Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Supplementary information for

Photochemical stability of conjugated polymers, electron acceptors and blends for polymer solar cells resolved in terms of film thickness and absorbance

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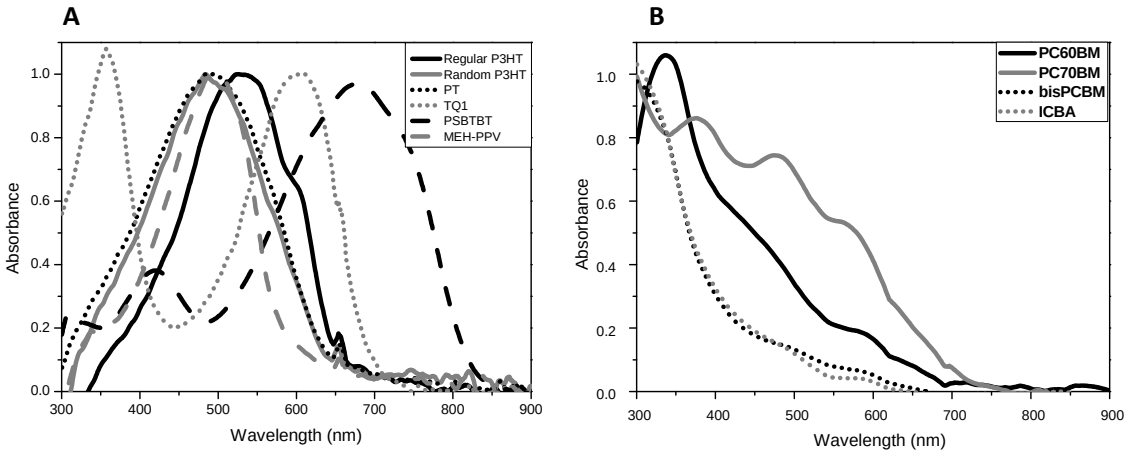


Figure S1: UV-vis absorption spectra of (A) the studied polymers and (B) the studied electron acceptors

Polymer	Molecular weight Mn	Reference
Regio-regular P3HT	50000	Rieke Metals
Regio-random P3HT	40000	[1]
PT	11300	[2]
TQ1	21000	[3]
PSBTBT	10000	[4]
MEH-PPV	45600	[5]

Table S1: Molecular weights of the polymers studied. Reference [1-5] describe synthesis and molecular weight of all polymers.

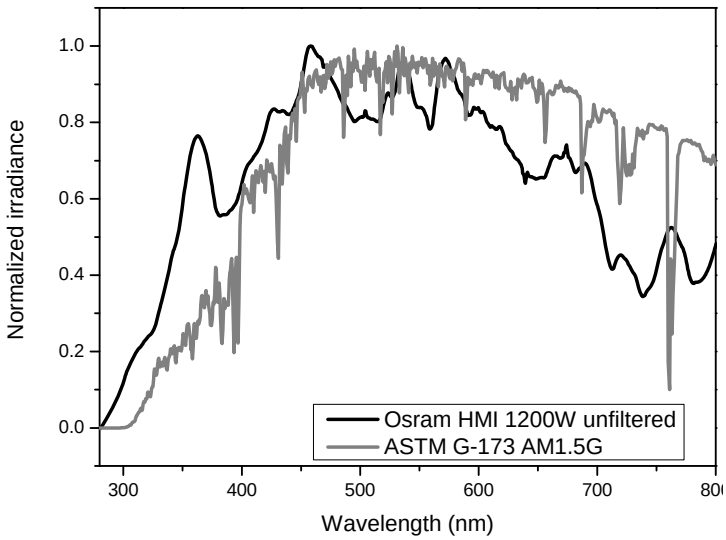


Figure S2: Irradiance of the 1200 W HMI lamp from Osram and the ASTM G-173 AM1.5 reference solar spectrum.

