

Looking for a safe bridge: synthesis of P3HT-bridge-TBO block-copolymers and their performance in perovskite solar cells

Aleksandra N. Zhivchikova ^{1,2}, Irina V. Klimovich ³, Maxim E. Sideltsev ¹, Aly Elakshar ², Artur T. Kapasharov ¹, Alexander V. Akkuratov ¹, Albert G. Nasibulin ², Keith J. Stevenson ⁴ and Marina M. Tepliakova ^{2,*}

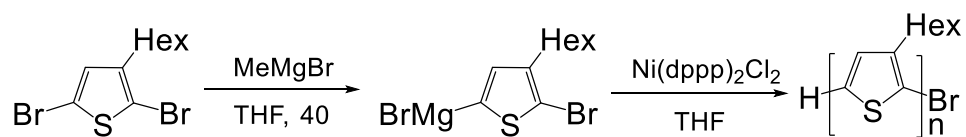
1 Federal Research Center of Problems of Chemical Physics and Medicinal Chemistry of Russian Academy of Sciences, Academician Semenov Avenue 1, 142432 Chernogolovka, Russia

2 Skolkovo Institute of Science and Technology, Bolshoy Boulevard 30, bld. 1, 121205, Moscow, Russia

3 ChemRAR, 2a-1, Rabochaya St. Khimki, 141401 Moscow, Russia

4 Moscow State University, Department of Chemistry, 1 Leninskiye Gory, 119991 Moscow, Russia

* Correspondence: marina.tepliakova@skoltech.ru



Scheme S1. Synthesis of P3HT-Br.

