

Supporting Information

Improved Carrier Transport in Perovskite Solar Cells Probed by Femtosecond Transient Absorption Spectroscopy

Efthymis Serpetzoglou^{§,||}, Ioannis Konidakis^{,§}, George Kakavelakis^{±,#}, Temur Maksudov^{±,#}, Emmanuel Kymakis^{*,±}, Emmanuel Stratakis^{*,§,#}*

[§]Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology-Hellas (FORTH), 71110, Heraklion, Crete, Greece

[±]Center of Materials Technology and Photonics, Electrical Engineering Department, Technological Educational Institute (TEI) of Crete, 71004, Heraklion, Crete, Greece

^{||}Physics Department, University of Crete, GR 71003 Heraklion, Crete, Greece

[#]Department of Materials Science and Technology, University of Crete, Greece, 71003, Heraklion, Crete, Greece

Corresponding Authors

*+30 2810-391835. E-mail: ikonid@iesl.forth.gr

*+30 2810-391274. E-mail: stratak@iesl.forth.gr

*+30 2810-379895. E-mail: kymakis@staff.teicrete.gr

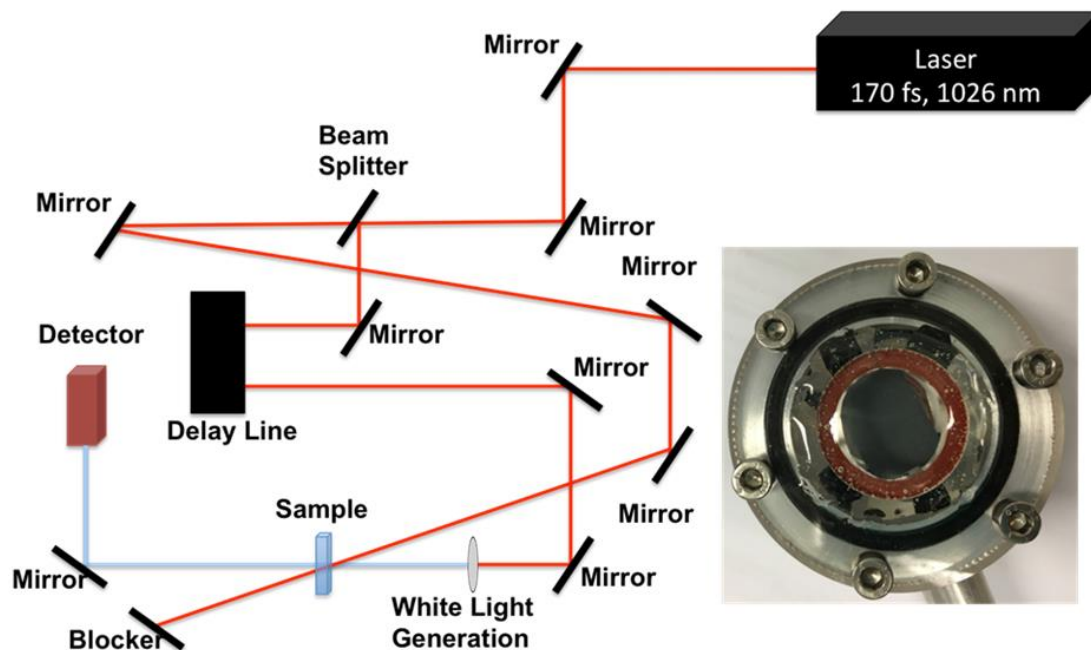


Figure S1. Schematic representation of Newport transient absorption spectrometer (TAS-1). The inset shows a photograph of the specially designed homemade cell employed for all TAS measurements in order to maintain inert conditions throughout measurements (extra pure nitrogen gas as in the fabrication glove box).

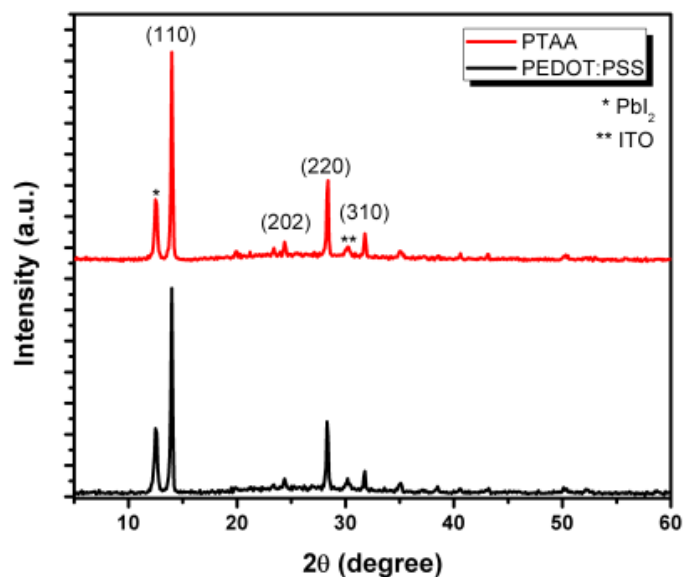


Figure S2. XRD patterns for PEDOT:PSS/CH₃NH₃PbI₃ (black line) and PTAA/CH₃NH₃PbI₃ (red line) architectures.