Material	A value in y = ax+b	B value in y=ax+b	Abs for 100 nm	Thickness for 0.6 Abs
Pure polymers				
Regio-regular P3HT	185.3	-9.8	0.59	101
Regio-random P3HT	188.9	2.2	0.52	116
PT	57.7	9.6	1.57	44
MEH-PPV	180.8	-8.3	0.60	100
TQ1	301.8	-17.4	0.39	164
PSBTBT	232.8	27.6	0.31	167
Regio-regular P3HT:Acceptor				
P3HT:PC60BM 1:1	372.9	-7.4	0.29	216
P3HT:PC60BM 1:2	469.2	-24.6	0.27	257
P3HT:PC60BM 2:1				0
P3HT:PC70BM	263.8	35.9	0.24	194
P3HT:C60				0
P3HT:bisPC60BM	306.6	24.0	0.25	208
P3HT:ICBA	310.4	17.5	0.27	204
Blends				
Regio-random P3HT:PC60B	378.6	-11.0	0.29	216
TQ1:PC60BM	443.8	5.3	0.21	272
PT:PC60BM	252.0	-20.6	0.48	131
PSBTBT:PC60BM	430.5	12.8	0.20	271
MEH-PPV:PC60BM	334.1	-22.9	0.37	178

Table S2: Fitting constant for correlations between absorption peaks and film thicknesses as determined by AFM measurements

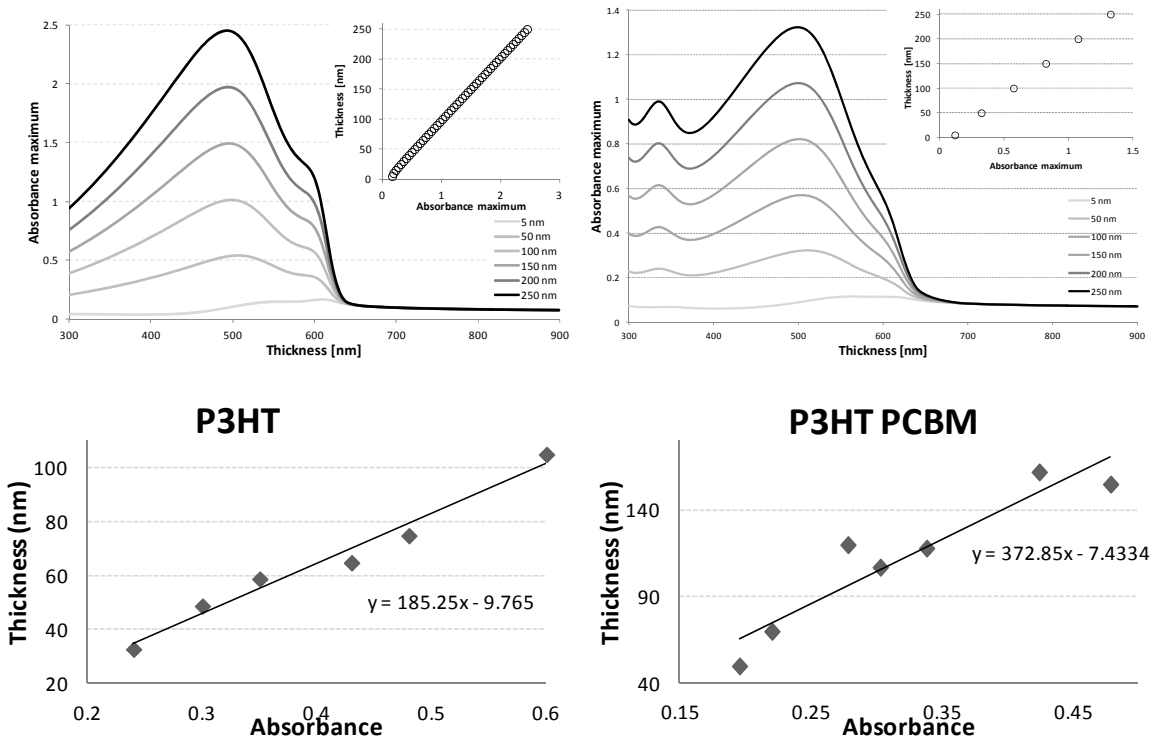
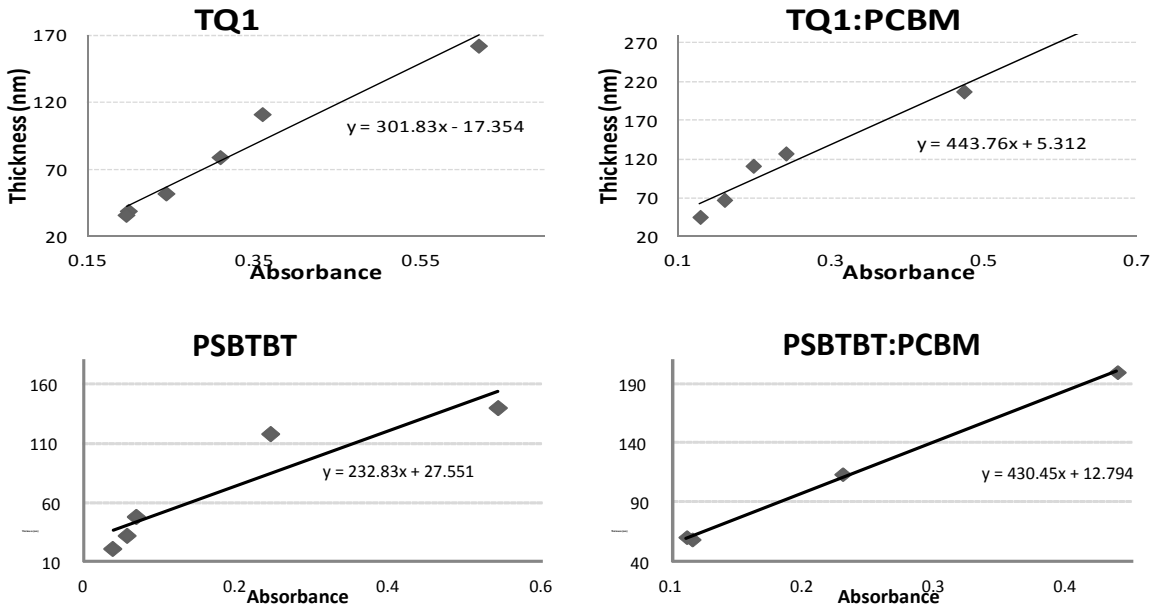