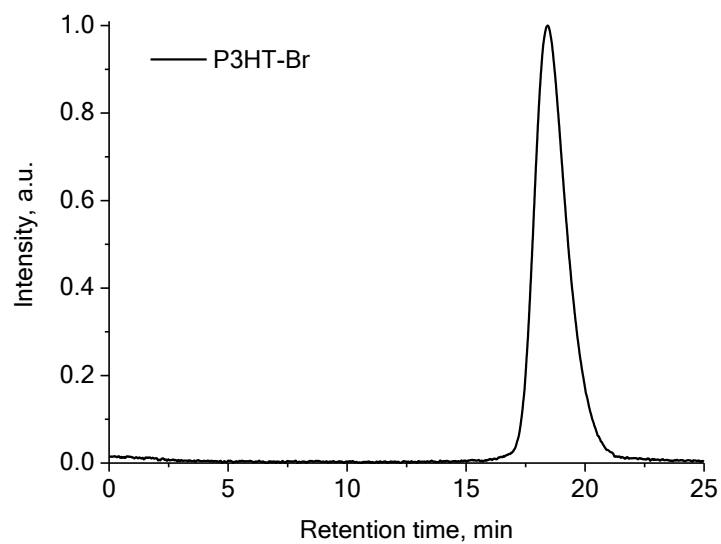


Figure S1. Gel-permeation chromatography of P3HT-Br

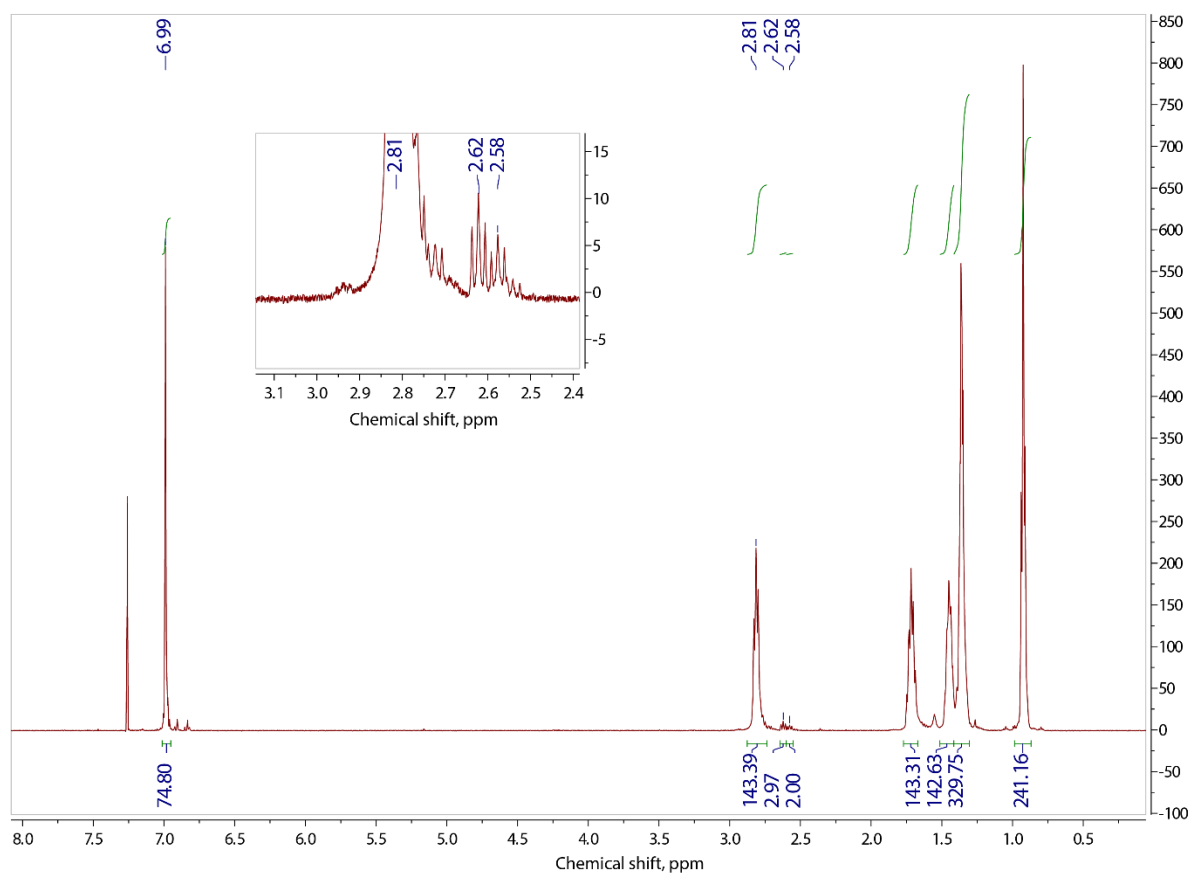


Figure S2. 1H NMR of P3HT-Br

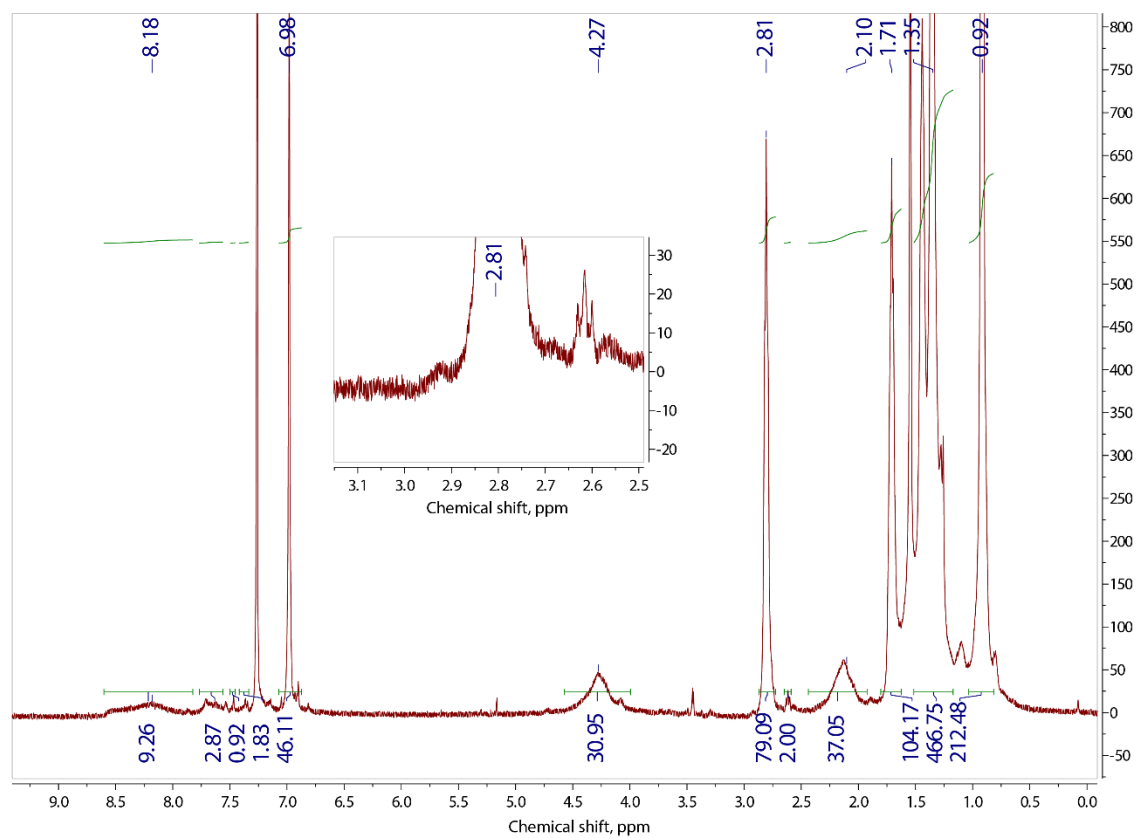


