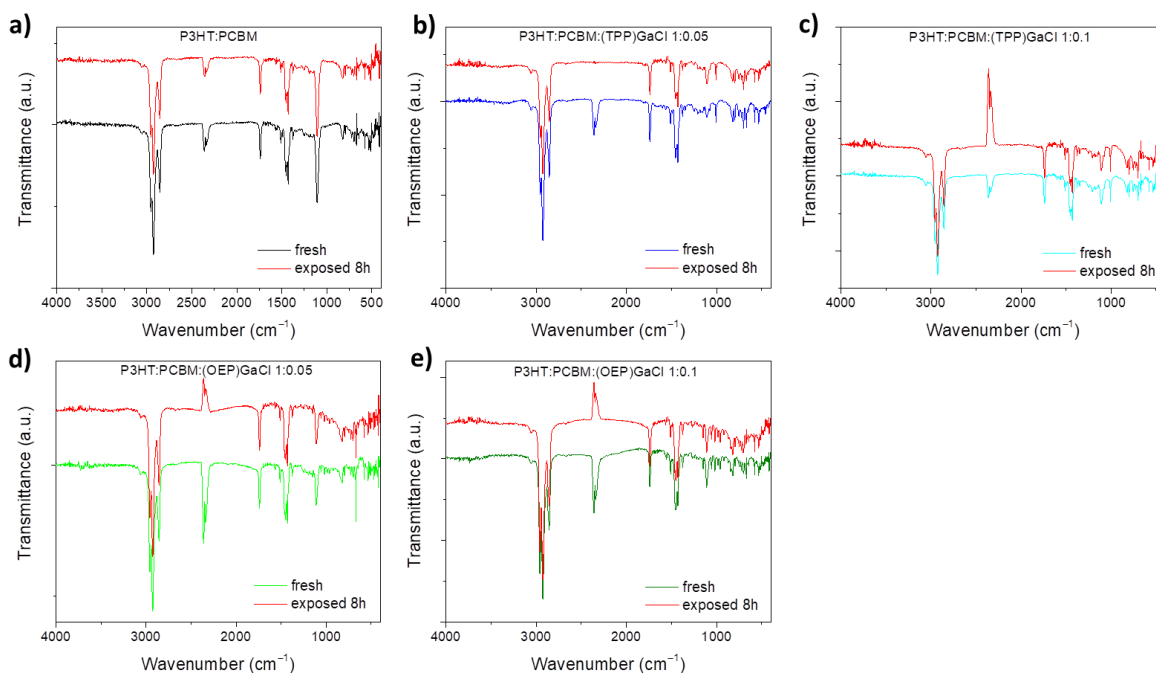


Figure S4 FTIR spectra of fresh and exposed to sunlight illumination for 8 h of (a) binary P3HT:PCBM and ternary (b) P3HT:PCBM:(TPP)GaCl 1:0.05, (c) P3HT:PCBM:(TPP)GaCl 1:0.1, (d) P3HT:PCBM:(OEP)GaCl 1:0.05, and (e) P3HT:PCBM:(OEP)GaCl 1:0.1 films.