Figure S3: Simulated absorption spectra of (Top left) regio-regular P3HT and (Top right) regio-regular P3HT:PCBM of varying thickness. The insets show the linear relations between absorption maximum and thickness for both the polymer and the blend. (Bottom) The measured AFM thickness / absorbance relations for P3HT and P3HT:PCBM.



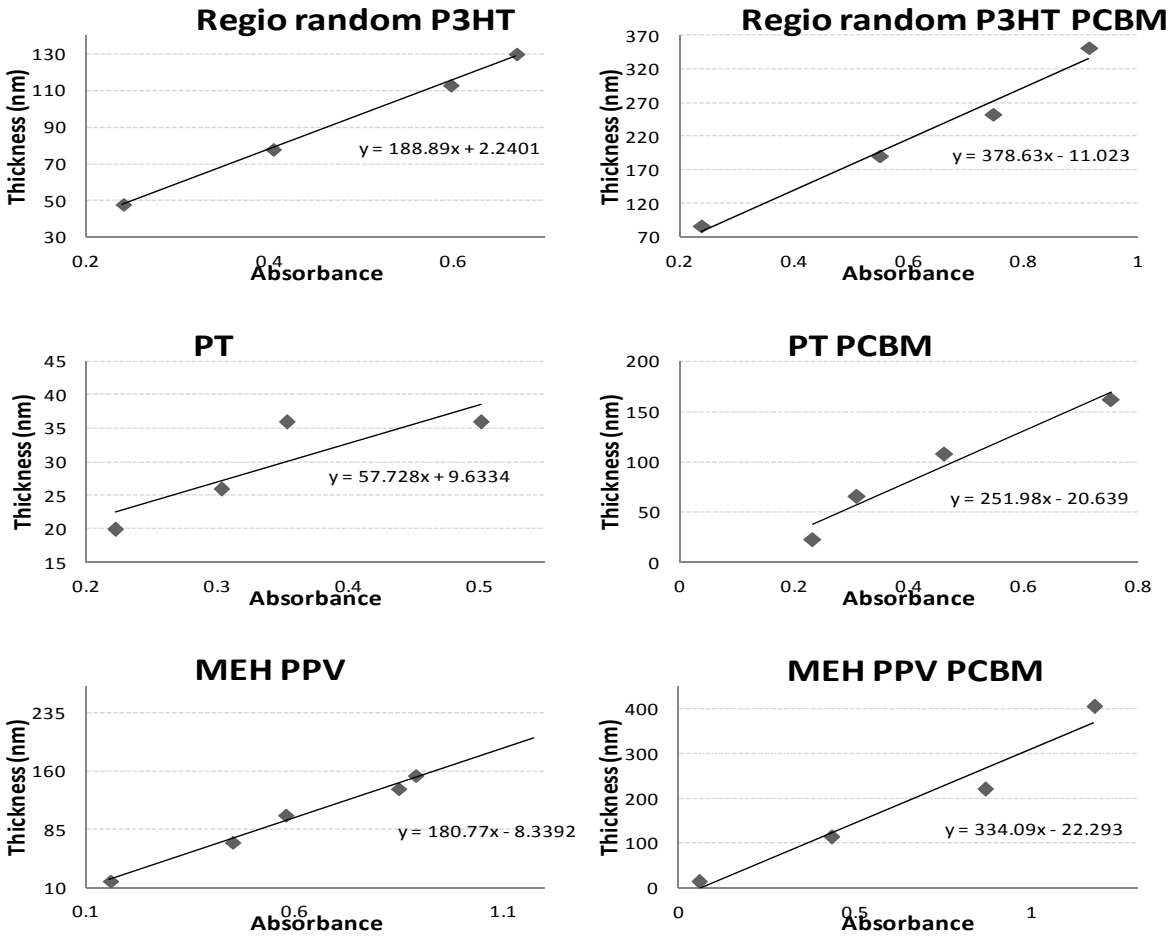
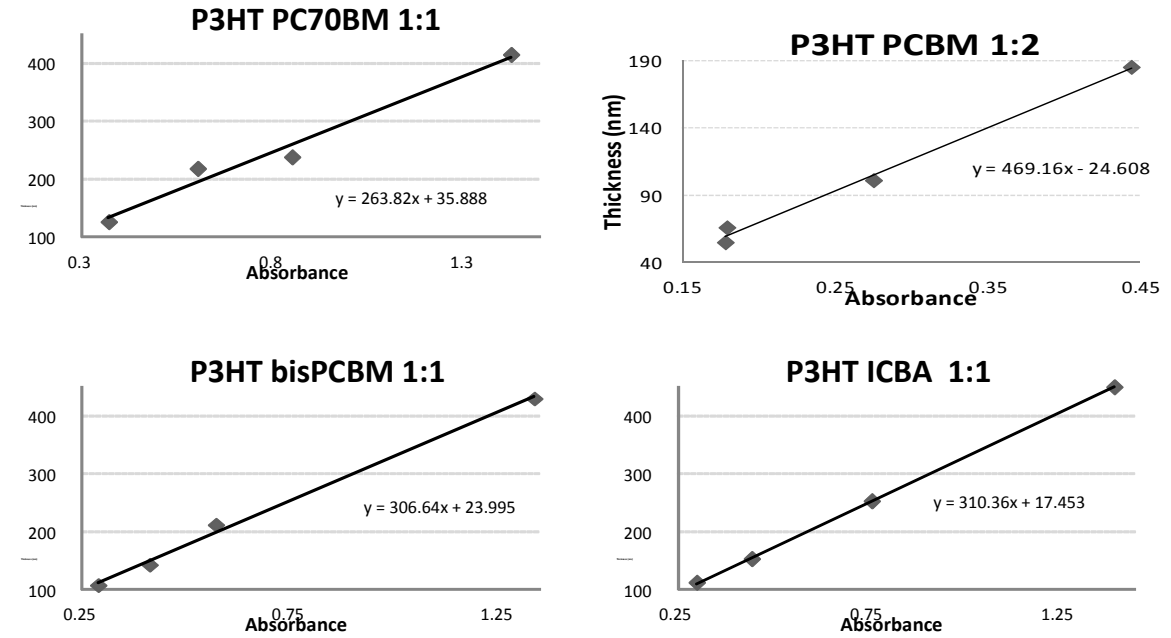