Figure S3. NMR of P3HT-TF-TBO

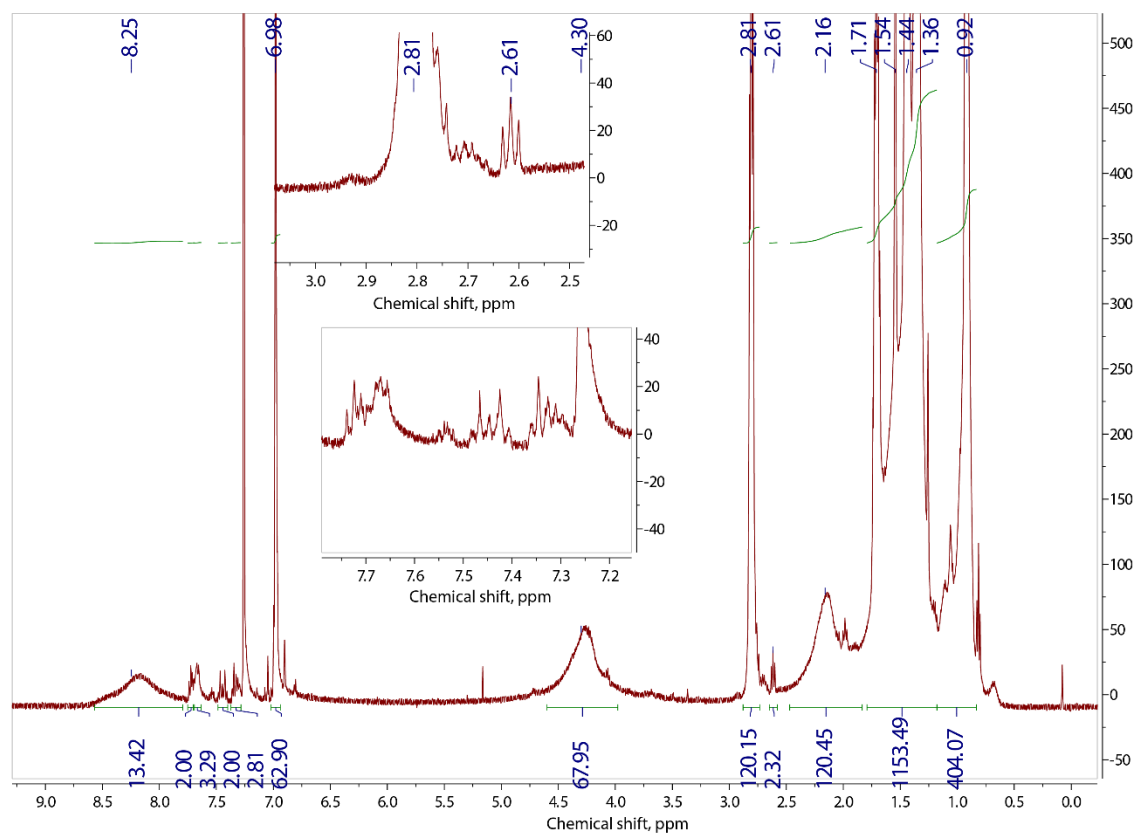


Figure S4. NMR of P3HT-FF-TBO

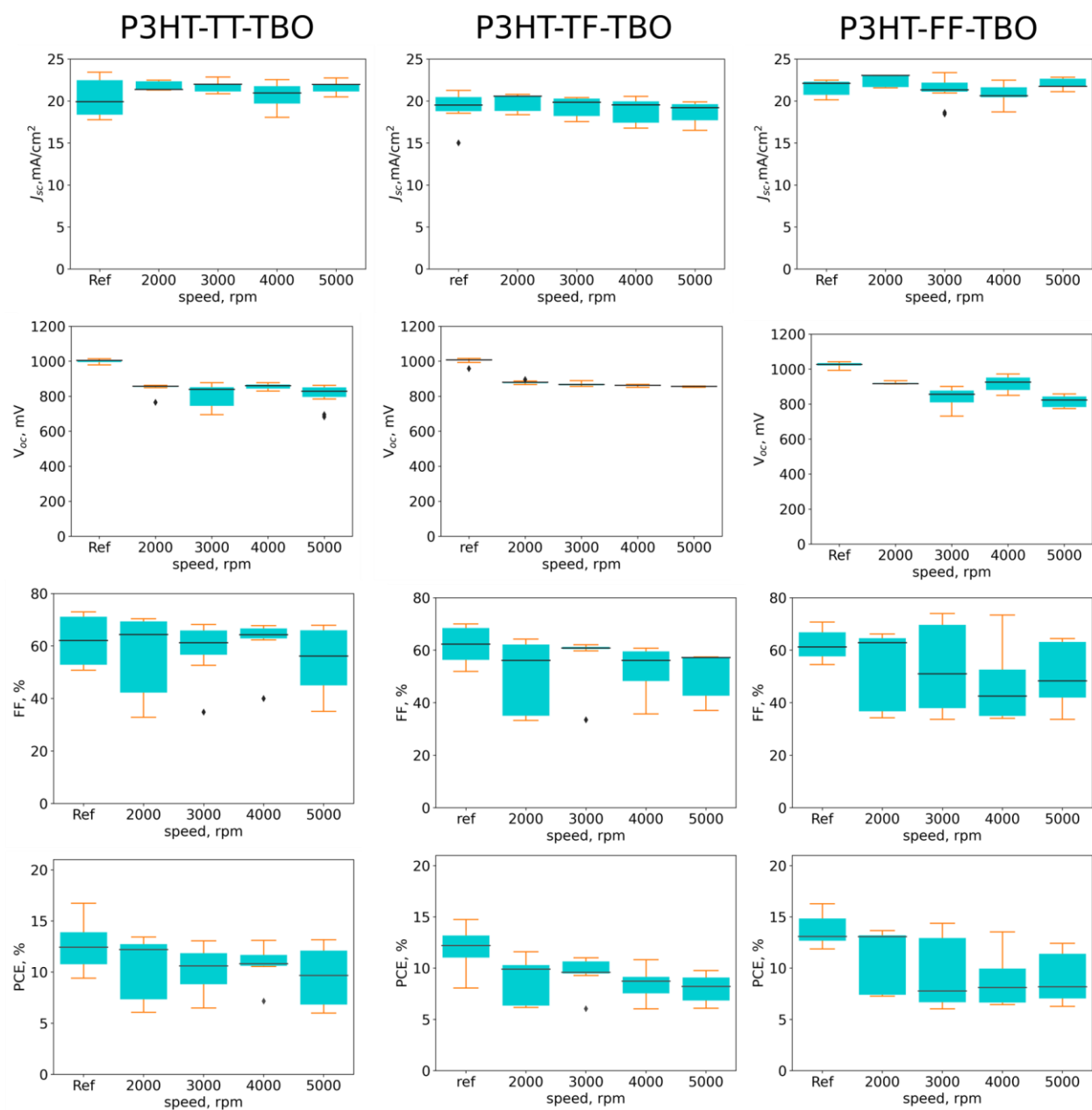


Figure S5. Optimization experiment. Current-voltage characteristics of devices with various deposition conditions applied for block-copolymers.

Table S1. Charge carrier lifetime extracted from time-resolved photoluminescence measurements.