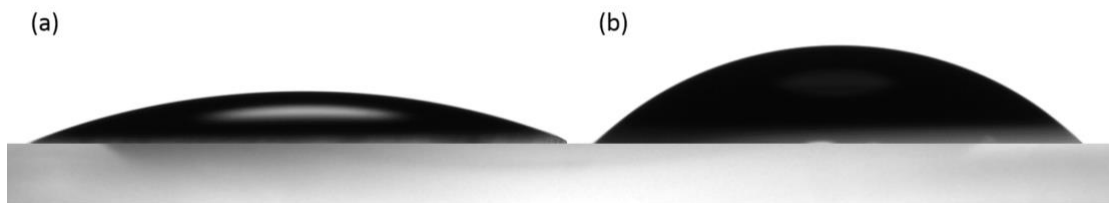


Figure S3. Photographs of the shape of a 5 μL de-ionized water droplet on PEDOT:PSS (a) and PTAA (b) polymer substrates that provide the corresponding contact angles.

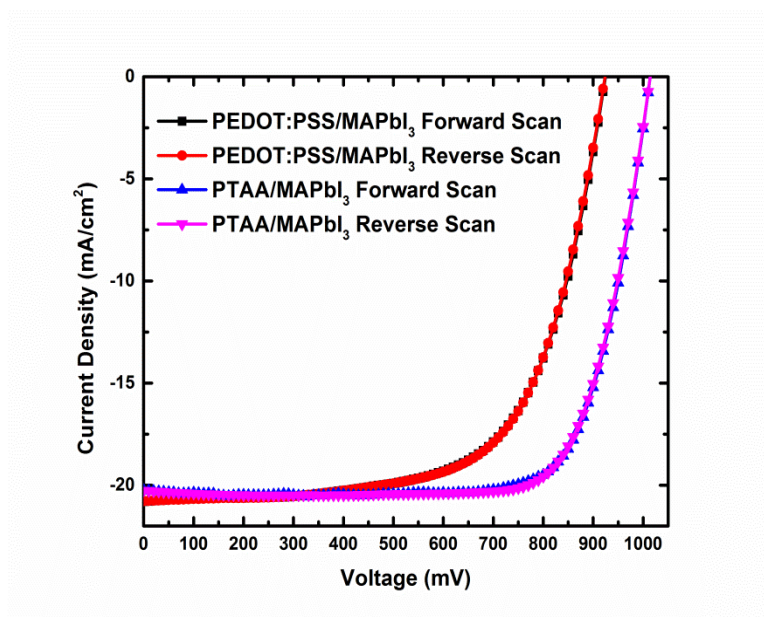


Figure S4. J-V curves of the PEDOT:PSS and PTAA HTM based PSCs with both forward (black and blue) and reverse (red and magenta) scan of the applied voltage.

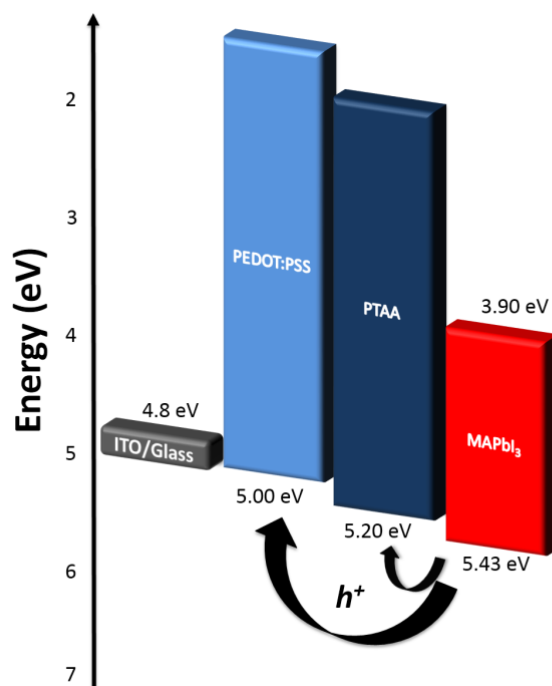


Figure S5. Schematic representation of energy levels of the studied HTL polymers, PEDOT:PSS and PTAA, and $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite as designed from values extracted from the literature.