Figure S4: AFM thickness / absorbance relations for the different polymers on the left column and polymers blended with PCBM 1:1 in the right column.



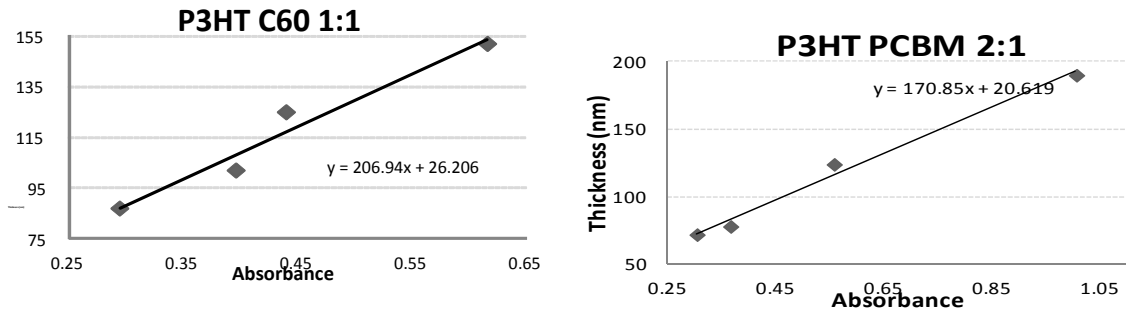


Figure S5: AFM thickness / absorbance relations for the different acceptors blended with P3HT. The ratio is 1:1 for all except for P3HT PCBM 1:2 and P3HT PCBM 2:1.

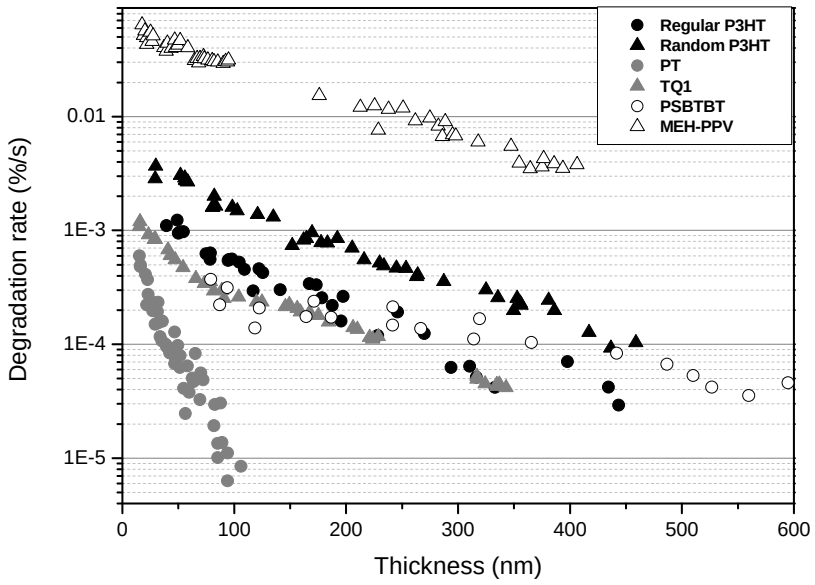


Figure S6: Degradation rates as a function of film thickness for different polymers.