Sample	A1	t1, ns	A2	t2, ns
Bare MAPbI ₃	452	63	3379	321
MAPbI ₃ /P3HT-TT-TBO	1255	17	973	61
MAPbI ₃ /P3HT-TF-TBO	2193	17	1917	39
MAPbI ₃ /P3HT-FF-TBO	1808	18	623	46

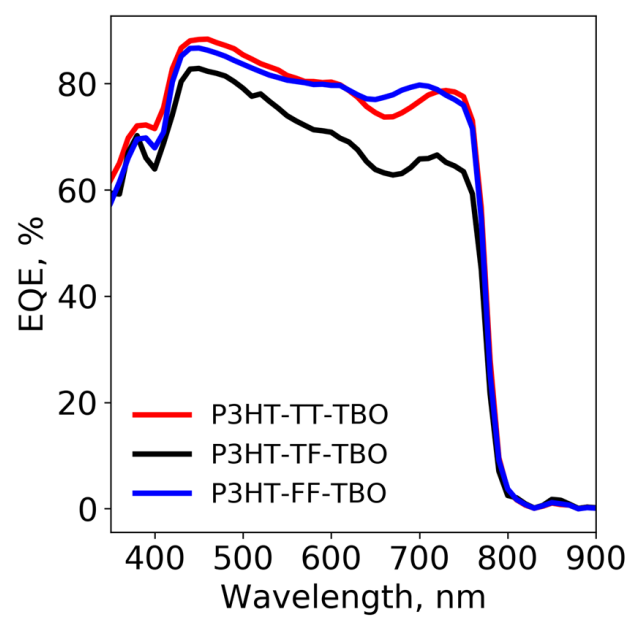


Figure S6. EQE of PSCs with various BCPs.