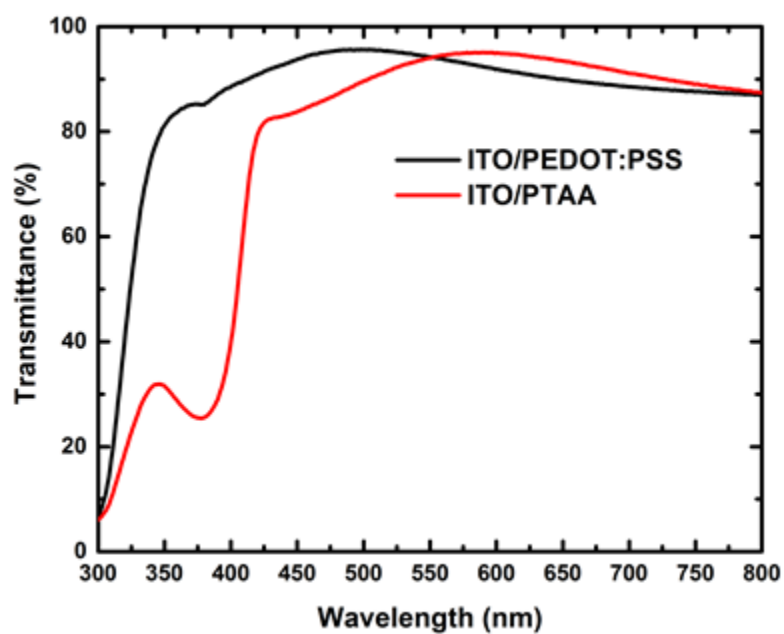


Figure S6. Comparison of transmittance spectra between the PTAA and PEDOT:PSS coated glass/ITO substrates.

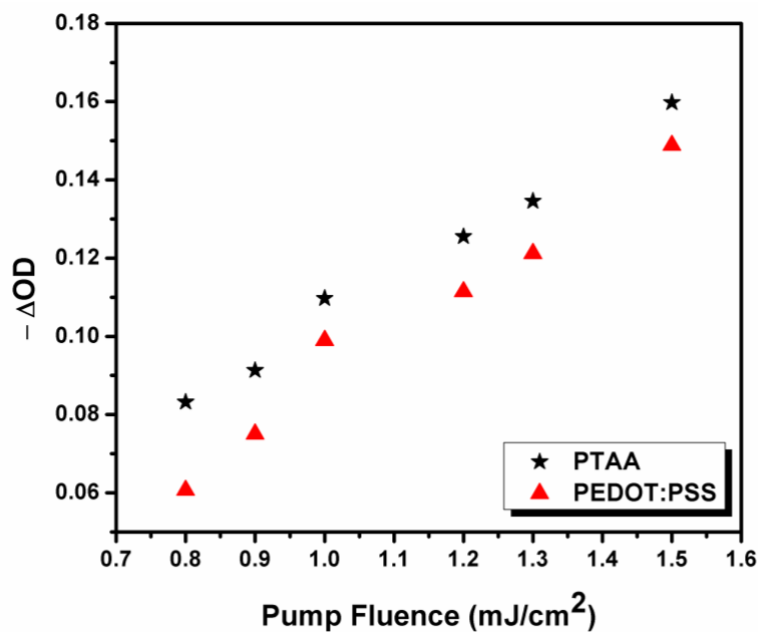


Figure S7. Relative optical density (ΔOD) dependence on pump fluence for PEDOT:PSS/ $\text{CH}_3\text{NH}_3\text{PbI}_3$ and PTAA/ $\text{CH}_3\text{NH}_3\text{PbI}_3$ structures.

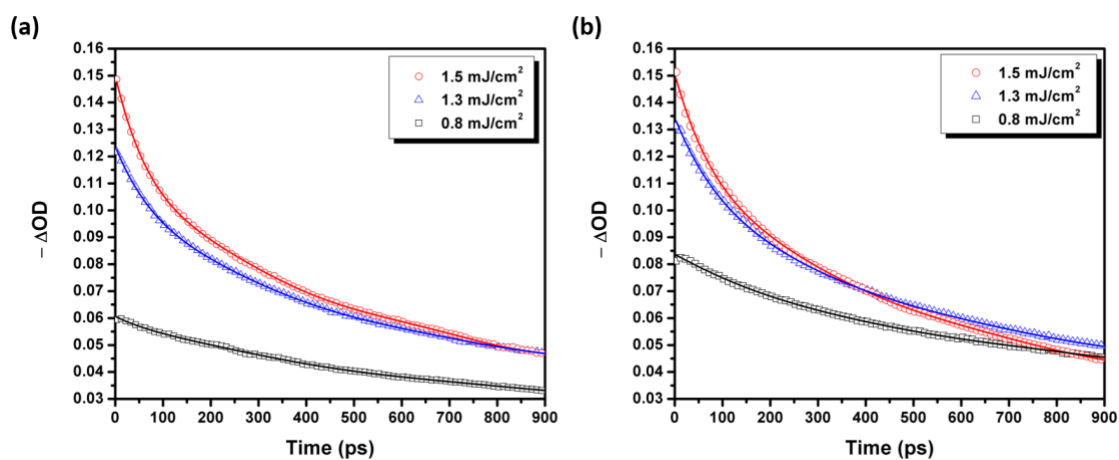


Figure S8. Transient band edge bleach kinetics (symbols) and their corresponding decay polynomial fits (lines) for PEDOT:PSS/ $\text{CH}_3\text{NH}_3\text{PbI}_3$ (a) and PTAA/ $\text{CH}_3\text{NH}_3\text{PbI}_3$ (b) configurations, photoexcited at 1026 nm with various pump fluencies.