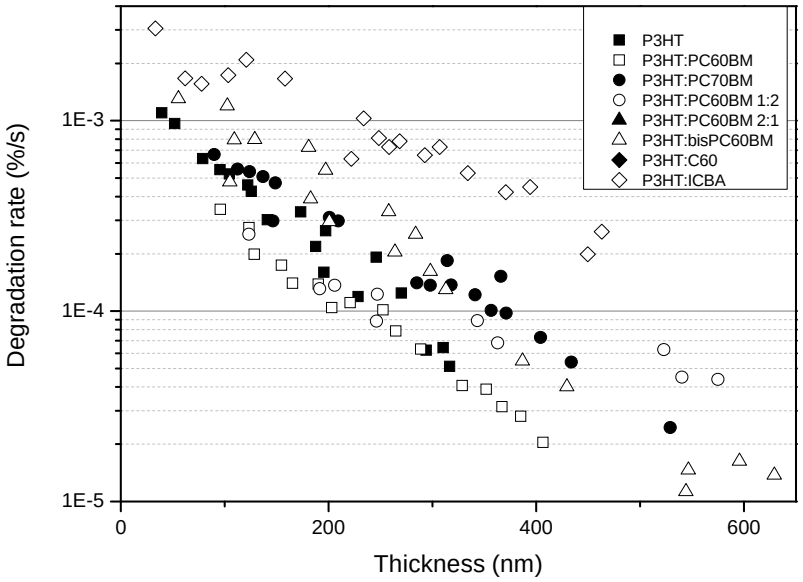


Figure S7: Thickness resolved degradation rates for P3HT blended with different electron acceptors.

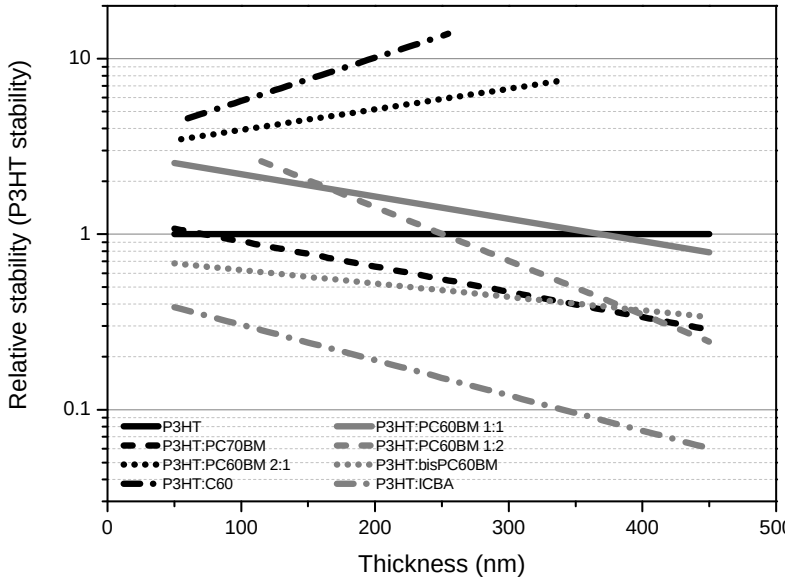


Figure S8: Thickness resolved stabilities in units of P3HT stability for P3HT blended with different electron acceptors.