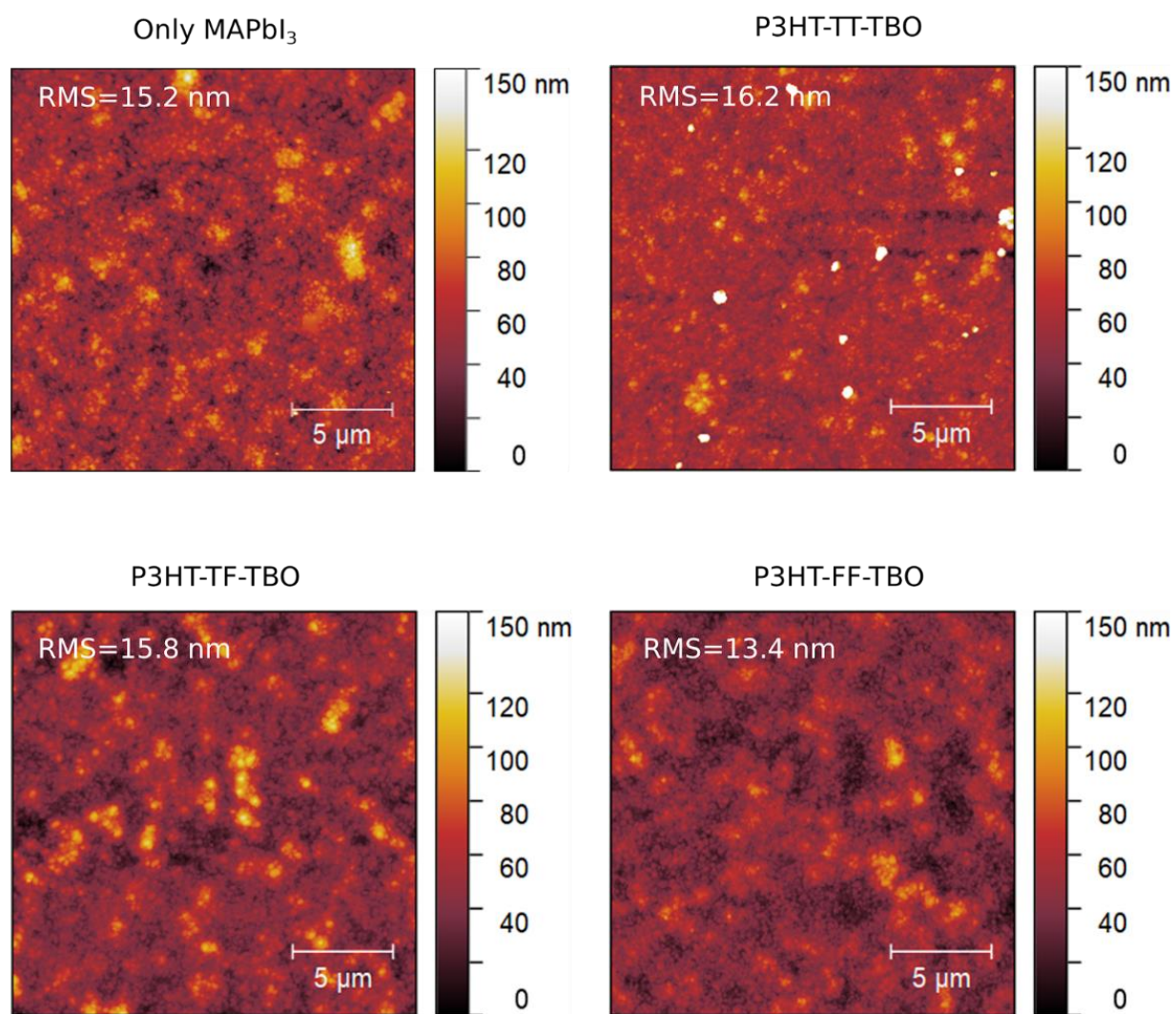


Figure S7. AFM of the samples with configuration perovskite/HTM.

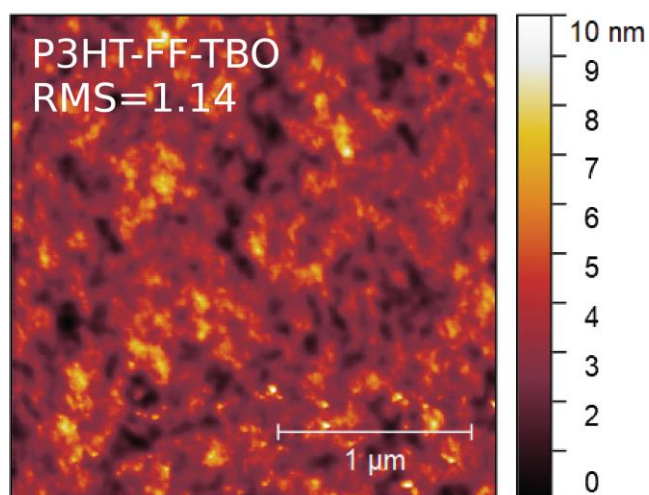
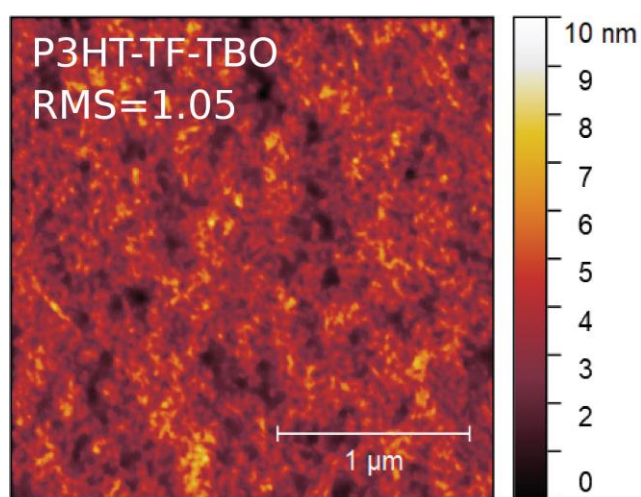
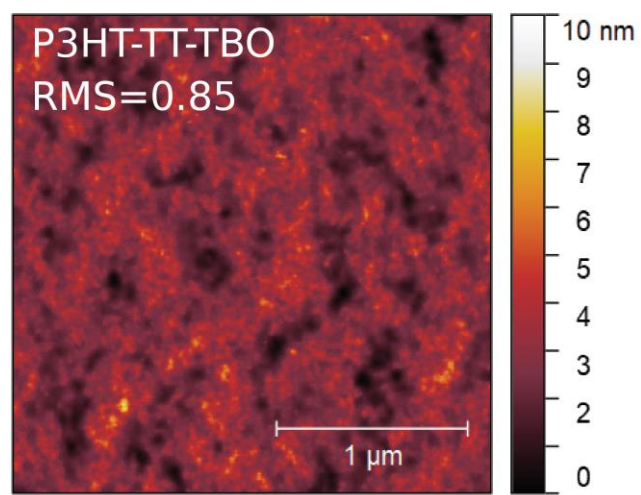