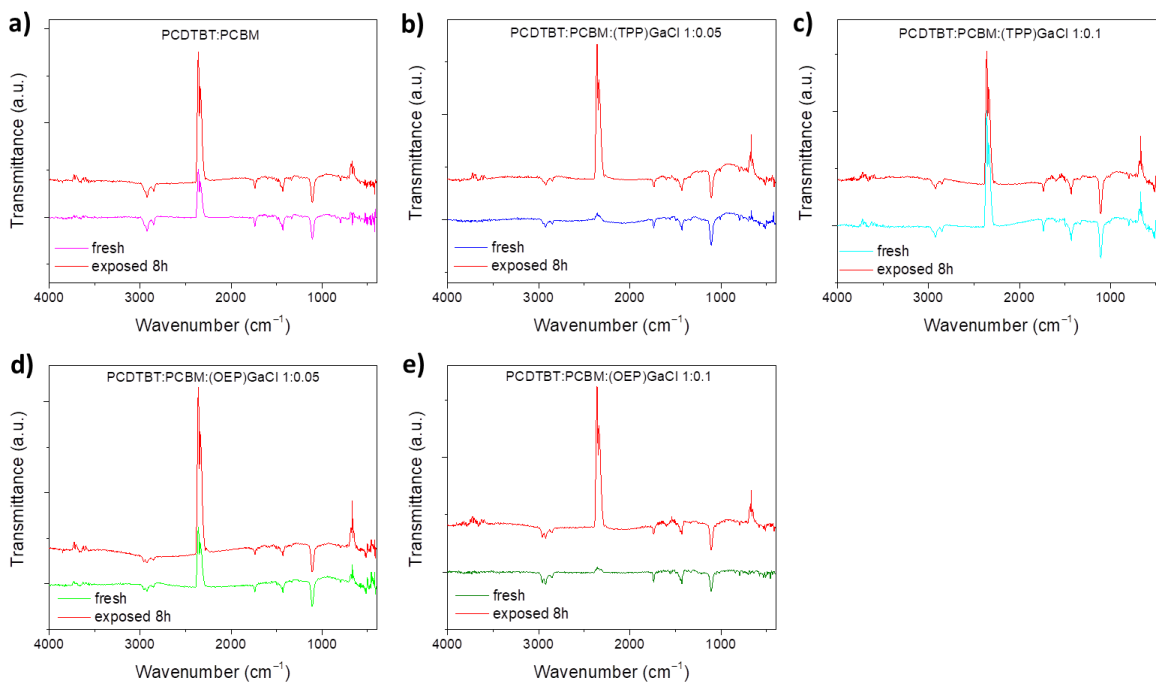


Figure S5 FTIR spectra of fresh and exposed to sunlight illumination for 8 h of (a) binary PCDTBT:PCBM and ternary (b) PCDTBT:PCBM:(TPP)GaCl 1:0.05, (c) PCDTBT:PCBM:(TPP)GaCl 1:0.1, (d) PCDTBT:PCBM:(OEP)GaCl 1:0.05, and (e) PCDTBT:PCBM:(OEP)GaCl 1:0.1 films.

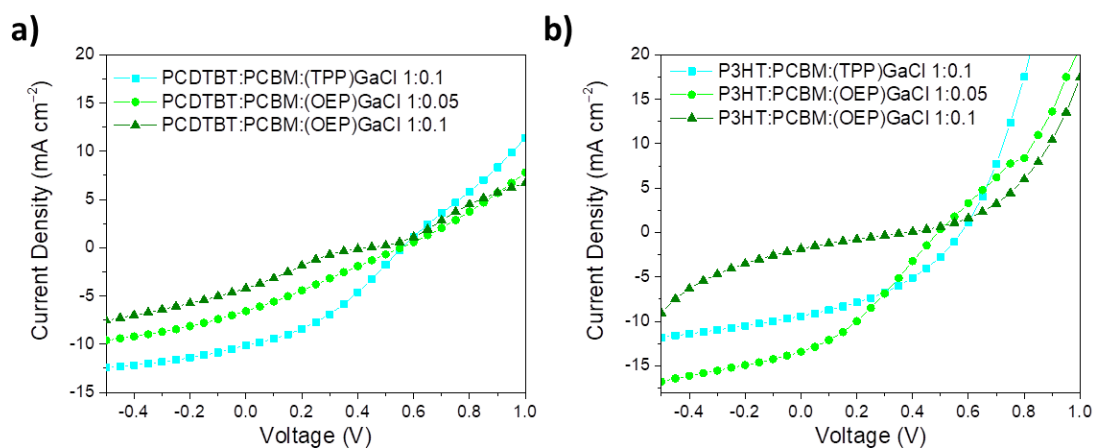


Figure S6 J-V characteristic curves under 1.5 AM illumination of ternary OSCs based on (a) PCDTBT:PCBM and (b) P3HT:PCBM with (TPP)GaCl 1:0.1, (OEP)GaCl 1:0.05 and (OEP)GaCl 1:0.1.

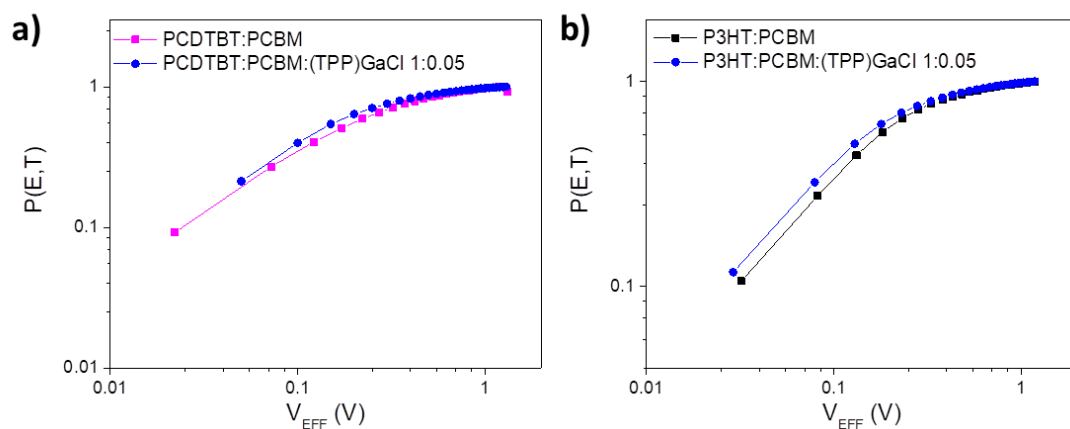


Figure S7 Exciton dissociation probability ($P(E,T)$) versus the effective voltage (V_{EFF}) of binary and ternary OSCs based on (a) PCDTBT:PCBM and (b) P3HT:PCBM blends.