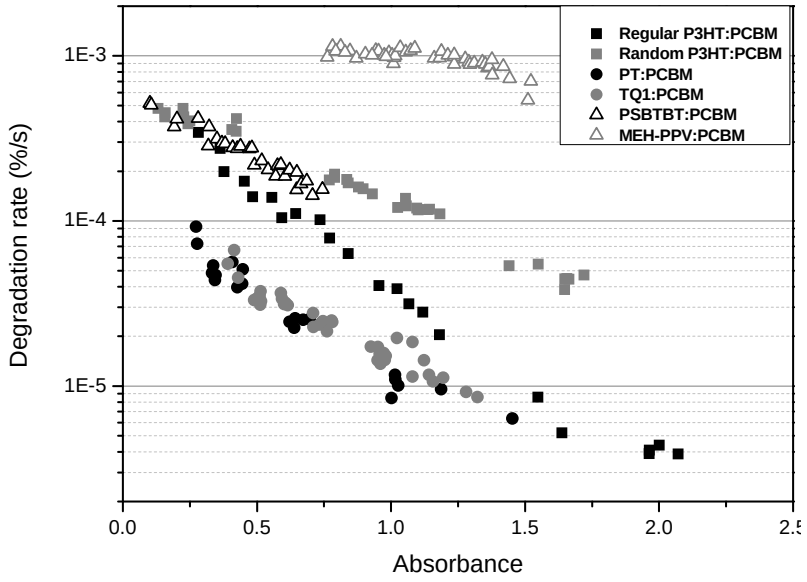


Figure S9 Absorbance resolved degradation rates of bulk hetero junctions based on different polymers and $PC_{60}BM$.

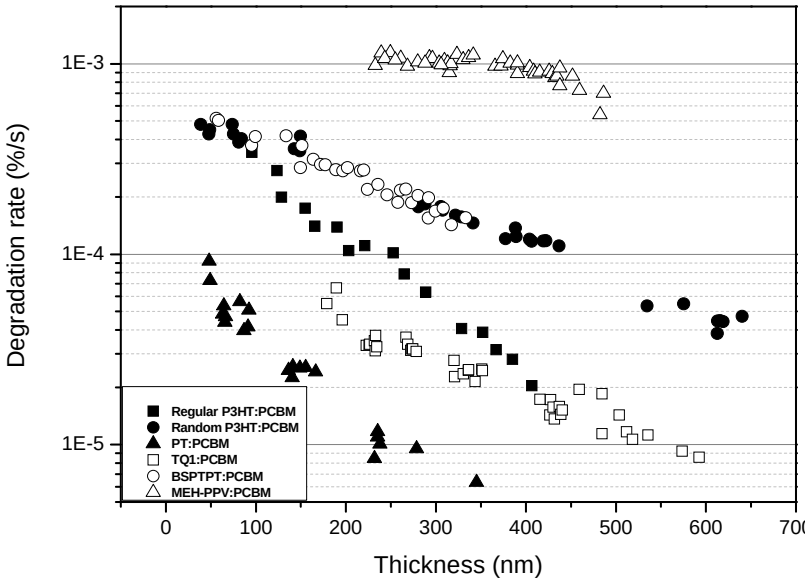


Figure S10: Thickness resolved degradation rates of blends based on different polymers and PC60BM.

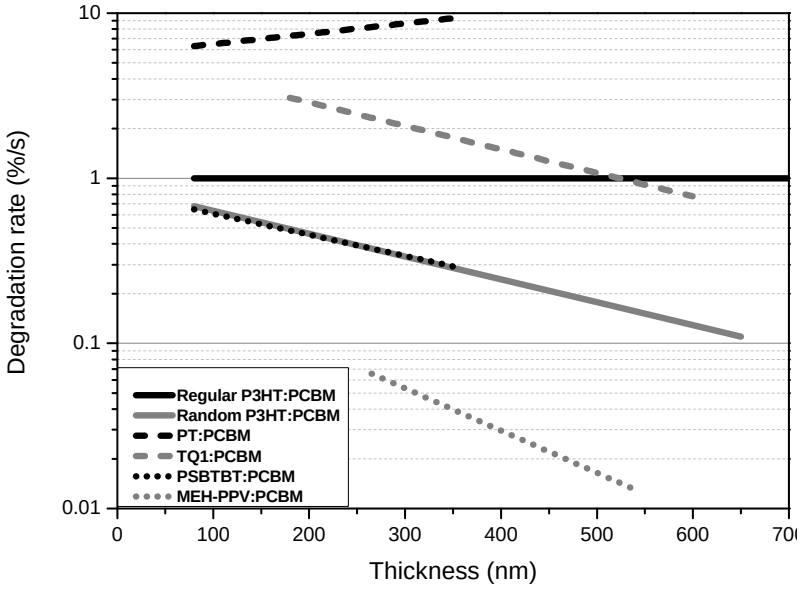


Figure S11: Thickness resolved stabilities in units of P3HT:PC_{60}BM stability of blends based on different polymers and PC_{60}BM.

Bibliography

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