Figure S8. AFM of bare BCPs

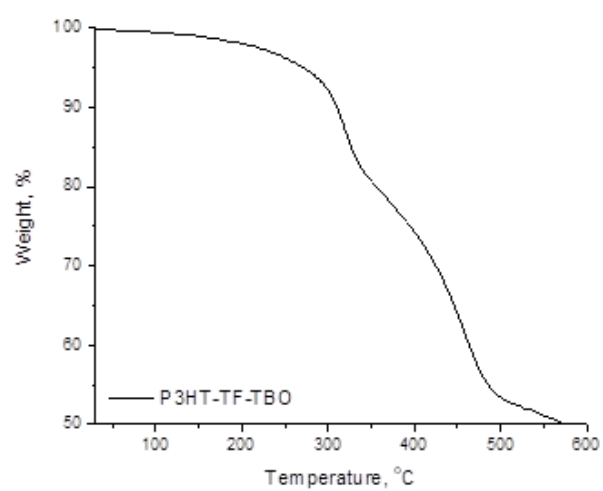
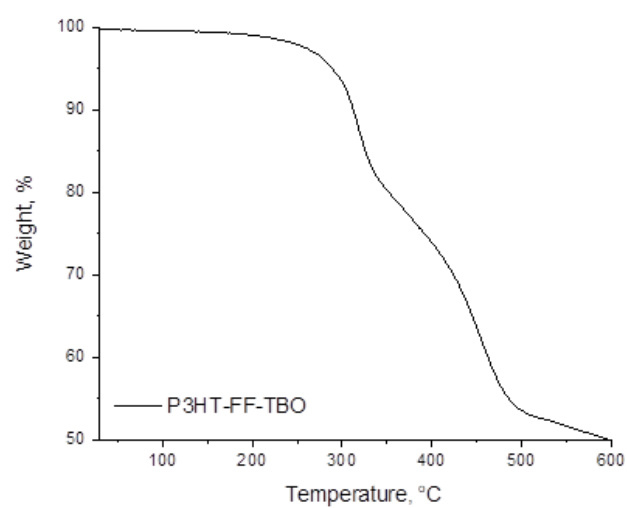
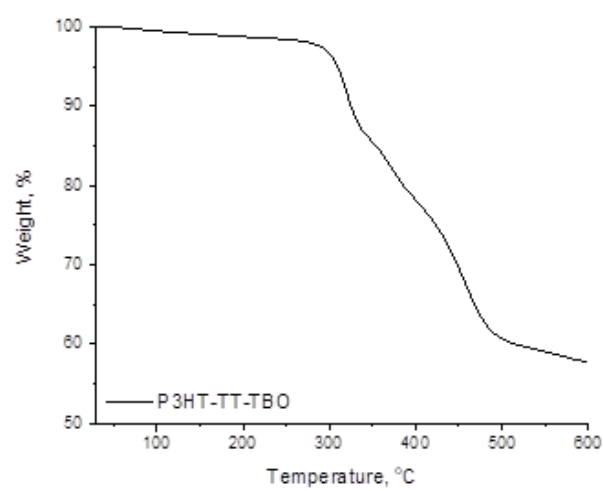


Figure S9. TGA of block copolymers

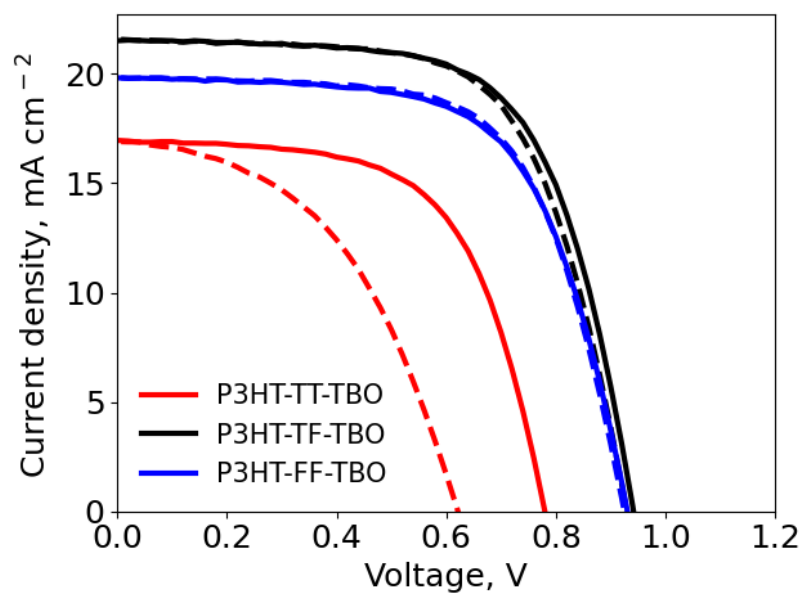


Figure S10. J-V characteristics of degraded (1000 h under continuous illumination) PSCs with P3HT-bridge-TBO block copolymers as HTMs.

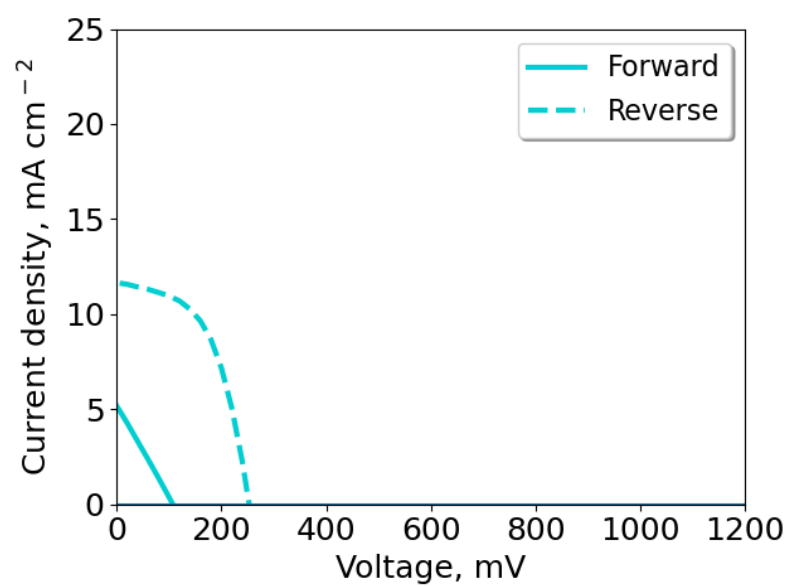


Figure S11. Current-voltage characteristics for device with MoO_x as HTL

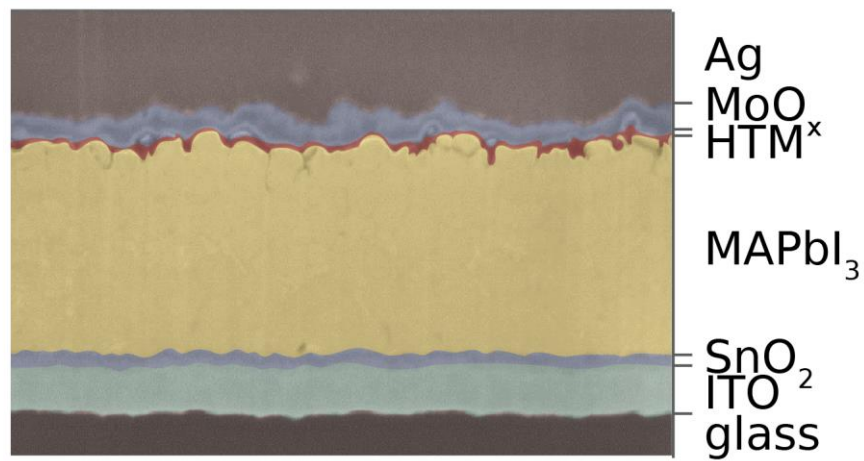


Figure S12. Cross-sectional SEM of PSC with PTAA measured on Tescan Solaris with Ga⁺ beam.